

An NFC-based Customer Loyalty System

Jef Smets, Glenn Ergeerts, Rud Beyers, Frederik Schrooyen, Marc Ceulemans, Luc Wante, Karel Renckens

Department of Applied Engineering
 Artesis University College of Antwerp
 Antwerp, Belgium
 glenn.ergeerts@artesis.be

Abstract—Customer loyalty systems that use barcode-based cards have gained a lot of popularity in the last decades, resulting in customer wallets that are overwhelmed with barcode-based loyalty cards. In this paper, a solution for this problem is provided. Based on general and market research of customer loyalty systems, a customer loyalty system that uses NFC (Near Field Communication) technology is designed that requires only one NFC medium (e.g., an NFC-enabled smart card or an NFC-enabled mobile device) for each customer, which is capable of holding multiple virtual loyalty cards.

Index Terms—Customer loyalty, NFC, group loyalty, city loyalty, NFC smart card, mobile NFC.

I. INTRODUCTION

As an old proverb states: the customer is always right, and nothing is more truthfully nowadays. Due to the current economical crisis and the rising expectations of the technology-enriched customers, the variableness and the switching behaviour of customers has increased significantly [1]. For this reason, many companies are forced to turn into customer-centric companies in order to attract new customers and retain the existing ones.

In a customer-centric company, the focus lies on the needs and behaviours of the customers instead of on the company's internal drivers. One of the key factors of a customer-centric company is customer loyalty, a very powerful tool for merchants [2]. By rewarding customers for their purchases, customers are retained. Furthermore, new and existing customers are attracted by publicity campaigns, resulting in an increased turnover. Research [1] has shown a revenue increase of 20% per customer. Other advantages of a successful loyalty system are marketing effectiveness, building true loyalty, increased word of mouth (WoM) marketing, strengthened value and brand proposition and increased long-term profits.

Existing loyalty systems are in need of improvement [3]. In this paper, a system is described that takes customer loyalty to a higher level, giving both merchants and customers new opportunities to enrich their relationship and build true loyalty. Decreased marketing costs and increased marketing effectiveness by using real-time sales data are the main benefits for merchants.

NFC (Near Field Communication) technology is used as an enabler-technology to ensure an efficient and convenient usage of the system. This very promising and relatively young technology is slowly penetrating the market and has a number of advantages over traditional loyalty systems technologies

(e.g., loyalty points on a barcode-based medium and paper strips for some short-term promotion).

This paper proposes a NFC-based loyalty system which allows the customer to use only one medium containing multiple virtual loyalty cards. From a merchant point of view the main advantage the system delivers is the easy implementation and managing of a loyalty system by joining the platform.

In the following section, we give a description of the concept of customer loyalty and in Section 3 we give a brief overview of NFC technology. In Section 4 we discuss the customer loyalty system. Section 5 handles about the performed interviews. Future works can be found in Section 6 and finally, the conclusion of this paper is located in Section 7.

II. CUSTOMER LOYALTY

The main focus of customer loyalty is to retain customers. In order to achieve customer loyalty, a relationship between a store or brand and the customer has to be built up. This is done by rewarding loyal customers. A customer is considered loyal when the customer actively participates in a loyalty program. Promotions and other forms of publicity are also used to increase the retaining rate of customers and to attract new customers, who, hopefully, will be converted into loyal customers.

Some examples of loyal customers rewards are a reduction on the total price, a cash value, a free product, a reduction on a specific product, a lottery game ticket (of a lottery game organised by the store or company), a reduction in another store or even a reduction in the customers parking ticket price. A larger reward is likely to retain more customers, but also decreases the revenue.

Coupons or promotion codes, which a customer can exchange for a reward, are also often used for attracting new customers or for rewarding loyal customers. When the reward is a free product or reduction, sometimes a catalogue is available from which customers can choose their free product or a product with reduction. A membership card is a kind of loyalty card as the members can be considered as loyal customers that are entitled to a reward.

