

# Using Shopping Data to Design Sustainable Consumer Apps

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**Abstract**— The Internet of Things is greatly changing the buying and consuming behavior. Future scenarios of smart shopping, smart kitchen and smart cooking become increasingly real and integrated. In this context we see current attempts of creating digital receipts in the food retailing industry. Respectively to these attempts, this paper shows that consumers expect a number of added values from the digital receipt, e.g. a higher transparency for a better self-reflection, therefore a more sustainable food consumption and more information about the bought products. We conducted qualitative interviews to find out how people use receipts and what added values they can imagine in terms of a digital receipt to improve their consumption behavior and to reduce food waste. Since all bought products will be registered digitally, it becomes possible to use the shopping data for sustainable consumer apps.

**Keywords**— *ICT, Sustainability, food consumption, digital receipt.*

## I. INTRODUCTION

Consumers have to face a lot of new challenges in almost all areas of life and consumption because of digitalization. It merges the physical and digital worlds together in terms of procurement of goods and services, dealing with one's own health and finances, but also housing, mobility, education and leisure [1]. The penetration of the society with IT-artefacts leads to a change in consumer behavior. These IT-artefacts find expression in a flood of information. With reference to retail sector, for example product information is not only printed on the product packaging anymore, they are also available online on different comparison portals etc. Advice booklets become supplemented by review websites where consumers can interact with each other. Cash becomes increasingly replaced by new forms of cashless payment systems and shopping becomes increasingly digital. These circumstances enable lots of new possibilities to support customers living and everyday economy with – in this context – more sustainable IT-Services.

The adequate design and capable usage of Information Systems becomes more and more important for modern economies. Enterprise systems (ES) are already a central research area within Information Systems (IS) and Human Computer Interaction (HCI), whereas the research of household and consumer systems is a rather young field. The key challenge

is a seamless connection of household IT with the business IT systems in order to support and simplify consumer's daily household management practices. An integrated IT system could avoid non-sustainable system discontinuities, insufficient information provision, manual data input, redundancies, and poor or outdated data.

The aim of this work is to explore how to optimize shopping practices by the concept of a digital receipts. The digital receipt will improve the data interchange at the point of service, so that the data could be used for a better household management. This contributes to the current attempt in Germany to introduce digital receipts in online and retail food trade [2], [3]. This raises the question, how consumers evaluate the concept of a digital receipt, and what are the perceived risks and benefits. Therefore, we conducted a qualitative interview study that address following research questions:

- (1) How do consumers rate the concept of digital receipts?
- (2) What kinds of value-added services based on the digital receipts are attractive for consumers?

## II. THE EXTENDED DIGITAL RECEIPT CONCEPT

Scanning goods at the checkout and printing out a paper-based receipt is a part of the existing purchasing and payment process. This practice happens so often that most consumers do not apperceive it, therefore there is a need of a more sustainable approach, because the consumption of paper has still a significant impact on the individual CO<sub>2</sub>-balance. The current discussion of digital receipts shows how this practice could leverage by enabling a digital data interchange between retailer and customer.

Current digital receipt concepts are limited. They are proprietary and do not include product identifiers and product dates. However, it is necessary to provide an open, standardized exchange format that includes the GTIN (Global Trade Item Number) or DataMatrix of products to enable a communication between enterprise systems, public product and receipt databases, consumer portals, and consumer applications [2].

Such purchase data are not just interesting for the business intelligence, but for the consumer intelligence, too. In the existing house-keeping books, food management and recipe recommending systems, consumers need to make entries about purchases and domestic inventory manually. This reduces the effectiveness and practicality of current solutions significantly.

Contributing to this gap, we started a grassroots project, where an extended digital receipt presents the key element of a broader, consumer-centered infrastructure (cf. Fig. 1). In the following, we give a brief outline of the most important parts of this infrastructure.

