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Unpacking the ERP investment decision: An empirical assessment of the benefits and risks

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NFC BASED SERVICE INNOVATION IN RETAIL: AN EXPLORATIVE STUDY

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Abstract

This paper presents the results of a survey conducted amongst European retailers on their plans and perceptions with regard to novel applications based on Near Field Communication (NFC) technology. Whilst the survey showed that retailers did evaluate the possible applications differently, none of them clearly stood out as the most beneficial one. NFC based services were on average conceded to be able to accelerate the checkout process at the point-of-sale. This is an important acknowledgment, as 65% of the respondents consider waiting lines which can occur at the checkout to hold the largest potential for an improvement of their customers' shopping experience. While the rate of agreement is somewhat smaller than in the case of process acceleration, retailers also concede that NFC applications could make shopping more convenient for their customers. On the other hand, none of the NFC-based applications seemed to yield cost saving potentials to the responding retailers. The most surprising result of the survey was the respondents' low expectations in regards to customer acceptance. This is in clear contrast to the reports on NFC trials which generally describe participants as enthusiastic about the technology.

Keywords: Near Field Communication, Retail, Payment Systems.

1 INTRODUCTION

1.1 Background

Retailers are currently confronted with several challenges in regard to their relationship with their customers. Shoppers expect retailers to sell quality products and to provide them with good service levels within their stores. However, they also expect the retailers' prices to be as low as possible. The last several years have seen fierce price competition, which has forced retailers to cut costs wherever possible. Apart from the optimization of supply chain activities, through initiatives such as Efficient Consumer Response (ECR), retailers have also reduced the number of employees in their outlets. This cutback has led to a lower employee to customer ratio in retail stores, which in turn created new problems e.g. longer waiting lines at the point-of-sale (POS) and difficulty for customers in finding store personnel for assistance.

Today, 95% of retailers consider waiting lines at their checkouts as the most serious problem to be solved in order to improve service for their customers (Chu and Morrison 2003). A long term study conducted by Zenith Management Consulting states that 92% of retailers have problems meeting their customers service expectations (Cowgill 2006). This assessment is confirmed by a survey of 1,000 US retail customers, conducted by the Verde Group, according to which the biggest perceived problems that shoppers encounter in retail stores are a lack of support by store personnel and long lines at the checkouts. A third of the respondents stated that they could not find store representatives when they needed help, or that representatives did not have enough product knowledge to be able to assist them. 6% of the respondents declared that they have left retail stores without purchasing anything, precisely because of these problems (Verde Group 2007).

These problems can lead to various negative consequences in the short, medium and long term: Crowded stores, and the necessity to wait at the checkout, cause shoppers to take a place in the waiting lines as soon as possible. Additionally, they reduce their shopping to that which is absolutely necessary, so as to be able to leave the store at the time they intended to. This can directly lead directly to a decline in sales for the retailer. On the other side, negative experiences have an influence on shoppers in their future choice of a store (Harrell and Hutt 1976). Long waiting lines and bad service can thus cause a retailer to lose customers permanently.

One cause for the long waiting lines at checkouts is the slow payment process, which prevents the cashiers at checkouts from starting to scan the next customers purchase (Chu and Morrison 2003). The most time-consuming payment process is cash, which to some extent is promoted by retailers through restricted card acceptance and the instatement of minimum amount rules for card payments. A wide-ranging switch from cash to electronic payment could increase the tempo of the payment process and shorten waiting lines in retail stores. In addition, offering customers the opportunity to use the payment instrument of their choice constitutes a service contribution. A study conducted by the German EHI Retail Institute in 2003 and 2004 found that card acceptance significantly influences the shoppers' decision on where to shop. According to this study, 56.4% of debit and credit cards owners stated that they were influenced by card acceptance when choosing a store. Card acceptance also leads to enhanced spending. 22% of the credit card users stated that they spend more when paying by credit card instead of cash (S-CARD Service 2004).

A further problem for retail customers is the phenomenon of 'consumer confusion', a catch phrase for the fact that consumers can be overwhelmed by the range of products that retailers offer in their stores (Rudolph and Schweizer 2004). While the German hard discounter Aldi has only 200 products (Brandes 2004) in each of its stores, a Wal-Mart Supercenter has 142,000 products (Wal-Mart 2007) to choose from. Consumer confusion, which can result from this abundance, might in turn limit the shoppers' willingness to spend money. This problem could be tackled either by reducing the number of products in the stores, thereby combating the problem at its roots, or by improved assistance for shoppers with their buying decision. Since assistance by store personnel already seems to be too

scarce, mainly because of cost reasons, other means of assistance, e.g. with the help of new technological solutions, could alleviate the problem.

