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Mobile and Interactive Media in the Store? Design Case Study on Bluetooth Beacon Concepts for Food Retail

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Abstract

The Internet has changed consumer behaviour, having an impact on local retail. At the same time, the number of smartphone users is continuously increasing, making mobile applications more and more important. By using Bluetooth beacons – small radio transmitters that can be placed anywhere and are processed by relevant apps – shopping can be facilitated and made more enjoyable. Even though some supermarkets, especially in the USA, are already using beacons, their use is not common and less researched in Germany. Pilot projects only refer to usage data and reaction times while customers are rarely asked for their opinion. This project analyses potentials of usage and customer acceptance of concepts based on beacons in retail via an online consumer survey, discusses the conception of an app, and provides a subsequent qualitative evaluation. As a starting point for our concept development and app implementation, the initial online survey of 203 participants emphasises the importance of user-friendly settings as well as costumers' interest in informative communication. Throughout all steps of our design case study, concerns for data privacy as well as the interest in transparency were apparent and regarded accordingly. The field experiment stresses users' perceptions of potentially useful functions, and highlights design-related aspects for improvement, offering useful implications for the future design of shopping apps.

1. Introduction and Background

Beacons have been known for a while, but only recently became popular through Apple's iBeacons. According to predictions, around 370 million beacon installations will be available by 2020 (Hilzinger 2016) and there will be 4.5 million active beacon users in the US by the end of 2018 (Iurchenko 2014a). Bluetooth beacons are constantly transmitting a signal which can be clearly allocated to the sender. When this signal is recognised by a receiver's app (e.g., a smartphone), it is transmitted to the web server. The latter determines whether an instruction is sent back and carried out by the app. This technology is enabled by *Bluetooth 4* or *Bluetooth Low Energy,* since pairing between two devices is no longer necessary for data transmission via Bluetooth (BT). The broadcasting feature allows to send signals without an identifiable sender. Along with the increased dissemination of BT speakers, hands-free devices, and wearables, we can observe an increase in BT activity. It is assumed that this trend will be expanding due to increased value associated with BT usage (e.g. via beacons) (Sperling 2014). Possible fields of application for beacons are diverse. The main use cases are analysis and tracking features, marketing, as well as indoor navigation.

Technology has become a part of (social) practices in connection with shopping. Practices are understood as mostly routinised patterns for a context-specific mental and physical activity, often supported by specific tools (Wulf 2009; Wulf et al. 2011). During shopping, customers are already using their smartphones to compare prices, access product information, or read customer reviews. This *showrooming* cannot be prevented and retailers should accept this trend and react appropriately (Scholz 2016). Not only by publishing their opinion to other consumers, but also by sharing the shopping experience and outcome with family and friends, users demonstrate the aspect of cooperation as crucial for shopping. As the study of the evaluation platform *BazaarVoice* by Scholz (2016) shows, there are numerous opportunities for stationary trade that emerge from this change of customers' behaviour. With 8 out

of 10 respondents performing as so-called "webroomers", doing product research while attending the local point of sale (POS) and buying products, as well as Europe's sales volume of offline trade being 92 %, it is suggested that negative consequences for offline trade are not necessarily apparent. It is important to consider that the purpose of *showrooming* is not always to spend as little money as possible. Rather, customers want to find support and reasons for buying the targeted product. In this regard, representations of products via text, images, videos, and customer reviews are relevant factors of individuals' decision-making processes. Yet, offline suppliers should be aware that approximately half of potential customers do not proceed with buying when finding 2.5 % cheaper offers, while a discount of 20 % almost always (90 %) leads to a disruption of the acquisition process. Suppliers may therefore ensure easy access to their respective online stores for their customers, aiming at keeping them away from other influential providers they might come across when actively using a search engine (Scholz 2016).

Analogous to the analyses possible in online retail, beacons are a first step towards keeping up with online shop analysis and conclusions locally as well as improve processes. Pilot projects involving the use of beacons can already be found in local retail, e.g. at *Waitrose* (UK), *Macy's* (USA), *Penny* (Italy) or *Carrefour* (Romania). *Shopkick* has brought beacons to Germany, where only few applications are known so far. Potentials include the accompaniment of the shopping process, for example, via an automatic shopping list sorting, collection campaigns, games, recommendations, or review possibilities. A discussion on whether shopping in general and an increase in consumption should be supported lies beyond the scope of our work. However, a beacon-based shopping app has the potential to assist retailers in analysing and addressing customers' needs more effectively.

The focus of this paper lies on food retail. Based on related work (Section 2), we carried out an online customer survey to point out usage potentials and examine user acceptance. The study includes current

smartphone usage behaviour before and during the shopping, attitudes towards the usage of apps in retail, and opinions on data privacy, localisation, and certain features (Section 3). Based on this, an app concept was developed which is based on the actual app of a discounter grocery store. The app was expanded by features enabled by beacons, such as push notifications, an automatic shopping list sorting, product search, and in-store navigation (Section 4). Finally, the concept was evaluated in a field study (Section 5). We discuss the results in Section 6.

2. Related Work

Up to now, there are only few publicly accessible surveys available on customer acceptance or usage behaviour concerning beacons. Related studies, for example, on *mobile location-based couponing* (MLBC), have been carried out (Banerjee/Dholakia 2008), however, the diverse opportunities provided by beacons apart from coupons, such as tracking or the transmission of further (product) information, have not yet been considered.

Furthermore, similar works on MLBC are either very broad (Dickinger/Kleijnen 2008; Nikander 2011; Shankar et al. 2010), concern other cultures (Catoiu/Gârdan 2010, Jayasingh/Eze 2009), or date back a few years ago and are already outdated due to a fast technological development (Dickinger et al. 2004; Mueller-Lankenau/Wehmeyer 2005). Field experiments, for example, *Gettings* (Städele 2015) are already partly outdated, too. Problems like impairment by thick walls or windows have already been solved by a better beacon modulation. Moreover, user data has been recorded in these experiments, but users have not been interviewed on acceptance, attitudes, or problems.

Meanwhile, apps like *shopkick* or *barcoo* are gaining popularity. Even though user data and shopping behaviour is analysed in the background, customers' opinions and attitudes concerning acceptance and usage in retail receive little attention. As the different (pilot) projects have shown, using a shopping app based on the beacon technology has

a positive effect on companies and customers alike (RCKT 2015; Städele 2015). However, these applications only have a small target group. Considering these aspects, the question arises how apps processing beacon signals can be improved for a more widespread usage. We attempt to answer this question by analysing users' attitudes and requirements towards beacons and apps in retail and their functions, as well as by examining their actual usage.

3. Methodology: Design Case Studies

For an optimal approach to the design of innovative information and communication technology (ICT), it is crucial to understand actual social practice and cooperation in the given context, i.e. an organisation. The method of *design case studies* (Wulf 2009; Wulf et al. 2011) aims to achieve this in three iterative phases. First, given social practices in the field are observed and described in-depth, including tools and methods. In the second phase, based on these findings, an innovative ICT artefact is designed, where the designer should consider assumed changes in the practices. Finally, the artefact is introduced into the organisation and a long-term evaluation takes place of how information systems are appropriated by the users and what effect it has on their social and cooperative practices. According to the results, the artefact may be redesigned and evaluated again in the same application context, thus establishing the cyclic feature of the method (Rohde 2007). In the following, we first present our pre-study based on this concept (Section 4). Based on this, we further designed a prototype (Section 5) and evaluated it via a field experiment (Section 6).