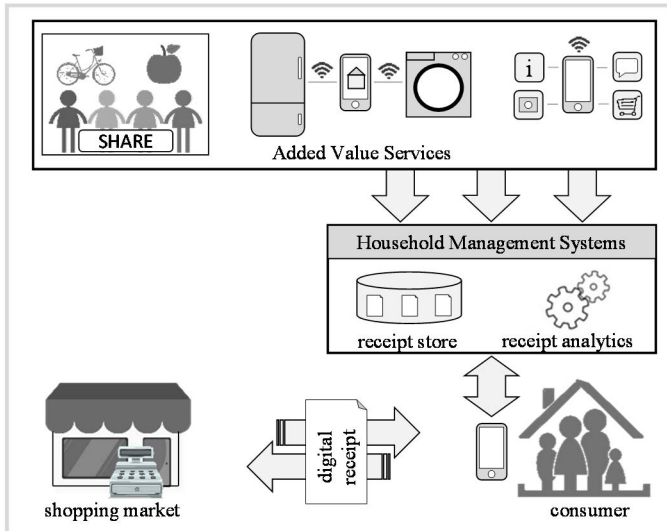


Fig. 1. The digital receipt as a key element of a consumer-centered infrastructure

Our focus was on the consumer and consumer-centered added value service. For instance, consumers could get tailored information and do not have to search for them within a mass of general information and therefore can easier assess search properties. In addition, the history of digital receipts makes it possible to capture the purchasing behavior automatically and thereby also estimate the inventory of food and domestic goods at home. That means it becomes easier to capture their own inventory without scanning the products manually. Still instead of asking what is technically possible, we should first decide which possibilities would give consumers a real advantage. We conducted, therefore, a user study, where the technical feasibility was consciously disregarded. Our aim is to show how the outlined digital receipt concept was understood from a user point of view.

### III. METHODOLOGY

To answer the above-mentioned research questions, 17 problem-centered interviews [4] about the intention of digital receipts and value-added services have been conducted. In this form of open and semi-structured interviews the participants were questioned about their shopping and household practices, as well as about their opinions on the concept of digital receipts and the ensuing added values. Table I shows an overview of the surveyed participants. The average length of the interviews was about 15 minutes. We made sure, that the genders are distributed about the same. In addition, we have chosen participations with

TABLE I. OVERVIEW OF INTERVIEWED CONSUMER

ID	Sex	Age	Job
P01	male	20	student: civil engineering
P02	male	22	industrial management assistant
P03	male	22	assistant tax consultant
P04	male	22	student: business administration
P05	male	23	student: lectureship
P06	male	24	student: business information systems
P07	male	26	student: business information systems
P08	male	53	constructional engineer
P09	female	20	pupil
P10	female	21	student: business administration
P11	female	23	student: informatics
P12	female	23	student: CME
P13	female	24	student: logistics
P14	female	25	student: history of art
P15	female	38	nurse
P16	female	44	nurse
P17	female	49	housewife

different ages, conditions and occupations (cf. Table I). The interviews were recorded, transcribed and coded in accordance with the qualitative content analysis. Following this, the identified topics were analyzed and clustered in topical areas [5].

### IV. FINDINGS AND CONCLUSION

Overall 14 of the 17 respondents liked the general concept, see various benefits, and would be willing to use it more often than the paper-based receipt. This positive response is a first indicator of the user acceptance [6], but must be treated with caution as the study is qualitative and thus not representative in its nature. The focus of this study was to analyze the individual motivations behind the positive assessments in more detail. The interviews showed that only a few people use the traditional receipt, especially in the food sector. Some reasons for taking the receipt are for example to get an overview about expenses and check if wrong prices have been charged – particularly concerning expensive purchases.

A lot of the respondents see the traditional receipt as a waste of paper. They either do not pick it up at the checkout counter at all or throw it away within the store because it does not offer an additional value; a traditional receipt shows unit prices and the total sum, all that can be calculated during the shopping process. Therefore, the respondents emphasized the digital receipt's positive environmental meaning due to the reduction in paper consumption. Current users of the paper-based receipts also mentioned this advantage, since most of them carry along their smartphone.