A distinction can be made between issuers, who want to increase the loyalty of their own products or brand, and merchants, who want to increase the loyalty of their stores, which offer a wide range of products. In this paper, the focus

lies on merchants because issuers only distribute coupons, not loyalty cards.

In order to increase loyalty, customers must be satisfied about the given reward and the received publicity. Because no customer is the same, there is no one-size-fits-all solution for delivering rewards and making publicity. Therefore, the concept of customer segmentation, where customers are divided into groups with each their specific characteristics regarding loyalty, is used. In this way, customers are better targeted by the publicity campaigns and more satisfied about the given rewards, thus increasing the customer loyalty. However, if the customer segmentation is done badly, customers will receive rewards and publicity in which they are not interested, resulting in customer churn. Its therefore important that good analysis of the customers is performed and optimally used in order to make a profitable loyalty system.

Research of Accenture [1] summarizes this in a three-step scheme. The first step is about knowing the customer in order to choose good segmentation criteria. The second step is all about customer-centric marketing (the actual publicity to lure customers to the store). The rewarding of loyal customers is discussed in the third step.

As loyalty can be increased by dividing the customers into groups, we can state that an optimal loyalty level can be reached by examining each customer separately. This approach is called one-to-one marketing [4]. Using one-to-one marketing, fully customized campaigns can be generated to reach the customers optimally and to boost loyalty. There can also be a much faster response to the increasingly switching behaviour of customers.

In order to measure the success of a loyalty system, so called loyalty or marketing factors must be carefully chosen and constantly measured. Those loyalty factors will determine the success of the chosen rewards and incentives, and the chosen customer segmentation.

Marketing agents have to keep in mind to make offers compelling but not too intrusive in order not to spam the customers. It is after all the customer that decides to opt-in to the promotions or not. Also, if customers take advantage of the system and better organise their redemptions, the system will have less impact [5]. Systems like mFero [6] or Puntavista [7], which help the customer to choose the best reward, reduce the complexity of choosing the best reward at the POS (point-of-sale) and could reduce the impact as well.

Today's younger generation uses smartphones intensively but good examples of mobile marketing are still hard to find. Research has shown that people care more of losing their cell phone than their wallet [8] and that 75% of the people take their cell phone with them everywhere [3]. Keeping that in mind, it is no surprise that mobile marketing is a hot topic nowadays. Customers that can be reached everywhere and at any time, using a different amount of technologies, make the customers mobile device an ideal marketing medium. The wide range of technologies that a smartphone offers can be used to for time based and/or location based loyalty at low cost.

III. NFC TECHNOLOGY

NFC (Near Field Communication) technology is a close-range communication technology with a typical operating distance of approximately 10 cm [9]. Its operating frequency is 13.56MHz. In 2003, NFC has been approved as ISO/IEC standard making it a very modern technology.

Next to its shorter distance and other operating frequency, NFC differs from other technologies such as RFID, Bluetooth, ZigBee, IrDA and Wi-Fi by a slower data rate [10]. The maximum data rate of NFC is 424 kB/s. This small data rate is no problem, as the size of the by NFC transmitted information is usually small as well.

NFC is, due to its short operating range, said to be very secure. However, research [11] has proven that some important related security issues like eavesdropping, data corruption, data modification, data insertion and man-in-the-middle-attacks remain. Solutions are available but not always easy to implement.

Typical NFC applications are smart posters, payment or ticketing and loyalty. Many different NFC trials in countries around the world have been held from those applications. However, during the last years the research about NFC has focussed primarily on mobile NFC [8]. Mobile NFC is the integration of NFC in mobile phones whereby mobile payment systems are primarily very popular nowadays.

IV. SYSTEM OVERVIEW

The idea behind the system described in this paper is that customers can replace all their loyalty cards with one NFC medium. This medium could be an NFC card or, in the future, an NFC GSM, which most customers already carry with them. This should be well accepted by customers since they are overwhelmed with paper vouchers and plastic loyalty cards nowadays. Issuers and merchants have lower costs and are more eco-friendly since there's no need for printing and distributing paper vouchers or catalogues.