Due to restrictions in time and resources, however, we implemented the design case study approach with strong deviations. Our pre-study was based on an online survey in order to answer predefined questions by including a larger participant sample. In the design phase, we created one version of the system. The third phase can be considered a pilot study of this first design round instead of a long-term evaluation, since

we did not have the possibility to include our app in the existing application and therefore gathered feedback for possible further iterations of the programme.

4. Study on Smartphones and Beacons in Retail

4.1 Methodology

For an analysis of user opinions, requirements and motivations on beacons and their features, we derived the following research questions:

(Q1) What is customers' attitude towards the usage of smartphones, beacons, and apps in retail?
(Q2) When traders offer technology like apps, do customers rate this as beneficial, neutral, or off-putting, especially in terms of data security and privacy?
(Q3) How can customers be motivated to install and use the app?
(Q4) Which features are relevant and likely to be used, and which are not?
(Q5) Do customers prefer one app per store chain or a one-for-all version?

To answer our research questions, we carried out an online survey including open- and closed-ended questions. Participants were recruited online via forum entries and social media and had open access to the survey. From the 228 filled-out questionnaires, some had to be excluded due to incomplete answers, resulting in a number of $n = 203$ participants. Our respondents included 129 (63.5 %) female and 74 (36.5 %) male participants between 19 and 66 years of age, the mean age being 29 years. Over 92 % of respondents had obtained at least a high school degree, with 64 % having completed higher education.

The following areas were covered in the survey: Shopping behaviour, smartphone usage in everyday life and while shopping, familiarity with Bluetooth and beacons, and attitudes towards location-based

advertisement as well as social media (e.g. *Facebook, XING*). IBM SPSS Statistics 24 (IBM 2014) was used for quantitative analysis. Responses of open-ended questions were iteratively sorted, coded, and analysed (Strauss 2007).

A survey was carried out as part of our methodology prior to a qualitative evaluation to include as many participants as possible in a limited time frame and to get a broader idea of our potential users. Quantitative data on the previously defined research questions served to define requirements for the design, which we later evaluated in-depth with representatives of our target group. The main app features were derived from existing retail apps and proposed for evaluation in the sense of a creative requirements engineering approach (Maiden et al. 2004).

4.2 Results and Discussion

(Q1) Customers' use of and attitudes towards smartphones, beacons, and apps in retail: Of 203 valid respondents, 35 (17.2 %) have installed one or several apps by discounters, supermarkets, or department stores. With 53 indications in total (with the option of multiple answers), *Aldi* was the most frequently named app (26 participants). It was followed by *Lidl* and *Rewe,* named by 10 and 8 participants; *real,-* was mentioned three times. Supermarkets like *Kaufland*, *Penny*, *Marktkauf*, *Netto* and *Edeka* were each named by one participant. Apart from these store-specific apps, we examined how often participants install general apps for several stores. Almost 73 % indicated to not have installed any shopping app. These results are similar to previous studies, where awareness of benefits of Bluetooth and mobile retail apps was relatively low (Iurchenko 2014b; Shankar 2010; Thammet al. 2016a). Of the three answer options, *Payback* was most frequently selected (25 answers), followed by *barcoo* (10) and *shopkick* (3). Participants could also state other apps they had installed; among these, *Amazon, Ebay, MyDealz* as well as *iTunes* or *H&M* were frequently named. It should be considered that some participants might not have thought of each single app

they had installed on their smartphones. On average, a higher share of male participants compared to female respondents suggested to have installed shopping apps (men: *M* = 1.59, *SD* = 0.49; women: *M* =1.70, *SD* = 0.46; 1 = app installed, 2 = no app installed). Regarding age, in the group of 30 to 39-year-old participants, more than half had at least one app installed (*M* = 1.43, *SD* = 0.5). The age cohort of 40- to 49-year-olds shows comparable results (*M* = 1.55, *SD* = 0.52).

96 % of all participants always carry their smartphones with them, while 86 % do so always or most times during shopping. Approximately 90 % of survey participants responded that whether a POS had its own app was not a decisive factor regarding their choices of stores. This is supported by only 6 % of respondents using the respective app in case a store represents itself via a smartphone application. Regarding campaigns of collecting points for specials or the possession of loyalty cards, respondents showed neutral attitudes, tending towards refusal on average (joy of collecting points for specials: *M* = 3.56, *SD* = 1.43; possession of loyalty cards: *M* = 3.55, *SD* = 1.34; 1 = strong approval (++), 3 = neutral (0), 5 = strong refusal (--). On average, participants appreciate to have their collected points or membership in paper or plastic form instead of saving respective data in an app, although opinions in this regard varied strongly (*M* = 3.99, *SD* = 1.87; 1 = digital form on smartphone, 6 = hard copies).

During shopping, more than a quarter of respondents are using their smartphones actively, while more than 20 % use it moderately in a more passive way, and more than half of the participants do not use their smartphones while shopping. Active participants use their smartphones mainly to set up shopping lists (37 %) while almost 20 % like to compare prices while visiting stores. 18 % use available WiFi; 17 % like to search for product information during shopping as well as browse through offers and leaflets (14 %). On average, participants viewed their apps as rather good (*M* = 2.41; 1 = very good, 5 = bad), *SD* = 0.73) with medium (2.91) usage regarding frequency (1 = very often, 5 = never,

SD = 0.73). Frequent and consistent smartphone usage, especially during shopping, indicates great potential for beacon-based retail apps. Generally, most users prefer to use such an app during shopping only.

Most important for beacon-based services is whether customers have activated Bluetooth on their smartphones, as well as whether this is intended. When asked for potential recognition of the Bluetooth symbol, only 6,9 % proved unsuccessful; 80 % recognized the symbol correctly, while the remaining answers indicated uncertainty of the symbol's actual meaning. Only 18 % have activated Bluetooth in general, with the larger part of respondents having it turned off or not being aware of it. Bluetooth beacon as a more specific term is known to almost half of the survey participants (46.8 %), while half of this group claims to be able to define it.

(Q2) Evaluation and potential added value: Around 40 % of survey respondents consider the use of apps during shopping at a POS to be redundant, contrasted by 26 % appreciating potentially added value. According to the open responses, apps are merely a nice additional feature in stores, but not decisive for the selection of products. Over a quarter of all respondents are actively using their smartphone when shopping, another 20 % are only sometimes doing so. The smartphone is primarily used for shopping lists, price comparison, WiFi usage, accessing product information, and browsing offers and catalogues. Most participants are shopping at discounters and supermarkets (as compared to department stores and organic grocery stores). Around a quarter of the participants thinks that using an app while shopping in a supermarket could have an added value for them.

Regarding the gathering of personal and location data, the majority expressed concerns (*M* = 2.23, *SD* = 1.39; Skala: 1 = concerned, 6 = not concerned). This corresponds to the question if customers would consent to sharing their data in exchange for an added value discussed in literature (Dudhane/Pitambare 2015a; Mueller-Lankenau 2005; Shankar 2010). In general, 35 participants indicated to have little or no con-

cerns at all. If customers' positions are used for analysis purposes only, around a fifth would agree when asked. However, the level of agreement is much lower if the retailer does not ask for permission (70 % would actively object). If added values like discounts, vouchers, or information are provided, about a third would voluntarily offer their data. Discounts should be as high as possible and usable for products the customer needs. Personal offers and navigation are added values as long as data security is guaranteed, and analysis results are made transparent. Further added values are features increasing shopping comfort, such as product recommendations or reminders. Men expressed less concerns regarding the gathering of personal or location data (Men: $M = 2.15$, $SD = 1.4$; women: $M = 2.36$, $SD = 1.38$), while women rated most listed functions (Q4) as more useful than did men.