1.2 Research questions

Against this background, this contribution concerns itself with the use of 'Near Field Communication (NFC)' technology in retail to address the before-mentioned issues. NFC stands for the integration of contactless smart card technology into personal devices, such as mobile phones, PDAs and personal computers. The integration of NFC hardware into a personal device enables it to act as a contactless smart card, as well as to read from and write onto such cards. These abilities make it possible for NFC compatible devices to be used as replacement for physical plastic cards (Ecma International 2005; NFC Forum 2006). The possible applications include the use of NFC devices as payment cards, electronic tickets, for the participation in loyalty programs and for the storage of rebate coupons. When compared to contactless smart cards, NFC devices have some advantages which are due to their user interfaces (keyboard and screen), their connection to mobile networks, their large memory and the close connection that people have built up towards their personal devices.

The implementation of NFC-based payment services could help retailers to tackle the problem of long waiting lines at their checkouts by accelerating the payment process. The adoption of NFC-based loyalty applications and rebate coupons could further contribute to this effect. In addition, NFC devices could be used by customers to obtain information on products without the need for assistance by store personnel. This could represent an interesting solution for retailers, since it would reduce the need for assistance by store personnel, which retailers have to pay for, using instead mobile devices, which would be provided by their customers. On the other hand, however, the adoption of NFC would still require significant investments in infrastructure, such as compatible payment terminals.

The standardization of NFC is being driven by the NFC Forum, which was founded by NXP, Sony, and Nokia in 2004. According to its website, the NFC Forum had 146 members, as of November 2008; only 1 (Groupe Casino, France) of these is a retailer. This could indicate that retailers are insufficiently represented in the organization which could in turn lead to an inadequate observance of their expectations in the standardization process. This paper aims to increase the knowledge on the attitude and expectations of the retail industry towards NFC technology. For this purpose, this paper considers the following research question: How do stationary retailers evaluate NFC?

In the following, we present the results of a survey among European retailers. The respondents were, amongst others, asked to evaluate various NFC applications in regard to their ability to increase the speed of the check-out process, improve the shoppers' convenience, and increase the customers' loyalty towards retailers. Section 2 provides an overview of our methodology. Section 3 discusses our survey results. The paper closes with a summary of our main findings.

1.3 Related work

The search for scientific publications on Near Field Communication does not lead to a large number of results. The technology has as of yet not received a lot of attention from researchers due to the recency of its emergence. There is however a considerable amount of works on the closely related subject of mobile payment. In their recently published review of literature concerning mobile payment, Dahlberg et al. (2008) classify 73 relevant publications in accordance to the stakeholders and issues they focus on. While 29 publications focus on technological aspects of mobile payments and 20 on the consumer, only five papers focus on mobile payment providers (Kreyer et al. 2003; Vilmos and Karnouskos 2003; Karnouskos 2004; Vilmos and Karnouskos 2004; Zmijewska and Lawrence 2005) and four center on retailer related issues (van der Heijden 2002; Ondrus and Pigneur 2004; Mallat and Tuunainen 2005; Teo et al. 2005). The literature review's authors state that the number and diversity of mobile payment publications focusing on retailers are disappointing and claim that quantitative studies are needed in order to contribute to a better understanding of merchant adoption. This paper

contributes to filling this gap by surveying the retailers' evaluation of NFC based applications including mobile payment.

While there are numerous publications on NFC trials and on the potentials of the technology published by proponents of the technology, these sources usually do not meet an academic level of rigour and completeness and therefore suffer from a lack of credibility. Additionally, since their authors have a stake in the success of the technology they might also be regarded as potentially biased.

2   DATA COLLECTION

Based on an extensive review of articles in trade magazines, press releases, and technology white papers on NFC and its applications in the retail industry, a survey was conducted among European retailers between October 2007 and April 2008. The research question was further operationalised, which resulted in the following sub-questions:
- How do retailers evaluate the different possible NFC applications?
- Do some of the applications seem more appealing to retailers than other applications?
- Which changes do retailers expect NFC to bring to their stores?
- Which NFC applications are retailers planning to implement?
- Which payment methods would retailers like to see implemented into NFC devices?

