

Charting User Expectations on Mobile Shopping - Role-playing Study on Mobile Interaction with RFID Technology

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ABSTRACT

The use of mobile communication devices and RFID technology is a popular scenario for future shopping experience, and it offers numerous use cases related e.g. to information delivery, item search, and payment. In this paper we focus on charting the user preferences and potential usability risks with the technology by presenting a user study employing in-depth interviews and role-playing technique in an imaginary shopping situation, where the user was introduced different use cases with a mobile phone employing RFID reader. In this paper, we report the study findings and discuss the questions concerning the distrust and conflicts related to the approach from the user point of view.

Author Keywords

Mobile devices, RFID, NFC, smart environments, user studies, usability, physical interaction.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Postmodern consumer energy is changing the future of the retail industry business. In the information society, many consumers use the internet to search information or for product comparison, and with the advances in ICT, this is increasingly possible while mobile. One technology to be utilized in shopping scenarios is near field communication (NFC), typically employing RFID technology, which can be used e.g. to get the information about the items of interest or for payment transactions. Mobile communication devices integrating RFID technology already exist, e.g. Nokia 6131 NFC mobile phone, creating true possibilities to expand the use of the technology for wide audiences. Applying the technology successfully to end-user needs would bring value for the consumer, *value gain* meaning here e.g. getting simple information about the item of interest or much more complex decision making support like qualified comparisons of features or prices. Nevertheless the acceptance of such technologies is not obvious. The user needs to see the personal value gain, face friendly physical interaction and trust in the new technology in mobile devices.

Many of the research studies with new use cases for mobile technology concentrate on rather narrow use scenarios and have been done with technology orientated people. In our study, we wanted to chart end user expectations and concerns in a versatile shopping scenario, which covered different kinds of use cases. By this, we aimed to facilitate the interviews by showing the participants different kinds of possibilities with the technology and evoke their imagination. Similar approach where role-playing technique has been used for charting user experience with physical interaction phenomenon can be found in [10], where the participants interacted with a mobile phone and visual tags. In the following, we present related work in the area, describe our user study and the key findings, and discuss the trends that rose from them.

RELATED WORK

Physical interaction phenomenon with mobile devices and real world has gained relatively high attention during recent years. Väikkynen et al. have proposed three categories for physical mobile interaction – touching, pointing and scanning [11], which have been further investigated by Rukzio et al. [7]. Here, touching and pointing refer to physically touching or remotely pointing the smart object, respectively, whereas scanning can be used to browse and search smart objects or services in a physical space. With RFID technology, the user typically touches or points an RFID tag from a near distance with his/her mobile device. This interaction style has been suggested both because of the efficiency of interaction in providing shortcuts to avoid long navigations paths in mobile device's application menus, as for its intuitiveness - when you select the physical object by touching, you know what you are interacting with. This kind of touching metaphor has been utilized for instance in pairing Bluetooth devices [9].

Also in commerce, simple RFID based interactive applications have been around for years, probably the most common example being ticketing. These applications are often developed around a limited functionality, and concentrate e.g. on loading bus tickets into an RFID tag card by buying certain amount of transactions associated with the card identifier, and paying each trip by touching a reader when entering the vehicle. Commercial applications integrating NFC technology into mobile phones can also be

found, for instance NTT Docomo's Osaifu-Keitai payment services in Japan [5].

Furthermore, more complex systems related to the use of RFID in shopping scenarios have been proposed, such as a concept level implementation that recommends the user similar products that s/he is interested in [8], or idea that bill money was tagged [1]. These kinds of scenarios inevitably raise questions related to usability, privacy and trust. Furthermore, despite of the positive experiences reported with physical interaction phenomenon, there are still large unexplored areas with the interaction technology and in successfully applying it to large scale use. Although RFID technology has been around for years, it does not necessarily appear as a familiar to 'a man of the street'. Moreover, the lack of commonly agreed user interface metaphors and icons on what do the tags do or what they are referring to builds barriers to the use [4].

USER STUDY

Set-Up

To find out users' acceptance, interests and fears with RFID technology in shopping domain, a user study was arranged. The study included user tests consisting of two parts: a role play and a semi-structured interview. The objective with the role play was to find out intuitions with interacting with RFID tags and NFC phone, and to get the participants to understand the concept of RFID and the possibilities it offers in shopping domain. Only after that it was possible to further interview the test participants.

The test was set up in a usability laboratory, where imaginary scenario of a shopping mall was staged, figure 1. The set-up consisted of two posters with RFID tags presenting an advertisement poster out side a shop and a shop map in the lobby area of the shop, a table with RFID tagged items presenting the shop itself, and a non-functional RFID check-out desk. Nokia 6131 NFC phone was used as the RFID tag reader.