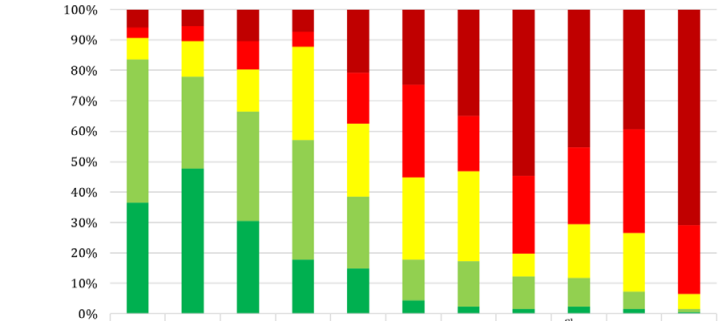
In a general, open-ended question we found that about half of the participants have a negative attitude. Most frequently, they named concerns about possible surveillance or potential spam. A quarter each is either undecided or has a positive attitude. Even those who are concerned see advantages and the practical benefits. Others do not have data privacy concerns, but fear receiving push notifications too often. Customisation options are therefore important. Push notifications and recommendations are regarded as something one must get used to. Those with a positive attitude prefer this method over advertisements via mail or e-mail, as long as the user has given their permission. An added value could be established if advertising is tailored to individual shopping behaviour and personal attitudes.

(Q3) Incentives to install shopping apps: With the prospect of getting a discount in return for installing a store's app, more than half of the participants (52 %) tend to show interest; almost a third indicates the strongest support on the six-levelled scale. Monetary incentives like percentage discounts (5-50 %), two-for-one coupons, loyalty discounts, free items, a one-time free purchase, or exclusive offers, although appreciated by participants (Dickinger 2008; Nikander 2011), were not the

only decisive factor. Non-monetary incentives such as in-store navigation, priority purchase for limited goods, recommender offers or pre mium services (extended warranty, consultation, or prize games) are also named as added values. Most dominant was the desire for personalisation, e.g. via customisation and automatic adaptation to the usage behaviour. Valuable features facilitating and enhancing the shopping experience are therefore the main reason for installing the app.

(Q4) Valuable features: The proposed main features were evaluated by participants on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Additionally, the respondents were able to indicate in an open question which other app functions they could imagine using. The citations used in the following are taken from the online survey, translated by the authors and marked with the response identifier. Information on offers, mobile coupons, or discount vouchers, reminders of saved offers, as well as further product information were identified as the most important features (see Figure 1). More than half rate information as helpful, while over three quarters would redeem discount coupons. As already described by Weigl (2013), recommendations in general are regarded as helpful and lead to a purchase if they are subtle and non-intrusive, but catch users' attention. Recommendations should be based on previous purchases and not overwhelm users. Further considered helpful are barcode scanners for price comparison (*"scan as you shop"*, 164), shopping or wish lists, product search and reviews, store finder, marking favourite or future offers, and managing recommendation notifications. Opinions on in-store navigation, review of the purchase, and prize games are mixed. Only around a third (36 %) agree on the value of purchase reviews. Games, receiving a greeting by the app when entering the store, sharing content with friends, and receiving messages while passing are the least popular features. Only 15 % could imagine entering a store in reaction to a notification. Useful information could "*incorporate indications for allergy sufferers*" (160) or be health-related ("*hidden sugars*" (31) or a "*health traffic light*", 115), produc-

tion, ingredients, nutrition details, "similar products [as a] *decision support*" (106) including "*price comparison*" (65), location-related data like opening times, parking opportunities, current crowd, and waiting time: "*Information on visitor numbers so that I can decide from home if the store is currently too full for me to go shopping*" (40). An overview map, including a search function, display of a catalogue and product categories, or an automatically sorted shopping list are considered equally helpful. This goes with high research interest in indoor navigation, which is increasingly accurate as well as popular with users (Kriz et al.2016; Purohit et al. 2013; Thamm et al. 2016b). Furthermore, a list of favourites with a notification function is required, as well as push notifications on spontaneous advertising events. Many participants hope for an extended recipe function, such as suggestions or ingredient lists which can be added to the shopping list together with the price, ideally even from external



	Info on offers	Mobile coupons/ discounts	Reminders (saved offers)	Product info	In-store navigation	Purchase review	Prize games	Greeting	Share content with friends	Notifications when passing	Games
Strongly disagree	12	11	21	15	42	50	71	111	92	80	144
Disagree	7	10	19	10	34	62	37	52	51	69	46
Maybe	14	24	28	62	49	55	60	15	36	39	10
Agree	96	61	73	80	48	27	30	22	19	12	2
Strongly agree	74	97	62	36	30	9	5	3	5	3	1

Fig. 1: Participants' attitudes towards the different possible features

websites like *Chefkoch: "Open recipes on Chefkoch or similar and add ingredients automatically into the app"* (205). In Table 1, we have summarised all listed features, evaluation results, whether they are included in the existing grocery store app, and implications for our further design.

In general, women appreciate collecting points more than men and show comparatively stronger support for offline loyalty cards (women: $M = 4.57$, $SD = 1.66$; men: $M = 2.99$, $SD = 1.82$).

(Q5) Store-specific vs. general shopping apps: Opinions regarding the scope of an app (one chosen store vs. various stores) differ among participants. Half of the respondents prefer a general app comprising several stores, a fifth voted for a specific app, while the remaining answers are located in-between ($M = 4.07$, $SD = 2.1$; 1 = store-specific, 6 = general shopping app). With respect to age, gender, and education our analysis only yields small variances, exemplified by men, respondents younger than 20 years, as well as 50- to 59-year-olds tending towards general shopping apps. Looking at answers to the question on installed apps by participants (Q1), it is indicated that store-specific apps are less popular among participants as they more often stated names of general shopping apps like *Payback* or *shopkick*. Yet, we have to keep in mind that respondents may not have considered each single app on their smartphone and classified them as a store-specific shopping app.

5 Concept and Prototype Implementation

5.1 Methodology

As the second step of the chosen method of design case studies, it is crucial to develop a related ICT artefact based on prior empirical analysis. Even though the majority prefers a general app, we regarded the integration into an existing supermarket app as suitable for the number of required features. Therefore, the app was specifically designed and equipped with functionalities for discount supermarkets. Furthermore, in this way, customer loyalty and store-specific features and policies

Table 1: Evaluation and implementation of various app features

Feature	Empirical result	Included	Implications for concept
Information on offers	Regarded as useful by 84%	Yes	Add online catalogue, product search and review, and filter
Coupons/ vouchers	Over ¾ would use offered coupon	No	E-coupons, (multiple) purchase points, exclusive and personalised vouchers, loyalty points, free item, loyalty discount
Reminders	Viewed as useful by 2 / 3 participants	Yes	Location-based reminders as push notifications
Product information	Rated as useful by over 50%	Partly	Allergen information, origin, ingredients, health traffic lights, nutrition information, product comparison incl. prices, warning for unhealthy food items
General information	Wanted multiple times	Partly	Product availability, parking situation, crowd situation, waiting times, analysis results, recommendations
Location-related information	Wanted multiple times	No	Opening times when passing, overview map incl. search function and product categories
In-store navigation	Over ¼ would use	No	Guidance towards products, sorting shopping list according to the store layout
Notifications while passing	About 15% would enter the shop	No	Choose carefully due to low popularity
Shopping list	Wanted multiple times	Yes	Automatic sorting, show available offers
Customisation	Wanted multiple times	No	Product reservations / priority purchase, setting interests, favourite list incl. notification
Barcode scanner	Rated as useful multiple times	Yes	Access to further information, home delivery, virtual shopping cart: Spending overview and mobile self-checkout
Push notifications	Mixed reactions (helpful vs. annoying)	No	Informative, send reminders, recommender offers, spontaneous advertisement events, customer recognition
Recipes	Wanted multiple times	Yes	Suggestions, ingredient list, price, automatic import into shopping list (also from external websites like Chefkoch), ‘fridge search’
Survey	Prospect of coupons increases participation rate	Yes	Quick survey via push message with direct link to current shopping check

could be considered and maintained. Based on our survey, some of the well-rated features were implemented in a prototype based on an existing discounter grocery store app (see Figure 2). Using creative methods (Maiden 2004), we derived required features which were intended for evaluation in the following stage of the design case study process. Our focus lies on aspects whose functionalities are based on beacon technology. Overall, clear structures were chosen to make the interaction as easy as possible and intuitive before and during the shopping.