A customer then only needs one NFC medium that is usable in different stores. Many actions can be automated, reducing processing time at the terminal. NFC is also said to be faster since there is no need for searching for a loyalty card in the customers wallet as this is automatically done by the terminal [5]. The tap and go functionality of NFC devices allows the customer to perform more intuitive actions which makes NFC an easy-to-use technology and results in an increased impulsive buying behaviour.

Since multiple stores use the same medium, the price can be split among them. Also, a medium already owned by the customer could be used, reducing the medium costs to zero. A disadvantage is that the branding aspect of traditional loyalty cards is lost, but the customers interface can be used for better, more personalised publishing resulting in increased customer loyalty.

A. System, terminals and mediums structure

The system consists of a backend which contains the webserver and database, terminals which are located at the

POS (point-of-sale) in the stores, NFC mediums (possessed by the customers) and a website as an online interface for both customers and merchants. This is shown in Figure 1.

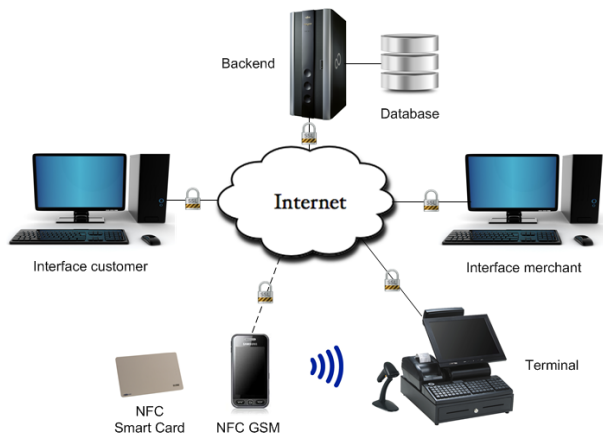


Fig. 1. System overview

An online architecture is used, meaning that all data is stored in the central database and the customers medium is only used for identification. The data is accessible via the online interface of the customers and merchants in real-time, which enables real-time monitoring of the customers (marketing information) on the merchants interface. The online medium and terminal architecture is needed to ensure this real-time data on the backend and website.

All operations (processing of the data) are performed on the backend (alternative is on the terminals) which enables efficient updating of the software. When implementing a new condition (see Section 4.3), only the code on the backend needs to be modified, all terminals can use the new backend code without need for updating. Also, when there are multiple branches of a store, all the data is already centralised; so, no additional synchronisation is needed (in contrary to when all or part of the data would be stored at the terminals).

Choosing an online architecture for the medium makes the system medium independent as only an identification number needs to be saved on the medium and all mediums support this. The most common NFC mediums are NFC smart cards and mobile NFC devices, as discussed in the previous Section. However, mobile NFC devices have not yet penetrated the market sufficiently, but NFC smart cards have (reaching even 95% penetration in Hong Kong) [8]. Therefore, smart cards are currently the most suited medium to use.

With 2011 that is announced as a promising year for mobile NFC, the breakthrough of mobile NFC will not last much longer, so the use of mobile NFC devices is supported by the loyalty system in order to be future proof. Its a small step to port NFC cards to mobile NFC devices. The intermediate solutions towards mobile NFC devices that currently exist, NFC stickers and NFC MicroSD cards, could also be used as a solution for the current absence of mobile NFC devices [12].

Because all data is stored in the database on the backend, an OTA transaction is required when using a mobile NFC device to consult this data. A semi-offline mobile NFC medium would not require an OTA transmission but as the new generation of smartphones all support mobile internet and the current price of mobile internet is descending, this should not be a problem.

An online architecture requires no memory storage on the medium (which is limited in size). This leaves room for other applications, it enables the possibility to have multiple users per medium and backups can easily be managed since all data is centrally available on the backend. A backup could be used to restore the data of a stolen medium which can be blacklisted instantly.