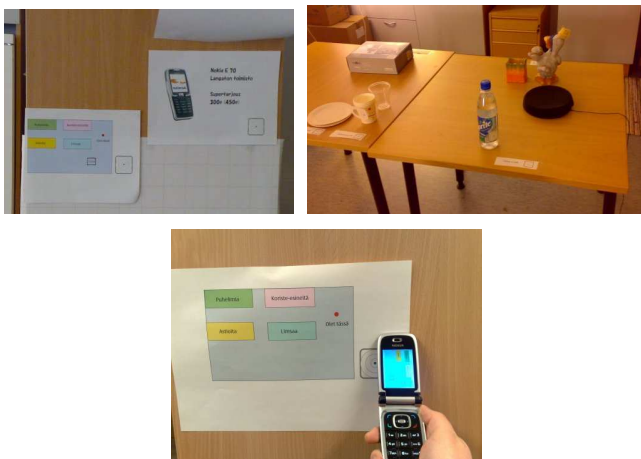


Figure 1. Examples of the shopping mall set-up.

Participants

The test participants were eight non-technical persons (4 women and 4 men), of which only one had ever heard of RFID before. Test participants were from the city of Tampere, Finland, and their age ranged from early twenties to over 60 years. Their active usage habits with mobile phones were restricted to phone calls and SMS, but majority (5/8) had also some experience with more advanced features like camera, MMS and mobile internet.

Procedure

The shopping mall scenario that was role played in the user study consisted of different tasks where user was asked to interact with a mobile phone and RFID as the storyline proceeded. The tasks utilized both interacting with Nokia 6131 NFC mobile phone and tags and paper prototyping. The storyline for the shopping scenario, where the user test participant acted as the customer, was as follows (each task is numbered).

First, the customer notices an advertisement including an RFID tag in the shop window, and 1) downloads more information about the ad to her/his phone by reading the tag. Then s/he enters the shop, and 2) downloads a map of the shop from a tag in a map poster next to the shop entrance. He then walks to the product shelf, where 3) s/he reads a tag in the product package, which includes more information about the product. On his way to the check-out s/he decides to buy a soft drink and 4) reads the tag in the bottle for more information. At check-out, 5) s/he pays the items with her/his phone by interacting with the tags. Before leaving the shop, s/he is asked 6) if s/he wants to create a profile based on her/his shopping. The profile could be used e.g. for informing him about special offers that might interest her/him.

During each task, the participant was encouraged to think aloud, and complementary questions to chart the impressions and expectations with the task were asked. The questions included, for instance, how the interaction was expected to happen, what kind of information was to be received, if it should be stored and accessible for later use, and alternative ways to do the task. After completing the scenario, the participant was interviewed e.g. about the usefulness and acceptability of different features.

FINDINGS

First Impressions

As none of the participants had earlier experience about RFIDs, the first impressions and intuition about interacting with tags varied. The expectations on how the interaction with RFID tags and NFC phone would happen (task 1) were divided into three groups: touching (3/8), pointing (2/8) and menu based (3/8). Touching the tag in the poster with the phone was done in various ways. Pointing the tag with the phone from a distance was done mainly for two reasons: either touching a tag was considered embarrassing, or the user associated the phone to a remote controller. Menu

based interaction was expected based on previous experiences with mobile phones in general, but not really wished by any of the test participants.

Information retrieved from a tag in an advertisement poster (task 1) was expected to include different things. The main use case was getting more information about the advertised product (6/8). Other ideas included for example information about the availability, available variations and location of the product, period of validity for the offer, being able to save the information of the poster in the phone and being able to purchase the product directly from the poster.

Navigating and Finding Information

Possibility to download a shop map from a map poster to mobile phone using RFID tag (task 2) was found very appealing idea by half (4/8) of the test participants. They stated that they often felt lost especially in hyper markets and shopping malls. A map application capable of assisting in navigating to a desired place or product was wished instead of a static map. 5/8 of the test participants wondered if they could locate a desired product by touching the RFID tag in a poster or typing the product name in. Also finding information and location of different variations of the same or similar product was hoped by 3/8. When considering the amount of information on the map, the main demand was to ensure clarity.

Whereas half of the participants appreciated a map, the other half consisted of people feeling confident in navigating in strange places by themselves and enjoying just wandering around and discovering interesting things.

Comparing Products, Advertising and Customer Profiling

All of the test participants had gathered information about some products for comparison. Here, 2/8 said that they could easily keep the information in their minds, but others used paper or brochures to record the information. This was done for comparing the features or prices between different products in the same shop or same products in different shops later on. The most important piece of information was the price. These people were interested in the possibility to easily capture the product information by interacting with a RFID tag.