The survey was conducted by means of a questionnaire consisting of five parts (technology adoption, accepted payment methods, payment method preferences and costs, customer services offered today, and customer services planned for the future). It was originally designed in English, but was later translated into German, French, and Italian in order to facilitate the respondents' participation. The questionnaire was sent to potential respondents by e-mail if possible, by ground mail and fax if requested. Due to feed-back concerning the questionnaire format from the first respondents, the questionnaire was later also migrated to a specialized online platform (www.unipark.de) which made the participation more convenient for the further respondents.

In order to generate contacts to be sent the questionnaire we made use of the 2007 version of the Deloitte Global Powers of Retailing report (Deloitte 2007), which is published annually and, among other data, contains a list of the world's 250 largest retailers. Of the 89 European retailers among the top 250, 6 are not stationary retailers, but operate mail order businesses and were thus excluded from the survey. A further 16 retailers were not contacted due to language barriers. The remaining 67 retailers were contacted by phone. 14 of the 67 companies stated to not participate in any research activities whatsoever, while 12 companies refused to participate in this survey, due to time issues, confidentiality issues or lack of interest in the topic. The remaining 41 companies asked to be sent the questionnaire. After up to two reminders, 16 (39%) of the companies sent the questionnaire back, while 25 (61%) did not answer.

In order to broaden the scope of our explorative study, a further 22 companies were contacted, whose type of business was not covered by the top 250, e.g. an operator of duty free shops at airports and a fast food chain. Of these 22 contacts, 5 refused to participate in the survey due to time issues or a lack of interest in the subject. The remaining 17 contacts were sent the questionnaire. After up to three reminders, 4 (23.5%) of the contacts sent back the questionnaire, while 13 failed to do so (76.5%).

European Retailer Ranking	Total Revenue (US$ mil)	Number of Respondents	Respondent Share	Respondents' Revenues (US$ mil)	Revenue Share
Top 10	518,816	4	40.0%	214,339	41.3%
Top 25	814,348	7	28.0%	273,220	33.6%
Top 89	1,178,979	16	18.0%	329,583	28.0%

Table 1.   Statistics concerning questionnaire respondents (based on Deloitte, 2007)

Overall, 57 questionnaires were sent out to different retailers, and 20 were returned. This represents a response rate of 34.5%. The 20 respondents include 4 of the 10 largest European retailers, 7 of the top 25, and 16 of the 89 included in the mentioned Deloitte ranking (cf. Table 1). While 50% of the respondents' companies have annual revenues of more than €5 billion, 40 % are between €1 billion and €5 billion, and the remaining 10% between €100 million and €1 billion.
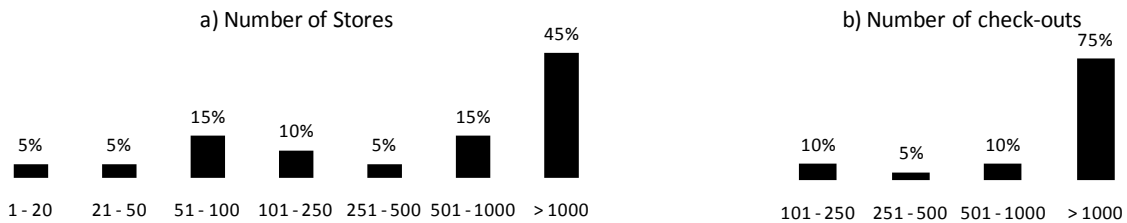

a) Number of Stores

1 - 20	21 - 50	51 - 100	101 - 250	251 - 500	501 - 1000	> 1000
5%	5%	15%	10%	5%	15%	45%