The only disadvantage of an online system is that the terminals require a constant connection with the backend to access the database. This is more expensive than a non-constant connection, the used terminals have to support network connections and there is the possibility that the connection is broken. However, using a buffer, in case of a broken connection the system can switch to a limited operation mode where it is still possible for customers to gain loyalty points but not to redeem them (see Section 4.4). In this way, customers still have to come back to the store (where loyalty is all about), so the system is still effective. The connection should be restored as soon as possible to ensure a full operating system in which customers can also redeem items so the customers loyalty experience remains positive.

Considering the terminals, three different terminals were implemented. Firstly, loyalty functionality was added to an online mobile terminal, the ACR880 GPRS Portable Smart Card Terminal. Secondly, an online fixed desktop pay desk was implemented and extended with an NFC reader, barcode reader, eID reader and loyalty functionality. Finally, the same fixed desktop terminal was implemented and extended with loyalty functionality to work in a semi-offline manner, which means processing the data on the terminal and logging all resulting data to the backend system at regular times. Advantages of this approach are no need for a constant connection with the backend and the ability to use product-specific conditions without the need for the product database to exist on the backend. The data on the backend (and the interface) is not real-time. Sections 4.3 and 4.4 don't apply to this terminal type as the data processing and management are not system-specific.

B. Support for different kinds of loyalty

Normal loyalty fits the scenario of stores with possible multiple branches with each one or more terminals per store. The following kinds are supported as well so more customers can be reached. All the different kinds of loyalty can be combined at will.

If a store has already an electronic barcode-based loyalty system in place, this system can be replaced by storing the barcode of the current loyalty card of a customer on the customers medium. An extra module would be needed in the terminals to support the NFC mediums in the system and to

log all data to the backend system. The semi-offline terminal could be used for this purpose. The advantage of this approach is obviously the support for existing barcode based loyalty system, which are very popular nowadays.

Group loyalty fits the scenarios of common loyalty points for a group of stores with each possible multiple branches and one or more terminals per store. The problem arises that the points have a monetary value. For example, customer X gains 499 points in store A after 10 visits, then gains 1 point in store B (1 visit) and receive a reduction of 5 (promotion says: for each 500 points, you receive a reduction of 5). This would mean that store B would pay for 1 visit in store B and 10 visits in store A which isnt correct.

This money mismatch requires all transactions to be logged to make regular money exchanges between all participation stores possible. Another option is that the stores can buy and sell the points from and to the system. Points need to be available on-the-fly and a store should never run out of points. Due the systems online infrastructure, this could be implemented without much effort. The monetary value of points also raises the need for increased security of the system. Advantages for the participating stores are not only raised profits due to the increased foot traffic but shared publicity costs as well.

As an extension of group loyalty, city loyalty additionally has third-party payment devices in the loyalty environment, e.g., a parking meter. Cities are found the most suitable places to perform this kind of loyalty, hence the name, but city loyalty is not restricted to cities at all, e.g., shopping malls are also a perfect location. The advantages of group loyalty remain. In addition, when using this kind of loyalty, customers find themselves in a complete loyalty environment, which they are yet more likely to return to.

Next to store-specific loyalty, product-specific loyalty is also an option as stated in Section 2. When enough stores use the system, cross-store product-specific promotions (branding) could be organised by the manufacturers, bringing new players to the loyalty ecosystem.

C. Promotions configuration

A difference is made between receiving points and receiving a reward (redeeming points). Both are triggered by conditions. There can be different kinds of conditions implemented. Examples of receive conditions are: receiving points for each visit, receiving points as a function of the total price, receiving points as a function of the price of a specific product or receiving a fixed amount of points for each visit. There are also different kinds of rewards as discussed in Section 2. All rewards are triggered by an amount of points.

When a promotion is configured, a merchant chooses which receive and redeem conditions to use. Minimum one of each is required but multiple conditions can be combined at will. Each chosen condition needs to be configured. The system can easily be expanded with new conditions, not requiring updating the terminals due the online architecture as mentioned above.