We included the features desired by participants (see Table 1) such as information on products based on users' location as push notifications, a shopping list which is automatically sorted according to store layout and user position, as well as product search combined with in-store navigation through the store to a selected product. All functions included in the original app were maintained and supplemented. Also, we considered data privacy concerns and included relevant information on as well as enabled user control over those features which require personal information, such as location and shopping list. Some of the desired features, such as coupons, personalised offers, and home delivery, could not be realised due to store policy and the lack of a complete digital product catalogue as well as online shop, while others were not relevant in terms of beacon usage. The additionally implemented features and corresponding requirements and considerations as well as implications for practices will be described in detail in the following section.

5.2 App Functions and Structure

The user's permission required by the German Data Protection Act is obtained together with an information on the update (see Figure 3). The description of the terms of use and new features play a large role along with transparency of data gathering to decrease user concerns regarding Bluetooth activation and the release of other personal data. Thus, informing users is the most important and a relevant factor with respect

to future use of the supermarket app functions. It is critical to inform users not only about the recording of location and data, but also about advantages for customer experiences, e.g., categorising important and irrelevant information, providing product search, and sorting grocery lists. Critics like Sperling (Sperling 2014) point out the difficulties of convincing users to follow opt-in processes and use Bluetooth. When accepting the terms of use, users are assisted by informing them about the necessity of Bluetooth activation for smooth functioning. In cases of non-acceptance, the app should provide a direct link for changing settings to ensure a user-friendly modification process.

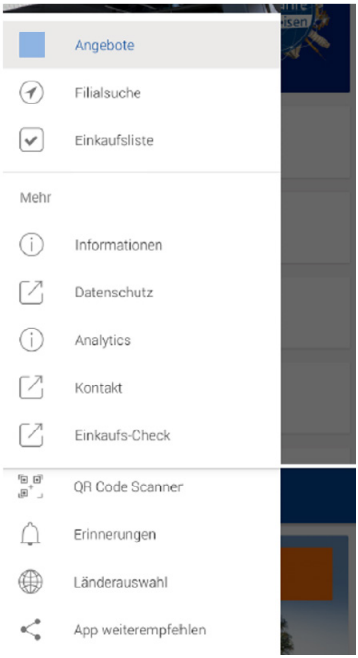


Fig. 2: Excerpt from the current menu of the existing app

Fig. 3: Information on the update

A **shopping list** is integrated into every supermarket app. Customers wish for add-ons, such as the recognition of current offers, sending recommendations, the option to save several lists, or an automatic sorting option. The latter aspect was integrated in the prototype since it is both based on beacons as well as holding a crucial added value.

When the shopping list is first accessed, the user is asked if a sorting should occur automatically to prevent confusion due to a differently resorted list. In an ideal case, the list would be sorted not only at the beginning, but also if the user diverts from the suggested path. Based on beacons, the chosen shopping list will be changed according to the various products' locations in the respective store. Besides this automated sorting, which depends on the store's set up and the costumer's own position, a supermarket app using beacons enables adjustments of products' names (sometimes determined by local stores), thereby helping customers to find products faster. Naturally, such a beacons-based app should ensure the refreshing of the product order within the shopping list in cases of detours or divergent routes.

Although automated sorting of shopping lists is formally accepted by first acknowledging the terms of use and related functions, user-friendly questions signalling the potential sorting of products on the person's shopping list are recommended. Users should be able to decide whether to allow or prohibit (in general or in a singular situation) the sorting of their envisaged products according to location. Furthermore, it may be useful to integrate short-term discounts into the shopping list, as proposed by some participants. Similarly, users have the option **to share the entire or parts of the list**. This way, the app can adapt to cooperative shopping practices with family or friends.

Usage of an **in-store navigation**, which around a quarter of participants would use, is demonstrated in the prototype along with the product search. Not only can one's own location be determined by beacons, but also the way to the desired product can be shown on the overview map (see Figure 4). Furthermore, it is possible to categorise various

shelves according to products and visualise the various groups of goods, e.g. displaying shelves storing groceries in green, drugstore products and cosmetics in red, discounted goods in blue. Entry and exit doors of the respective store should serve as a point of reference as well. Visualising various product categories by different colours and following Gestalt laws by Heinecke (2004) help customers to orientate themselves in the store. An integrated search function should be included analogous to other search functions in the app according to the conformance of expectations (ISO 2018).

Alternatively, a display of **products in the shopping list on a map** was considered, including the most efficient paths, but discarded due to the generally small display size of current mobile phones.

Fig. 4: Product search and in-store navigation

Beacons offer huge advantages like location and time relation when it comes to push notifications (see Figure 5). Highly appreciated by participants and indicated by their usage and answers regarding their interests, push notifications are **informing users about discounts**, e.g. offering them coupons and vouchers. Yet, it is important to consider frequency and perceived (in-)significance of push notifications of marketing products, following the rule of "[t]he right message, to the right user, at the right time, in the right place" (accengage 2017 [translated by authors]).

Opinions towards **push notifications** were very different. Some participants felt disturbed by messages for marketing purposes, perceiving them as interrupting. Others appreciated informative messages, reminders, recommendations, and information about short-term discounts. Participants pointed out to the frequency of such notifications being a decisive factor as well as their habitual use of supermarket apps, where they do not expect regular push notifications. Generally, not only advertisements, but also informative messages should be sent (e.g. changed opening times, product information, reviews). Addi-

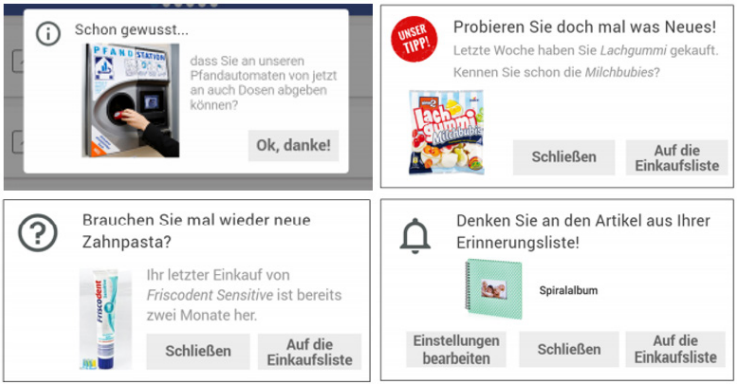


Fig. 5: Product recommendation

tionally, messages may be transported via graphics. In general, allergy-relevant information, product origins, nutritional facts, alternative products (including prices), as well as an evaluation system referring to health aspects is valuable to participants. However, offering these types of information while using beacons may be problematic regarding exact mapping, as products are often positioned right next or above each other.

Furthermore, **recommender** offers can be valuable due to personalisation and location-based services. Participants wish for an adaptation to user behaviour as well as customisation options. Push notifications can be sent in different forms: Apart from information and recommendation (Figure 5), they could indicate set reminders or the option of a purchase review.