b) Number of check-outs

101 - 250	251 - 500	501 - 1000	> 1000
10%	5%	10%	75%

Figure 1.   Respondents' number of stores and number of points-of-sale

As depicted in Figure 1, the number of stores operated by the respondents varies between 1-20 and more than 1,000. A strong majority of the respondents (75%) operate more than 1,000 check-outs. The adoption of a technology which requires new hardware at each check-out would entail significant investments on the part of these retailers. While most of the respondents' companies operate stores of different formats, supermarkets are the most common among them with a share of 50%. This seems to give those companies that during the interviews showed most interest in NFC solutions which can accelerate the check-out process a disproportionate weight in the survey's results. However this is attenuated by the fact that 35% of the respondents operate department stores, which on the other hand showed a greater interest in NFC solutions that support the shopper on the store floor (cf. Figure 2).
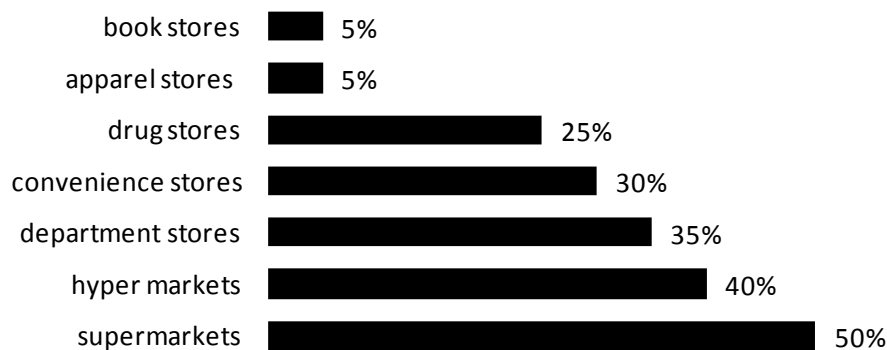

book stores	5%
apparel stores	5%
drug stores	25%
convenience stores	30%
department stores	35%
hyper markets	40%
supermarkets	50%

Figure 2.   Respondents' store formats

During the initial phone calls with retailers, it was always attempted to contact the person that is, or that would be responsible for implementing NFC based solutions in the company's stores. The respondents were all heads of departments or managers of relevant projects. While some of the companies linked NFC technology directly to payment terminals and the departments responsible for these devices, others classify it as a technology related to RFID and the departments driving these technologies. The responding companies have attributed the responsibility for the operation of their payment terminals to different departments. The most common responsible is the IT department followed by the finance department and general store management. Due to NFC's closeness to RFID, two of the respondents designated their logistics department as closest to NFC. Finally, one of the responding retailers disposes of a dedicated innovation group, which is responsible for all major innovations that are tested and implemented by the company. The head of this department also answered to the questionnaire (cf. Figure 3).

Innovation 5%
Logistics 10%
General Management 10%
Finance 20%
IT 55%

Figure 3.   Respondent's position / department

3   RESULTS

3.1   NFC Application Evaluation

The respondents were asked to evaluate five NFC-based applications that are also discussed in the majority of related works on NFC: payment, loyalty applications, rebate coupons, the retrieval of product information, and mobile device based self scanning. Each application was evaluated in regard to six criteria on a five point Likert-type scale. The scale enabled respondents to answer to statements concerning the NFC applications in a spectrum reaching from "strongly disagree" to "strongly agree". During the evaluation, these answers were replaced by points:

- strongly agree: 5 points
- agree: 4 points
- neither agree nor disagree: 3 points
- disagree: 2 points
- strongly disagree: 1 point

The criteria for the evaluation of the NFC applications were their ability to (a) accelerate the check out process, (b) make shopping more convenient for the customer, (c) increase the user quota when compared to conventional (e.g. barcode based) implementations of the application, (d) reduce the retailers' costs when compared to current solutions, (e) increase customer loyalty, and lastly (f) the expected consumer acceptance. These criteria were chosen, because they represent the possible influences that seemed most crucial to the interviewed retailers.

In two cases, the questions in regards to the procurement of product information deviated from those of the other NFC applications, due to the facts that it would not constitute a part of the check out process, and that, according to interview results, it was expected that product information solutions were less established than the other applications. Instead of its effect on the speed of the check-out process, the respondents were asked to judge the potential of NFC based product information to reduce the customer's need for store personnel assistance. Furthermore, instead of being asked to judge its ability to increase the user quota when compared to current solutions, retailers were asked whether they thought the solution could increase the consumers' knowledge of products they buy. An overview of the respondents' evaluation of NFC application is given in Figure 4.

Ability to Accelerate the Check-Out and Payment Process

On average, the respondents agreed with the statements that NFC applications could benefit their stores by accelerating the check-out and payment process. In the case of NFC coupon applications, that agreement is considerably weaker than in the cases of payment, loyalty applications, and self scanning applications.

As stated before, the fact that NFC based product information procurement would support the shopper on the store floor instead of becoming part of the check-out process gave reason to deviate from a check-out related question. Instead, the questionnaire asked, whether NFC based product information

procurement was expected to reduce the customers' need for assistance by store personnel. The respondents were on average unsure whether this would be the case or not.