Multiple promotions are possible on a stores virtual loyalty card just as this is now the case with traditional loyalty systems.

D. Use cases

1) *Normal flow*: The following steps summarise the general customer flow at the terminal.

- 1) The cashier enters all products
- 2) The cashier asks the customer to put the medium on the reader
- 3) The cashier asks the customers which promotions and items of that promotions the customer wants to receive points for
- 4) The customers choice is sent to the backend and processed, a list of available rewards is returned. If this is the first time a customer uses the loyalty card in that store, a virtual loyalty card is created automatically. If this is the first time a customer uses the promotion on the virtual loyalty card of that store, a counter is created automatically.
- 5) The cashier asks the customers which rewards the customer wants to collect. If a customer doesnt select a reward, no points are redeemed. This enables a customer to save for a certain reward, e.g., 100 points give a free magazine and 200 points give a free book, etc. Another possibility is that the reward is e.g., a free hamburger and that the customer already bought food and wants to postpone the reward to the next visit.
- 6) The customers choice is sent to the backend and processed.
- 7) Next customer.

Some of the promotion items to receive points and receive a reward are chosen automatically. This is configured by the merchant on the merchants part of the website.

Received points can be added to the points balance before there is checked if enough points are available to receive a reward or afterwards. This is also configured by the merchant on the merchant part of the website. If afterwards, this means the customer will have to return to the store in order to retrieve the award (which is the basic of loyalty, letting customers return to the store).

2) *New customer flow*: Customers can start saving points immediately after receiving their medium in the store and providing their eID information the first time they use their medium to save points.

The systems goal is to increase loyalty. In order to achieve this goal, merchants must have access to information of their customers. This information is obtained when an NFC medium is used for the first time to ensure every new customer provides this information.

Customers will have the choice between using an eID reader or handover the eID to the cashier which will enter the data manually in a form (in order to ensure correct data). The manual option is for customers who fear their privacy as it is unclear for the customers which data is obtained from their eID.

The advantage of using an eID reader for entering the customers information is the reduced processing time. Instead of paper registration forms that need to be processed (manually entered in a computer system), this is done automatically, the customers eID data is even available in real-time. In addition, the entered eID data has a very low error-rate.

Following steps summarise the new customer flow at the terminal.

- 1) A new customer asks for and receives an NFC card (or uses an already owned NFC medium)
- 2) The cashier enters all products
- 3) The cashier asks the customer to put the medium on the reader
- 4) The cashier asks the customers which promotions and items of that promotions the customers want to receive points for
- 5) The customers choice is sent to the backend and processed, a list of available rewards is returned. If this is the first time a customer uses the loyalty card in that store, a virtual loyalty card is created automatically. If this is the first time a customer uses the promotion on the virtual loyalty card of that store, a counter is created automatically.
- 6) The cashier gets a notification that the customer is a new customer. The customer is asked to handover the customers eID card.
- 7) The cashier reads out the eID card or enters the data of the eID card manually (if preferred so by the customer)
- 8) The cashier asks the customers which rewards the customer wants to collect. If a customer doesn't select a reward, no points are redeemed. This enables a customer to save for a certain reward, e.g., 100 points give a free magazine and 200 points give a free book, etc. Another possibility is that the reward is e.g., a free hamburger and that the customer already bought food and wants to postpone the reward to the next visit.
- 9) The customers choice and eID data is sent to the backend and processed. An un-activated customer website account with the eID data linked to is created at the backend.
- 10) The customers registration code is printed on the cash ticket.
- 11) Next customer.

After using their medium for the first time, customers can (optionally) register an account on the website interface using their registration code which is printed on the cash ticket.

E. Customer interface

Customers have an online, browser based interface (website) on which they can view the stores of which they have a virtual card and view their points balance and history of each promotion. In their account settings they can opt-in and opt-out to various aspects of the system so at any time their privacy is guaranteed.