To increase customer satisfaction, opportunities to **give feedback** easily may be introduced through push notifications sent to customers after finishing their shopping and receiving a respective beacon signal. Users may evaluate their experience by choosing smileys or a certain number of stars. In case customers do not show any interest in giving feedback, it is crucial to reduce the frequency of push notifications asking for a review.

Apart from the features named above, participants mentioned many functions that are independent from beacons. They would prefer a '**favourite list**' where items can be saved and notifications are sent in case of an offer; up-to-date, shop-specific information like **availability of parking spaces**, **crowds**, **waiting times**, and **product availability**; **location- or shopping-related prize games** (e.g., for bridging waiting times at checkout); **visibility of analysis results**; **product reservations**, and **reviews** after creating a profile; a **virtual shopping cart** and **mobile self-checkout**, as well as an extension of **recipes by suggestions**, **price indications**, and **automatic import of products into the shopping list**.

6 Evaluation

6.1 Methodology

For the evaluation of the concept, a prototype as well as a questionnaire were developed. Testing the subjects' use of the prototypical implementation constitutes the last step of the three-phases-approach of design case studies, namely the evaluation of appropriation of the artefact and its influence on the respective social practices. In the conducted user test, the focus lay on customers' behaviour and attitudes. We evaluated which features were popular, which results from our online survey and related work could be confirmed, which features participants would use in everyday life situations, to which degree the technology is accepted, as well as the concerns, wishes, suggestions, and potentials for improvement expressed by participants. Since the context of software use is crucial to enable a better immersion of subjects in the situation and to safeguard a higher validity of the results, we conducted an explorative field experiment based on a prototypical click dummy with representatives of our target group up to the age of 40. This age group is not only easily accessible, but also includes most smartphone and mobile couponing users (Shankar et al. 2010). In our usability test embedded in a field observation study (Holzinger 2005), the participants were guided through a simulated shopping situation in a grocery store via different tasks (see Figure 6). Our method included an everyday scenario, where participants fulfil predefined tasks reflecting actual interaction with the product from the start until the end of their usage experience in a natural environment. At the same time, participants should express their thoughts and opinions during the usage according to the *thinking aloud* method by Nielsen (1992). By direct observation, we were able to notice the interaction, define attitudes and problems, as well as to react to participants' expressions at the same time. Following the observation, we conducted a conversation based on a semi-structured guideline. For a further analysis of the demographics and shop-

ping as well as smartphone usage habits, we concluded the study with a questionnaire on technology acceptance (Davis 1986) grocery shopping, smartphone usage, assessment of their own affinity towards technology, and personal data, using 5- to 10-point Likert scales.

We carried out the evaluation, which took about 30 minutes, in two identically structured stores which belong to a food retailer. 22 users between 20 and 46 years (M = 28.5, SD = 5.21) in a balanced gender relation took part. Most of our participants indicated a high interest in new technologies and an above-average affinity towards technology. On average, they do grocery shopping two to three times a week (72.7 %), while 95 % manage this on their own or with their partner. All participants indicate to usually buying the same but are willing to try new products. Shopping is often a cooperative activity, as a quarter of participants

Fig. 6: User test situation

share it with a partner, and many are likely to follow a friend's recommendation when looking for new products (40.9 %). The smartphone is used once or several times an hour by more than three quarters of all participants (77.3 %), during the shopping, one third use it *sometimes* (36.4 %), another third indicated to use it *often* or *always* (13.6 % each).

6.2 Results and Discussion

Our evaluation has shown mostly positive reactions to the prototypical implementation of the app. In general, the link between virtual and real world is seen as progressive, especially compared to other countries (e.g. *mobile payment* (Statista 2017)).Currently, apps hardly offer support for grocery shopping and this should change. Around a quarter of the participants indicated to already use apps by supermarkets, while the acceptance rate was greater in our user test and an increase could be achieved by a greater scope of functions. Prior to the evaluation, we asked our subjects about these features. Those who did not previously use a supermarket app wished for a shopping list, display of current offers and discounts, including personalised vouchers, a barcode scanner, store finder with opening times and navigation, stock overview, including prices, and product availability check. Some respondents asked for notifications for various events: When a particular favoured product is in stock or on offer, when a new item comes in or is about to be removed from stock, with the option to vote against it. Cooperative aspects such as creating a common shopping list with others are highly desired for a new version of the app. The checkout can also be made more appealing: For example, by making it mobile or involving scanning, by utilising digital receipts or distributing vouchers for long waiting times. Users also expressed the wish for an online shop and home delivery, as well as the option to create a shopping list via voice recording and recipe suggestions with automatic import of ingredients to the shopping list, based on set preferences or even ingredients the user already has at home. Recipes should not only include ingredients, but also instruc-

tions in text, image, and video. Detailed information on products, their contents, and nutritional and health-related facts is desired alongside reviews, tests, and comparisons. Table 2 gives an overview of all desired features or areas and the according user feedback which cannot currently be imported in our app. The citations used in the following are taken from the interview accompanying the customer journey, translated by the authors and marked with the response identifier.

Approval: Most participants agreed to the opt-in process, meaning the update on the existing app, prompted before the evaluation. Even more could imagine providing the necessary personal and location data for the duration of the shopping as they see the advantages, even though

Table 2: Participants' suggestions for improvement

Feature / area	Requests / implications
Checkout	'Queue function': Offer voucher as reward for long waiting times Scanning articles (see ***IKEA***) Mobile checkout (see ***Amazon Go***) Digital receipt: Save paper and costs, easier return, expenditure overview
Shopping list	Not only sharing, but also creating a common shopping list (see ***Wunderlist*** etc.)
Store finder	Display alternative stores and opening times Navigation to the selected store
Offers	Notification when observed products are in stock When offers are sold out: notify next time Push notification when offers are online
Recipes	Import of recipes into the shopping list Step-by-step instructions, video instructions Active suggestions by the app (e.g., based on set preferences) Suggestions based on products user has got at home
Discounts	Personalised vouchers or discount coupons
Product catalogue	Display whole product range incl. prices and information Receive products recently added to stock via push notification or overview (can be based on previous purchases) Display products soon to be removed from stock, maybe with veto or review function Suggestions based on products user has got at home
Information	Ingredients, nutritional facts, health rating Test reports, reviews, comparisons

one third would hesitate to do so. The accessed data and underlying reasons should be understandable: "*With a calculator, I would say 'no, why does it want to have my location data', but if I have an advantage – like here, when I'm guided through the store or just reminded – then yes*" (2). Using Bluetooth was not a problem to most participants, while a fifth would like to activate it only during app usage and deactivate it afterwards, e.g. via a prompt. We also found out that some were not aware of the existence of such supermarket apps at all. Consequently, awareness should be raised, and interest should be triggered. Therefore, a successful integration in the marketing concept is mandatory. Trust in the providers is an important aspect for the approval. In general, more participants agreed on using the update than expected.

Added values: We found that, in contrast to mostly monetary incentives named in the online survey, added values can also be found in non-monetary aspects, such as sorting the shopping list, product search, navigation, and the resulting faster pace of the shopping. For example, almost all (21) participants agreed to sorting the shopping list, saying it was "*a nice service*" (2) and "*one of [their] main reasons why [they] agreed [to the update]*" (8). In general, the app should "*make the shopping as easy as possible, one should have to walk as little as possible and have as little stress as possible*" (7). In general, shopping practices should be facilitated and made more efficient. However, one participant chose to stick to their practice of working through the shopping list without sorting, willing to risk walking back if they forgot something. If we take a closer look at the added values, data privacy concerns increasingly fade into the background.