Ability to Reduce Costs

The respondents were asked whether NFC based solutions would help them to reduce payment transaction costs and issuance costs for loyalty cards and coupons. The questionnaire also asked whether NFC device based solutions would constitute cheaper alternatives to current self scanning and kiosk based product information solutions.

On average, the respondents disagree with the statements that NFC based payment, loyalty applications, and coupon solutions are going to reduce their costs of providing the respective services. Self-scanning and the procurement of product information based on NFC enabled mobile devices receive a less negative assessment. However, these two applications also do not seem to represent big cost savers to the respondents.

Ability to Increase Customer Loyalty

The respondents answers concerning their opinion on the ability of NFC applications to increase their customers' loyalty show, that they are on average unsure whether NFC application can have such an effect or not. The average answers differ less than in the previous two questions concerning check-out acceleration and cost reduction.

Ability to Increase Customer Convenience

As the results show, the respondents' belief that NFC solutions could make shopping at their stores more convenient for their customers is slightly weaker than their belief in their ability to accelerate the check-out process. However, with the exception of NFC based product information retrieval, retailers on average tend to agree that NFC solutions could make shopping more convenient.

Ability to Increase the Shoppers' Use of Customer Services

The respondents tend to agree, that NFC based payment and self scanning could increase the number of electronic payments and the use of self-scanning solutions. On the other hand, they tend to disagree, that NFC based loyalty application and coupons could increase the participation ratio of loyalty programs or the use of coupons by customers.

In the case of the NFC based product information procurement application, the questionnaire again deviated from the standard question. Instead, the questionnaire asked, whether NFC based product information procurement was expected to be able to increase the customers' knowledge of the products they buy. The respondents, on average, tended to agree to the statement. However, the agreement was not very strong.

Expected Customer Acceptance

The retailers' opinions as to the acceptance of the different NFC application by their customers differ only slightly. Retailers are on average neither convinced that NFC based services would be greatly appreciated by their customers, nor that they would be rejected. This clearly contradicts the statements made by companies that have conducted NFC trials. These statements generally speak of enthusiastic consumers and high approval rates concerning NFC technology. This divergence means that either the statements issued by trial organizers are too optimistic, or that the retailers that participated in the survey lack the appropriate enthusiasm, because they have an inaccurate picture of their customers' preferences. Anyhow, retailers and trial organizers which usually include NFC hardware vendors and service providers clearly have different views on the shoppers' preferences. If these hardware vendors and service providers wish to make these retailers their customers, they will have to convince them that customers will be fond of NFC.
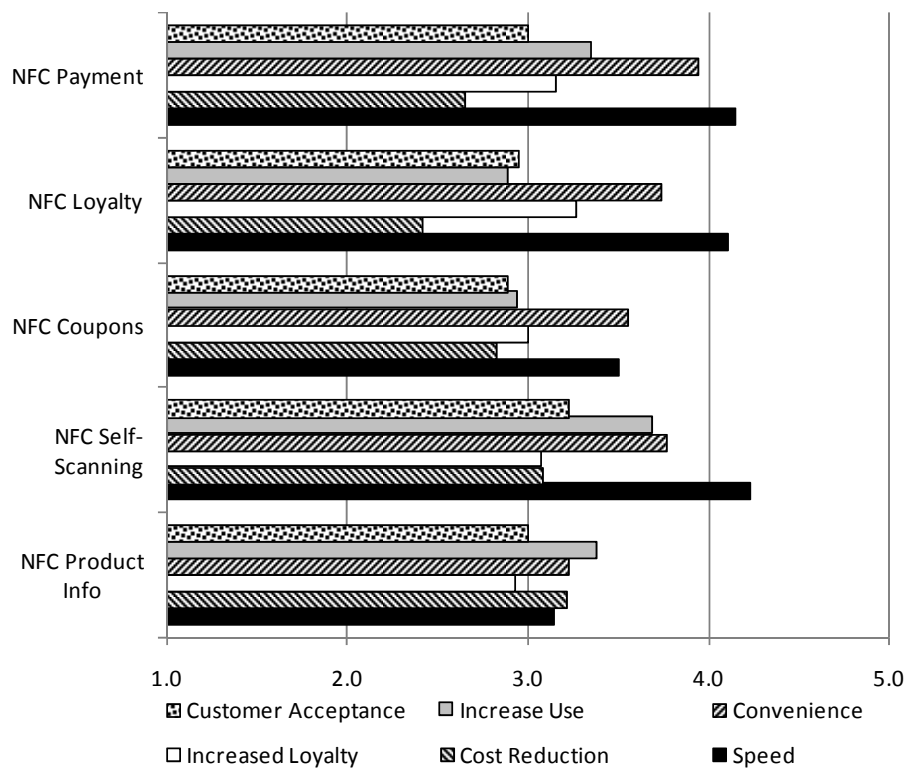
Figure 4: NFC application evaluation