Nine of ten companies will increasingly use digital solutions in the future to offer their customers and partners more information about the origin and properties of their products. [7] Currently there are increased efforts in the consumer economy to expand the digital channel to the consumer [3], [7]. At the same time a lot of consumers increasingly use apps and web services as part of their house-keeping practices [8], [9]. But these apps and web services offer usually just general, non-personalized information [2].

The conducted interview study shows that the contribution of the digital receipt is the improvement of the information supply for consumers allowing e.g. a more sustainable awareness when buying goods. The concept of the digital receipt has been evaluated as good and useful. From the consumer perspective it offers an added value compared to traditional solutions. However, the digital receipt is rather understood as an „enabling technology“ and its benefits result from the derived value-added services – such as additional comparison services, warnings, feedback of consumption patterns and the utilization of purchased products, as well as detailed information about products ingredients.

*“That you can just click on particular products (...) where you can get information about contents and ingredients of the specific product.” [P09]*

These services would facilitate and support consumers in their purchasing and house-keeping practices. Furthermore, personalized value-added services become conceivable that benefit commercial enterprises and producers. These include e.g. product-related feedback or rating systems which allow consumers to report shortcomings and help manufacturers to respond, react and improve their products. At the same time consumers get the opportunity to discuss with each other about products, review them, see other reviews and therefore increase the transparency and sustainable awareness.

In the context of sharing and exchange with other consumers for a more sustainable usage, respondents liked the idea that the best-before date and use-by date function additionally serves as a platform to hand leftover or disused products to other consumers, food sharing platforms, or food banks. Some respondents suggested marking these specific products so that the food can be picked up.

*„That is going to become unfit, but it is fine so far, okay, I can give it to charity through the app or mark it to be picked, put it outside, however, if it is cold enough or bring it somewhere.” (P07)*

The value-added services largely based on a more extensive data collection, which can theoretically be used for profiling. This potential for abuse leads to a conflict in terms of the digital consumer and data protection through data economy. This conflict can be seen in more recent consumer research, for example Reisch et al. acknowledge that the digital options offer great benefits and facilitation of the issues of every-day life and consumption. At the same time the digital world bring along risks that are rather long, often hidden or at least difficult to estimate in contrast to an immediately experienceable benefits [1]. The implementation of digital receipts has to prove itself in this conflict.

On the technical level, several implementation options are possible: the base builds a standardized exchange format, in which especially the barcodes or QR codes of the purchased goods are stored. This format may e.g. be embedded in existing receipt PDF files to be sent to the customer via email. Further, NFC solutions or on receipt printed QR codes are feasible to provide consumers with the available information. Concerning

online trading, browser plug-ins are also conceivable, with which the digital shopping cart is read.

On the socio-organizational level several implementation scenarios are conceivable: commercial enterprises can offer their customers a digital receipt, and based thereon value-added services to collect more data about customers and increase customer loyalty [3]. From the consumer's perspective, however, a standardized, anonymous receipt would be more desirable to reduce lock-in effects and to increase data protection [2]. Such a solution could meet resistance from the retail industry, as trading companies could lose control over the data. From the consumer's point of view, two strategies are possible: On the one hand it is conceivable that consumer initiatives and consumers App manufacturers are developing solutions that enable consumers to create digital versions of their paper-based receipt by photographing or scanning it via smartphones. Since the information will be poor and the costs will be higher, such solutions are likely to be used by a small group of consumers. Secondly, a legal regulation for the digital receipt is conceivable oriented e.g. on the market transparency regulation to electricity, gas and petrol [10]. This could also be linked to the sustainability strategies and the industry 4.0 implementation recommendations of the governments. It would however be a long-term process. This study points out that such a regulation may be a perfectly sensible measure in consumer policy and thus could realize a series of consumer-centered value-added services and improve lasting sustainability.

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