All stores that use the system and their promotions can be viewed. Customers are informed about new promotions and

other news via advertising on the pages. Finally, each store has also its own information page with the stores address details, a map, opening hours and other information.

Customers can also add additional profile data using the website as an extension to the eID data as this data is not complete (e.g., phone numbers are missing). The customers email address is retrieved during the registration process.

F. Merchant interface

On the merchant interface (website), merchants can manage the promotions of their store. Each store has its own space on the website with information about the store such as the stores address, opening hours and general information.

Merchants have access to the points balance and history of their customers, the (relevant) eID information of their customers and other marketing information of their customers and promotions which allows them to increase loyalty. Different graphs and other tools are available, e.g., a map with all addresses of their customers in order to view the distance to the store or a graph that shows the amount of customers that visited the store during the past week.

V. SECURITY & PRIVACY

Various security levels were implemented in the system. Firstly, all communication between the backend system and clients (website users and terminals) is encrypted using SSL. Secondly, Web pages or web services require authentication (except the public pages). Finally, each user or terminal is restricted to see only the appropriate data. The system should prohibit data duplication (points). This is obtained by securing the backend, all data is stored there.

Considering the privacy, access to customers data (personal data and loyalty data) is restricted to merchants of stores where customers have a virtual loyalty card. One is considered a customer of a store if a virtual loyalty card of that store exists. By visiting a store, a customer opts-in to that store and a virtual loyalty card is created, giving the merchant of that store access to that customers profile information.

The eID reader brings privacy issues with it as well. Laws exist that protect the customers privacy and that should not be ignored and, as discussed above, an alternative to the eID is provided by giving the option to let cashier manually insert the eID data in to the system.

Confidence agreements between merchants and the system administrators have to be made as well. Those regard the loyalty and sales data of the stores which should not be sold to third-party organisations by the systems administrators.

VI. INTERVIEWS

7 interviews were held in 5 different stores, ranging from small local stores to national stores with multiple branches. The currently used loyalty mediums vary from none to paper and barcode cards. Both normal loyalty and group loyalty were encountered.

The system was well accepted in all stores. The same goes for the NFC technology. Merchants find NFC easy to use and

faster than traditional loyalty mediums. The possibility to opt-in to the loyalty system and keep the existing (barcode) loyalty system was found to be a good alternative.

The opinions about the competition between the stores when using a shared medium and the loss of the mediums publicity aspect are divided. However, everyone is enthusiast about the possibilities of the online platform. The customer interface and the merchant interface were found well-thought out and complete.

The layout and usability of the website were rated very high. None of the interviewees found any missing parts in the interface pages. We made the suggestion of adding billing information on the interface but this was found not needed and to complex and confusing for the customers by the interviewees.

The interviewees have, as expected, wishes for some specific information of the customers regarding their preferences (store-specific marketing data). Further, the interviewees liked that the offers and publicity can be personalised using the marketing data on the website and noticed this is already possible with their current loyalty system but not done as it takes to much effort. Loyalty on product level is a requirement of the larger stores. The small stores were only interested in the basic functionality of the system. Social media integration was also well accepted by all stores. See the next Section for more information about those items.

The use of an eID reader to collect customer information was also well accepted. Some of the stores admitted that they never used the collected paper forms because the processing took too long while other stores simply dont gather customer information due the manual processing.

Finally, privacy of the customers was found to be a delicate subject. The interviewees are very aware of the fact that customer privacy should not be ignored.

VII. FUTURE WORKS

A. Backend

Barcode replacement, group loyalty, city loyalty, product-specific loyalty (branding) and combinations of those, discussed in Section 4.2 are not implemented yet and can be added to the system.

Not all conditions, discussed in section 4.3, are implemented yet. Note that the implementation of product-specific conditions will require product information to be stored in the backend database as this data is needed for the processing of the product-specific conditions which takes place on the backend. The product data is also needed on the terminals to ensure a fast barcode/price lookup. Product-specific conditions are currently implemented on the semi-offline fixed desktop terminal, avoiding the need for a product database on the backend.