In-store navigation: Most subjects were highly interested in the app's navigating function as they appreciated the suggestion of shorter routes to targeted products and called this function "*very cool*" (7) or "*extremely helpful*" (12). In principal, the participants viewed the app design to be intuitive and to offer a comprehensible approach. Ideally, navigation via the shopping app should integrate arrows pointing into the

right direction and a highlighting of the relevant store areas according to their shopping list. While some subjects viewed the map to be sufficient, others demanded one's own position to be included on the map as a point of reference and the direction on the map changing according to the direction of the smartphone. Generally, the field experiment highlighted the need to further optimise the displaying of in-store-navigation, not at least because the map was perceived to be too dominant in relation to other functions. Colouring of various groups of products did not always make sense to the subjects testing the app, where a differentiated annotation would be more understandable, and the integrated search bar was sometimes overlooked. Additionally, the experiment pointed out that users might find it helpful to be able to zoom in or scale up certain parts of the map. An integration of searched products into the shopping list for resorting and optimising the shopping route in total was also suggested.

Push notifications: Users had very mixed reactions to push notifications: On the one hand, they are perceived as unnecessary and annoying when containing irrelevant information or having bad timing, while they can also be helpful on the other hand. Generally, they should adapt to user's preferences, frequency and timing of use, and not create feelings of annoyance and frustration, while an optimal number of push notifications is difficult to determine. Also, the context of usage is relevant: "*It can be really annoying. If one is prepared for it during shopping and is using the app anyway, then I don't mind*" (6). We should also keep in mind that users do not expect a lot of interaction in order not to be distracted from their shopping and possibly miss products.

We tested different types of push messages: Information, reminders of saved products, further purchase recommendations based on previous purchases, product recommendations, and a review request. Reminders and informative messages were the most popular types, while reminders are preferred to be sent at the start of the shopping. Informative push notifications are generally seen as helpful as long as they are

relevant, not redundant, and sent too frequently. Reminders were received positively because they refer to products in which users are already interested, can save walking distances, and the app can remind its user even when it is running in the background and is not actively used. A prioritisation function could help to quickly navigate to desired products but should not disrupt any already running navigation.

Concerning further purchase recommendation based on previous purchases, opinions differed greatly, as participants see benefits for efficiency on the one hand: "*Because often I really need these things or didn't know that I need them. And then I bought them anyway*" (19). Around half had a positive attitude towards such messages, especially if they are linked to their current shopping list. On the other hand, there is the perception of surveillance: Several participants consider such messages as unnecessary and uncanny.

Similarly, users rated product recommendations without a link to their purchases very differently: More than half rated them as helpful and interesting, while others had mixed feelings or did not like them because they feel observed or dislike the advertisement aspect leading to unnecessary purchases. In contrast, participants who approved mentioned that they are encouraged to buy different products than they usually do and appreciate help in choosing from a range of products. In general, recommendations should not be sent too frequently, and it should be explained why a product is suggested: "*So that I know it makes sense why it is displayed to me*" (4). Suggestions of new versions or products recently added to the stock were received better than recommendations based on previous purchases. Unnecessary messages should be avoided, and the system should learn from user input to avoid adverse effects.

Also, more than half of the participants would follow the request to leave a brief review of a purchase, while around half of them would also participate in a more detailed survey, preferably in exchange for discount coupons or other added values: "*I think it is important to have the*

opportunity to leave positive and also negative feedback" (1). Apart from direct benefits, reasons for answering the survey and direct integration in the prompt could, according to the participants, indicate a possible extension of shopping practices into the time after the actual shopping. However, in general, participants would prefer to receive notifications only during shopping and to have the option to deactivate push notifications on surveys and purchase reviews.

Other: Customisation options seem to be very important to users, not only concerning notification frequency and content, but also on the saving and usage of their personal data or location. Concerning the settings, options should be clearly understandable and numerous, but at the same time not too detailed regarding product categories. Participants also expressed the wish for a "new in stock" product list. In contrast to the first survey, a retailer-specific app is well received, because different advantages are offered. Only one person expressed the wish for a general app.

Technology acceptance: In our concluding questionnaire, we asked about perceived usefulness, ease of use, and attitudes towards usage. In total, participants rated the app as useful and the app functions were generally perceived as easy to use. Participants thought using the app could be fun and generally a good idea, while over two thirds (68.18 %) could imagine using the app in future everyday situations and most would recommend it to others. Important aspects for the usage are feeling in control of the app, feeling supported instead of patronised or analysed, and not being distracted by or made dependent on the app. Participants could also imagine combining it with *wearables* or *augmented reality* for optimal support, or attaching the smartphone to the shopping cart as they do not want to carry it in hand all the time during shopping. Reasons for non-usage include privacy concerns and no need for support or shopping in different supermarkets. However, many see a potential in technological support for grocery shopping: *"I think there are too few possibilities, it can and should be more"* (12).

7 Discussion and Outlook

Even though "a certain disillusionment arises" (Becker 2016 [translated by authors]) due to range problems and data security concerns regarding beacons, some of the initial problems have been addressed or solved (e.g. extension of battery time, decrease of impact on battery by BT Low Energy, increase of BT devices and added values). Location-based services are already used in mobile internet, while users are more advanced in this area as compared to companies (Becker 2016). Considering the higher usage of smartphones and online shops, beacons can make shopping more enjoyable and attractive and allow retailers a better presentation and planning. While customer opinions on the specific aspects differ, beacons can be useful and beneficial, although not undifferentiated and in all versions.

After the documentation and analysis of social practices, we followed the productive approach of design case studies to develop a concept and to design a prototypical app. As subjects took part in a field experiment testing the store-specific app, the results did not fully comply with conclusions derived from the first step which emphasised users' relatively strong interest in general shopping apps that include various stores' information. Nevertheless, our work dedicates itself to important questions and offers valuable insight into the attitudes of and usage by customers. In Table 3, we have summarised important results and implications derived from our study.

Even though prior works (Sperling 2014) doubt the success of an opt-in process and data privacy concerns were expressed in the online survey, most of our field study participants were willing to allow the app to use their location and personal data. The importance of trust provided by transparency, comprehensibility, adjustability, and limitation to analysis was stressed (Atkinson 2013). In general, our app was perceived positively and seen to provide an added value, especially when promising an easier and more enjoyable shopping experience to users. In contrast to the study by Iurchenko (2014a), many participants con-

Table 3: Summary of study results and implications

	Pre-study	App evaluation
Acceptance	Less than a quarter are already using shopping apps Smartphone usage is high, among other scenarios, during shopping About a quarter see a potential in shopping apps	Around a quarter are already using shopping apps Smartphone usage is high, among other scenarios, during shopping Most participants would agree to install a shopping app
Added value	Offer information and discounts are one of the biggest motivators for installing shopping apps One general app attracts most participants	Non-monetary values increasing efficiency are popular Most respondents voted for a store-specific app
Desired functions	Discount coupons, offer reminders, detailed product information, and navigation are highly popular Leaving reviews, playing games, or receiving notifications when passing are rated rather negatively or as unnecessary	An automatically sorted and shared shopping list with a recipe function was among the most popular features In-store navigation Checkout should be made digital and queueing rewarded with coupons Detailed product and stock information with reminders and notifications Personalised offers
Concerns	Privacy and security concerns are often expressed Too frequent notifications could be bothersome and should be customisable	Benefits justify the disclosure of personal information to a certain degree Push notifications not carefully based on personal settings can overwhelm the user
Implications	To most users, beacon-based shopping apps are a nice addition, although not a decisive factor, and have potential as many are already using their smartphone when shopping To increase their popularity, shopping apps should be part of marketing and offer selected benefits that make the shopping process easier, faster, and more enjoyable Apart from monetary incentives, features which make the shopping more efficient, like navigation, shopping list sorting, and valuable information on products, reminders, and offers as well as a common shopping list and recipe functions, should be included and emphasised The user should be able to decide in detail and in an understandable way which information to disclose and which notifications to receive and how often.	

sidered the process of shopping to be more efficient using in-store navigation. Also, customisation and adaptation to usage behaviour were crucial aspects. While in the online survey, half of the respondents voted for a general app, almost all participants of the field experiment saw the benefits of a store-specific one. The results could be based on previous experience, where many participants indicated to have only used general shopping apps and emotions as well as experience pose decisive factors for the decision to download a location-based services app (Kang et al. 2015).