3.2 Plans in Regards to NFC

When asked which of the listed NFC applications they were currently planning to implement, 40% of the respondents stated that they were currently planning to implement NFC based payment. NFC based self-scanning and coupons applications followed with two respondents each. An NFC based loyalty application and a product information service based on the technology are currently only planned by one respondent each (cf. Figure 5). This significant lead in planned implementations of NFC based payment is rather surprising when the previous evaluations of the different applications are taken into consideration. While NFC based payment received relatively good evaluations throughout all criteria, there was no exceptionally high rating when compared to the other applications.
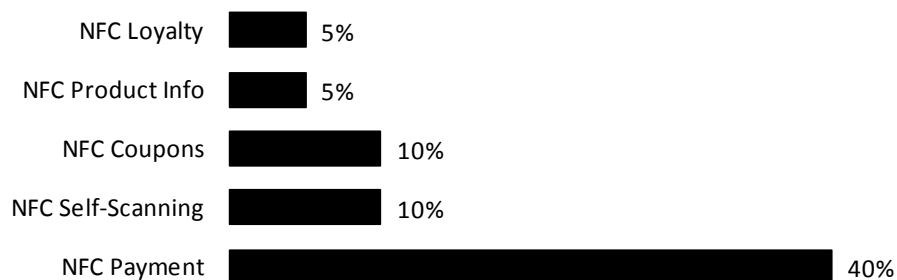

Figure 5: Planned NFC services

A possible explanation for this predominance of payment could however be found in the answers to another question: The respondents were asked to point out, which of the possible NFC applications they considered to be the killer application that would drive the technology's introduction in the retail industry. A clear majority of 70% think of payment applications as the driving force of NFC in the retail industry. Two of the respondents on the other hand think that loyalty applications will be the

initial driver. One respondent stated that both payment and loyalty applications together would drive the technology's adoption. Coupon Applications and the support of internal logistics applications were picked by one respondent each, and finally one respondent stated that NFC would be driven into the retail industry by another application, but did not state which. NFC based self-scanning and product information solutions on the other hand were not mentioned by any of the respondents (Figure 6). The role as NFC killer application that is attributed to payment could in part be due to the fact that retailers would only have to upgrade their payment terminals in order to accept contactless and NFC based payments. The remaining infrastructure would be provided by the payment system operators. Loyalty and coupon applications on the other hand would require higher investments from the part of the retailers, because the issuance of loyalty cards and coupons would require them to also invest into infrastructure for the delivery, the processing, and the authentication of loyalty cards and coupons.
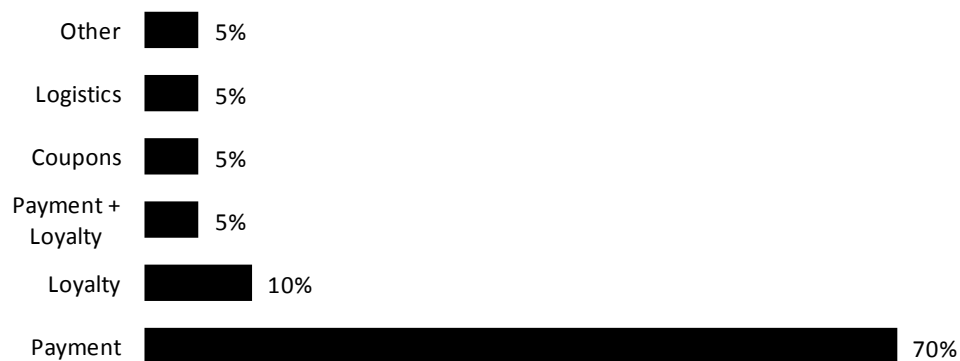
Category	Percentage
Other	5%
Logistics	5%
Coupons	5%
Payment + Loyalty	5%
Loyalty	10%
Payment	70%