On the merchant interface managing the advertising (adding and removing ads), new graphs on the marketing pages and a marketing data export functionality, to export the marketing data to a more advanced CRM (customer relationship management) program, could be implemented. The marketing data

should be usable to segment customer into groups and ideally to perform one-to-one marketing by generating more personalised advertising (on the customer interface), publishing (via folders and mailings) and promotions based on the customers preferences. This can already be obtained but is not yet fully automated which is required in order to provide a full surplus to the system. When a store has multiple branches, it should be possible to manage those branches and filter the marketing data per branch.

Both on the customer and merchant interface newsletter functionality and/or a news page per store could be implemented. Also, integration with social media is possible. Merchants and customers could opt-in to a loyalty system where the customers social media is used for publishing in exchange for loyalty points (given to the customers). The online interface can also be used to provide support towards the customers and merchants.

The billing part for the merchants needs to be implemented. A flat fee could be used or the billing could be directly based on advertising, server space (database space), the number of terminals, the number of customers the number of website users, the number of distributed NFC cards and/or NFC GSMs and/or other parameters.

B. Terminals

The buffer functionality, discussed in section 4.1 is not yet implemented on some of the terminals. Also, the customer flow is not fully implemented on the terminals. The selection of promotion receive and redeem items (including auto selected items) is not possible.

The customer flow at the terminal and or the website can be extended to show the rewards a customer may expect next visit. It should be possible for the cashier to manually enter a custom amount of loyalty points instead of choosing a predefined promotion in order to make corrections or to make a one-time loyalty receive or redeem transaction.

Modifying the eID data should be done via the eID reader or form on the terminals, instead of via the website, to ensure correct eID data of the customers. Customers should still be able to modify the additional customer information via the website (email address, phone numbers, etc.).

When the system is combined with an NFC payment system, even faster processing times at the terminals can be achieved.

C. Mediums

New possibilities arise when an NFC smartphone is used as medium as discussed in section 4.1. The customers and/or merchants interface can be accessed using a mobile web browser or a smartphone application. A smartphone application is preferred due the higher user-friendliness. Such an application requires OTA application management (downloading, installation, updating and removal).

It is also possible to perform P2P (peer-to-peer) transactions using NFC smartphones. This functionality could be used for exchanging points between customers (if permitted).

The system can be extended by Smart Posters (only work with active NFC mediums such as an NFC smartphone) or Smart Kiosks (also work with passive mediums such as an NFC smartcard). When using a Smart Poster or Smart Kiosk a semi-offline medium is required. Using a mobile NFC device and an OTA connection with the backend, a semi-offline medium could be emulated, enabling the use of a Smart Poster.

Finally, if required, a terminal page on the merchant interface or a terminal smartphone application could be implemented.

VIII. CONCLUSION

After performing extended market research and literature research an NFC customer loyalty system is developed that bundles all advantages of NFC technology and traditional customer loyalty systems.

An online system architecture is found to be the best choice and an online platform is created. An optimal customer flow is designed to ensure a convenient and user-friendly loyalty experience. During the implementation process there was ensured at any time that the system was as generic as possible. The system has been tested extensively. Convenience, speed, security and privacy were fully considered.

Next to normal loyalty, other kinds of loyalty such as group loyalty and city loyalty are supported. Its also possible to extend existing loyalty systems to interoperate with the system.

The backend framework, the website (customer, merchant and public interfaces) and the web services for the terminals are implemented. The Event Wallet Mifare Desfire NFC smart card is used as medium. Three different kinds of terminals are implemented. The mediums are portable to mobiles NFC devices, making the system future proof.

The interviews learn that the choices that were made during the research and implementation phase are correct. Merchants are waiting for automated one-to-one marketing and an online platform is preferred. This customer and merchant interface is found to be complete and user-friendly, because most users are familiar with web interfaces.

Considered future works, there are a lot of possibilities to go from now, also due the generic structure of the system.

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