However, most of them were not aware of the existence and benefits of similar apps, supporting earlier studies (Iurchenko 2014a; Shankar 2010; Thamm 2016a). Beacon-based shopping apps could therefore be made more popular by facilitating shopping practices: i.e. by offering information on products, prices, availability, and discounts, for example via a catalogue and a scanner, allowing personalisation, navigation, as well as an automatically sorted, collaborative shopping list which users can share with family and friends. Some of these areas have been identified by prior research as well (Kriz 2016; Purohit 2013; Thamm 2016a; Weigl 2013), while coupons and discounts did not play a large role in comparison to the works by Dickinger (2008) and Nikander (2011). High smartphone usage, also during shopping, further demonstrates a potential to benefit from beacons in retail (Thamm 2016a).

In creating a beacon-based shopping app, overwhelming users and sending too many (irrelevant) notifications – which is also a challenge for other apps, such as crises apps (Reuter et al. 2017), e.g. in times of crises (Reuter 2018) or conflicts (Reuter 2019) – and therefore making the experience more difficult, disrupting, and inefficient should be avoided Iurchenko 2014a). The evaluation of the designed app supports moderate implementation of push notifications as participants of the field experiments as well as survey respondents signalled mixed feelings about (too many) potentially unwanted messages. Instead, the app should help users find their desired products faster, offer useful and tailored

reminders and suggestions, provide the opportunity to give feedback and receive rewards, as well as support collaboration with others with whom users share their shopping, all the while allowing them to be in control of all information they are providing. Games, in-app greetings, and notifications while passing were among the least popular functions. Therefore, these features can be left out or limited in a next version of the prototype.

Limitations and outlook: Many questions remain unanswered and beacons, especially in retail, remain an interesting and dynamic area of research. Especially because their use promises benefits for customers and sales increases for retailers (Dudhane/Pitambare 2015b; RCKT 2015; Spender 2015) this technology requires a closer look and an increased customer awareness. It could be examined how customers can be made aware of the app and its advantages (e.g. by comparing marketing methods: digital displays or geo fences). Further research may also focus on general shopping apps. In pilot projects lasting over several months, customer behaviour, loyalty, satisfaction, and changes in revenue could be analysed to find out whether the creation and implementation of such apps and technologies are worth the (financial) effort for a company. Not only the benefits for retailers, but also the advantages for customers should become a focus of studies. How beacons are appropriated by customers and how all the new app functions influence shopping and corresponding social practices requires closer attention. Even though sharing content with friends was not highly valued, the desire for a shared shopping list indicated that cooperation within the family or shared flat, which is an integral part of shopping, should be addressed in retail apps and can be supported and strengthened in the evaluations of longer usage processes. Meanwhile, the requirements towards the app could change and functions previously regarded as useful could be perceived as unnecessary or annoying, while wishes for additional features could emerge. These questions can only be answered by a long-term study accompanying the implementation

and usage development. It is also crucial to analyse the transformation of social practices in-depth, as is the requirement of design case studies, and to fulfil the final step of iteration. Context factors like the individual shopping situation, social environment, or culture should therefore be taken into account. The study should be conducted with more representative groups with a more demographic diversity, especially concerning age and affinity towards technology. One could also consider a shopping support for people with (visual) impairments, as suggested by López-de-Ipiña et al. (2011). Apart from usability tests and an evaluation for increasing user experience, beacons should also be evaluated in other stores and sectors. Furthermore, alternatives should be considered, such as *Google's Eddystones* or advertisement in messengers like *WhatsApp* or *Facebook*.

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References

accengage (2017): "Push-Benachrichtigungen und In-App Nachrichten" Accessed 8 June 2018. https://www.accengage.com/de/push-benachrichtigungen/

Atkinson, L. (2013): "Smart Shoppers? Using QR Codes and "Green" Smartphone Apps to Mobilize Sustainable Consumption in the Retail Environment", in: *International Journal of Consumer Studies* 37 (4), pp. 387–393. doi:10.1111/ijcs.12025

Banerjee, S.S. / Dholakia, R. R. (2008): "Mobile Advertising: Does Location Based Advertising Work?", in: *International Journal of Mobile Marketing*. December 2008 Available at SSRN: https://ssrn.com/abstract=2135087

Becker, J. (2016): "Neu gedacht: Beacons als Teil des Marketing-Ökosys-

tems", in: *Berlin Valley*. Accessed 8 June 2018. http://berlinvalley.com/67157-2-neu-gedacht-beacons-als-teil-des-marketing-oekosystems/.

Cătoiu, I. / Gârdan, D.A. (2010). "Romanian Consumer Perception Towards Mobile Marketing Campaigns", in: *Annales Universitatis Apulensis Series Oeconomica* 2 (12), pp. 731–741.

Davis, F. D. (1986): *A Technology Acceptance Model for Empirically Testing New End-User Information Systems (PhD thesis).* Cambridge, MA: Massachusetts Institute of Technology Sloan School of Management.

Dickinger, A. / Haghirian, P. / Murphy, J. / Scharl, A. (2004): "An Investigation and Conceptual Model of SMS Marketing", in: *Proceedings of the 37th Annual Hawaii International Conference on System Sciences, Big Island, HI,* 5 - 8 January 2004. New York, NY: IEEE, pp. 1–10. doi:10.1109 / HICSS.2004.1265096

Dickinger, A. / Kleijnen, M. (2008): "Coupons Going Wireless: Determinants of Consumer Intentions to Redeem Mobile Coupons", in: *Journal of Interactive Marketing* 22 (3), pp. 23–39. doi:10.1002/dir.20115

Dudhane, N.A. / Pitambare, S.T. (2015a): "Location Based and Contextual Services Using Bluetooth Beacons: New Way to Enhance Customer Experience", in: *Lecture Notes on Information Theory* 3 (1), pp. 31–34. doi:10.18178/lnit.3.1.31-34

Heinecke, A. (2004): *Mensch Computer Interaktion: mit 18 Tabellen.* Leipzig: Fachbuchverl. Leipzig im Carl-Hanser-Verlag.

Hilzinger, M. (2016): "Bluetooth 5 ab Ende 2016: Mehr Reichweite, mehr Daten, weniger Stromverbrauch", in: *Android User.* Accessed 8 June 2018. from https://www.android-user.de/bluetooth-5-ab-ende-2016-mehr-reichweite-mehr-daten-weniger-stromverbrauch/.