Initial reactions towards mobile advertisement and user profiling (task 6) were many times very negative. Privacy issues related personal data were raised by 6/8 of the users. Any kind of attempt to control one's shopping habits was resisted. Advertisement at least in form of (mobile phone) messages was considered disturbing. Despite negative first reactions, 6/8 of the participants had moderate interest towards mobile advertisement if they could decide what kind of advertisement to receive and when not to receive anything. According to them, deciding upon advertisement content would be done by creating a self made profile. Attitudes towards automatic user profiling remained highly negative with 3/8 users. More or less neutral attitudes

towards profiling among the rest 5/8 were based on assumptions on anonymity and experiences with current loyalty card systems.

One of the ideas presented to the test participants during the interview was to create a profile of preferred and avoided attributes to assist in shopping suitable products. Here, the user's personal profile would be matched against the product attributes resulting on recommendations and warnings. This idea interested 6/8 of the test participants and they were willing to use some time for getting the added value provided by the service. Though, 3/8 stated that they were very lazy at typing information into a mobile phone, so an easy method for adding information would be needed. PC, RFID tags containing only attribute information and choosing from product attributes were methods suggested by the test participants. Interesting product attributes included for example allergens (3/8), country of origin (2/8) and energy content (3/8).

Paying

Using a mobile device as the means for payment interested half (4/8) of the test participants. Particularly paying for smaller, cheaper items on-the-go was found interesting. The other half resisted the idea. They had fears of reliability and privacy. 2/8 of the participants resisted and feared information systems to such degree that they only used cash for payments at the moment.

General Impressions after the User Test

The suspicion in the beginning of the test session was replaced by interest towards the possibilities of RFID during it. Every test participant found some agreeable use for RFID in shopping environment. Getting more information about the products fast and without having to trouble anyone interested 7/8 of the participants. Possibility to summon appropriate sales person on the spot via a tag interested those preferring human service. Prospect shopping in a more cost and time efficient way was appealing, but there was high resistance towards any shop or even system getting hands on personal information like shopping habits thus allowing personalized advertisement.

DISCUSSION

The study revealed several interesting trends, where there are conflicts of interests, suspicions, mistrust, and thus potential usability and acceptability risks with the technology. The study recorded fears related to privacy e.g. in giving out personal information in consumer profiling, and receiving spam messages. Similar findings in the context of mobile services have been reported before [2]. There is also an interesting contradiction in consumers' wish. On the other hand, users desire personalized services, here e.g. information about allergens, but on the other hand they don't want (and bother) to give out much information about themselves. This is yet another challenge for the service designers.

Moreover, there is a possible conflict between what the users want vs. what the shopkeeper wants. Comparing prices to find the cheapest one may not be in the interests of the retailer. However, among our participants, it was the preferred use case for current practices in taking notes of a product. Moreover, wandering behavior is an interesting phenomenon, which currently is not supported in many technology orientated use scenarios – many times people come to a shop to look around and wander, not necessarily to find a particular product. On the other hand, wandering behavior may be desirable also from the retailer's point of view, as it may result impulse purchases. In order to feel useful, a successful technical application should try to adapt to the current shopping practices of the user.

Trust is one of the most important acceptance criteria of the RFID technologies in the shopping business. Today's mobile phones with integrated RFID readers give the customer direct control over capturing information about the items of interest. This can be supported by using a customer defined personal profile for information filtering, timing and flow optimization.

Methodologically, applying role-playing technique to the user study was found to be a good choice. The dilemma with charting user expectations and attitudes with a new technology is that ordinary users, who typically have little expertise in technology, should be involved. However, they may have difficulties to comprehend the possibilities with the technology, and thus surveys or interviews without any connection to users' everyday experiences give less reliable results. With role-playing technique, we could engage non-technical participants and give them an idea of the technology in real life use, provoking them to brainstorm about the possibilities with the technology and reveal their attitudes and opinions about its possibilities. Positive experiences of using acting in participatory design and scenario development have also been reported earlier [3, 6].

CONCLUSIONS

In this paper we have presented a user study shopping scenario employing mobile phones and RFID technology. The user study included 8 participants having no earlier experience with RFID technology, and applied role-playing technique and interviews.

Touch based interaction with RFID tags together with information systems brings positive prospects to shopping by allowing users to get different kinds of information faster and paying for goods. Information about the products would be used for making decisions about buying and doing shopping in a more cost and time efficient way. Touch based interaction may however be considered embarrassing, thus building a barrier to use in a public place like a shop. Adapting RFID technology to users' current shopping practices is a challenge - it is easy to imagine solutions for a user seeking a product but less easy

to support wandering type shopping behavior. Fears of the privacy of the data that is considered personal and the reliability of the information systems create even more barriers. The contradiction in users' wish to get personalized ads while maintaining high control over personal information and without having to spend much time on providing it is yet another interesting challenge for application designers.

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