Holzinger, A. (2005): "Usability Engineering Methods for Software Developers", in: *Communications of the ACM* 48 (1), pp. 71–74. doi:10.1145/1039539.1039541

IBM. (2014): "Statistical Package for the Social Sciences" Accessed 18 October 2017. https://www14.software.ibm.com/

ISO. (2018) "ISO 9241-11:2018(en): Ergonomics of Human-System Interaction — Part 11: Usability: Definitions and Concepts" Accessed 8 June 2018. https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-2:v1:en

Iurchenko, A. (2014a): "Overview of The Beacon Market", in: *Stanfy*. Accessed 10 June 2018. https://stanfy.com/blog/overview-of-the-beacon-market/

Jayasingh, S. / Eze, U.C. (2009): "Exploring the Factors Affecting the Acceptance of Mobile Coupons in Malaysia", in: *2009 Eighth International Conference on Mobile Business*. New York, NY: IEEE, pp. 329–334. doi:10.1109 / ICMB.2009.63

Kang, J.Y.M. / Mun, J.M. / Johnson, K.K.P. (2015): "In-Store Mobile Usage: Downloading and Usage Intention Toward Mobile Location-Based Retail Apps", in:

Computers in Human Behavior 46, pp. 210–217. doi:10.1016/j.chb.2015.01.012

Kriz, P. / Maly, F. / Kozel, T. (2016): "Improving Indoor Localization Using Bluetooth Low Energy Beacons", in: *Mobile Information Systems*, 1–12. doi:10.1155/2016/2083094

Leopold, I. / Reuter, C. (2017): „Kundenakzeptanz von Bluetooth-Beacons im Lebensmittelhandel", in: Mensch & Computer: Tagungsband, M. Burghardt, R. Wimmer, C. Wolff, C. Womser-Hacker (Eds.), pp 361-364, Regensburg, Germany: Gesellschaft für Informatik e.V.

López-de-Ipiña, D. / Lorido, T. / López, U. (2011): "BlindShopping: Enabling Accessible Shopping for Visually Impaired People through Mobile Technologies", in: *International Conference on Smart Homes and Health Telematics, Montreal, Canada, 20 - 22 June 2011*. Berlin, Heidelberg, Germany: Springer, pp. 266–270. doi:10.1007/978-3-642-21535-3

Maiden, N. / Gizikis, A. / Robertson, S. (2004): "Provoking Creativity: Imagine What Your Requirements Could Be Like", in: *IEEE Software*, 21 (5), pp. 68–75.

Mueller-Lankenau, C. / Wehmeyer, K. (2005): "Mobile Couponing - Measuring Consumers, Acceptance and Preferences with a Limit Conjoint Approach", in: *Proceedings of the 18th Bled eConference, Bled, Slovenia, 22 - 23 June 2005*. Atlanta, GA: AISeL, pp. 266–270.

Nielsen, J. (1992): "Evaluating the Thinking-Aloud Technique for Use by Computer Scientists", in: *Advances in Human-Computer Interaction*. New York, NY: Hindawi Publishing Corp., pp. 69–82

Nikander, A. (2011): *Determinants of Consumer Intentions to Redeem Mobile Coupons*. Espoo, Finland: Aalto University School of Economics.

Purohit, A. / Sun, Z. / Pan, S. / Zhang, P. (2013): "SugarTrail: Indoor Navigation in Retail Environments without Surveys and Maps", in: *2013 IEEE International Conference on Sensing, Communications and Networking (SECON 2013), New Orleans, LA, 24 - 27 June 2013*. Atlanta, GA: IEEE, pp. 300–308. doi:10.1109//SAHCN.2013.6644999

RCKT. (2015): "Studie zeigt: shopkick fördert Umsatzvolumen", in: *RCKT*. Accessed 8 June 2018. https://rckt.pr.co/114253-studie-zeigt-shopkick-fordert-umsatzvolumen.

Rohde, M. (2007): *Integrated Organization and Technology Development (OTD) and the Impact of Socio-Cultural Concepts - A CSCW Perspective (PhD thesis)*. Roskilde, Denmark: Datalogiske Skrifter, Roskilde University.

Scholz, H. (2016): "Studie: Showrooming als Chance für das Omni Channel Marketing", in: *Zukunft des Einkaufens*. Accessed 8 June 2018. https://zukunft-deseinkaufens.de/studie-showrooming-als-chance-fuer-das-omni-channel-marketing/.

Shankar, V. / Venkatesh, A. / Hofacker, C. / Naik, P. (2010): "Mobile Marketing in the Retailing Environment: Current Insights and Future Research Avenues", in: *Journal of Interactive Marketing* 24 (2), pp. 111–120. doi:10.1016/j.intmar.2010.02.006

Spender, A. (2015): "Top 10 Strategic Technology Predictions for 2015 and Beyond", in: *Gartner*. Accessed 10 June 2018. https://www.gartner.com/smarterwithgartner/top-10-strategic-technology-predictions-for-2015-and-beyond/.

Sperling, S. (2014): "Beacon: Kleine Sender mit großer Wirkung für den Einzelhandel?", in: *netzstrategen*. Accessed 10 June 2018. https://netzstrategen.com/sagen/beacon-sender-wirkung-einzelhandel.

Städele, K. (2015): "Beacons am PoS: Diese Nachrichten verleiten zum längeren Stöbern im Laden", in: *Werben & Verkaufen*. Accessed 8 June 2018. https://www.wuv.de/digital/beacons_am_pos_diese_nachrichten_verleiten_zum_laengeren_stoebern_im_laden.

Statista. (2017): "Prognose zur Entwicklung der Nutzerzahl von Mobile Payment in den Jahren 2012 und Prognose für 2017 nach Regionen (in Millionen)" Accessed 8 June 2018. https://de.statista.com/statistik/daten/studie/226677/umfrage/prognose-zur-entwicklung-der-nutzerzahl-von-mobile-payment/.

Strauss, A. L. (2007): *Grundlagen qualitativer Sozialforschung: Datenanalyse und Theoriebildung in der empirischen soziologischen Forschung* (2nd ed.). Stuttgart, Germany: UTB Fink.

Thamm, A. / Anke, J. / Haugk, S. / Radic, D. (2016a): "Towards the Omni-Channel: Beacon-based Services in Retail", in: *International Conference on Business Information Systems, Leipzig, Germany, 6 - 8 July 2016*. Cham, Germany: Springer, pp. 181–192. doi:10.1007/978-3-319-39426-8.

Thamm, A. / Anke, J. / Haugk, S. / Radic, D. (2016b): *Towards the Omni-Channel: Beacon-based Services in Retail* (No. 255). *Business Information Systems. BIS 2016. Lecture Notes in Business Information Processing*. Cham, Germany: Springer. doi:10.1007/978-3-319-39426-8.

Weigl, M. (2013): "Goldesel oder Sündenbock: Werbung in Location-Based Services aus Sicht der Anwender", in: C. Schmidt (Hg.): *Optimierte Zielgruppenansprache*. Wiesbaden: Springer Fachmedien, pp. 149–167. doi:10.1007/978-3-531-19492-9_6.

Wulf, V. (2009): "Theorien sozialer Praktiken zur Fundierung der Wirtschaftsinformatik: Eine forschungsprogrammatische Perspektive", in: Becker, J. / Krcmar, H. / Niehaves, B. (Hg.): *Wissenschaftstheorie und Gestaltungsorientierte Wirtschaftsinformatik*. Berlin Heidelberg, Germany: Springer / Physika, pp. 211–224.

Wulf, V. / Rohde, M. / Pipek, V. / Stevens, G. (2011): "Engaging with Practices: Design Case Studies as a Research Framework in CSCW", in: Fussell, S. / Lutters, W. / Morris, M.R. / Reddy, M. (Hg.): *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work - CSCW '11, Hangzhou, China, 19 - 23 March 2011*. New York, NY: ACM Press, pp. 505–512. doi:10.1145/1958824.1958902.