Figure 6: Potential NFC killer application

3.3   Payment Method Preferences

Finally, the questionnaire asked for the payment methods currently accepted by the respondents, their payment method preferences, which payment methods they would like to see implemented as NFC based payment methods, and whether costs to the retailer or convenience for the customer are more important in the decision to accept a new payment method. As Figure 7 illustrates, the only payment method accepted by all respondents is cash. While debit cards and credit cards are also accepted by a large majority of 95% and 85%, only 35% of the respondents accept the stored value cash cards and a private label card operated by their own company. While, 40% of the respondents allow for on account payments, this method of payment is restricted to regular, commercial customers.
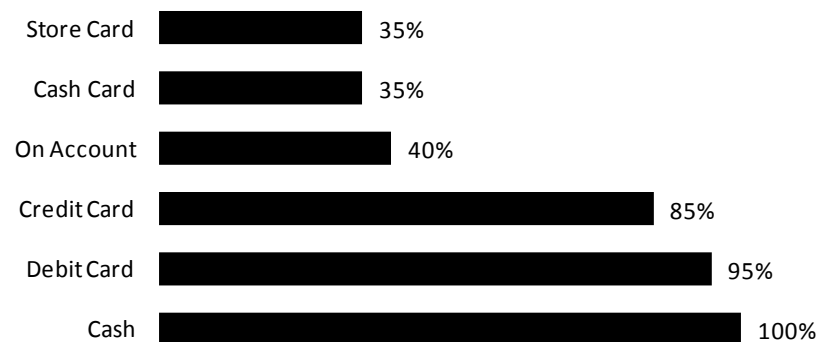
Payment Method	Percentage
Store Card	35%
Cash Card	35%
On Account	40%
Credit Card	85%
Debit Card	95%
Cash	100%

Figure 7: Accepted payment methods

The respondents' preferences as to the payments methods their customers settle their purchases with are dependent on the amount that the customer has to pay for. Cash is clearly the preferred payment method for payments up to 10 EUR, while debit cards are the preferred method of payment for amounts above 10 EUR. Whilst cash payments decrease in popularity with increasing amounts, all

card payment increase in popularity with increasing amounts. The only exceptions to this rule are the prepaid stored value cards, whose popularity decreases for amounts above 100 EUR (cf. Figure 8).
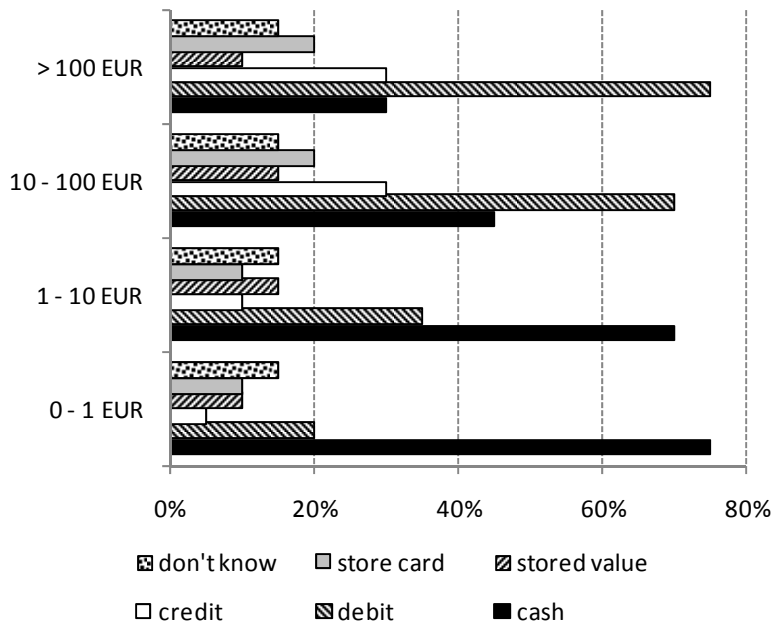

Figure 8: Payment method preferences

When asked which payment methods they would like to see implemented as NFC enabled payments methods, most respondents favored debit cards (80%) before credit cards (75%). As Figure 9 illustrates, the preferences of the respondents as to which of the payment methods they would like to see NFC enabled seems related to the share of respondents that currently accept them based on conventional cards in their stores.
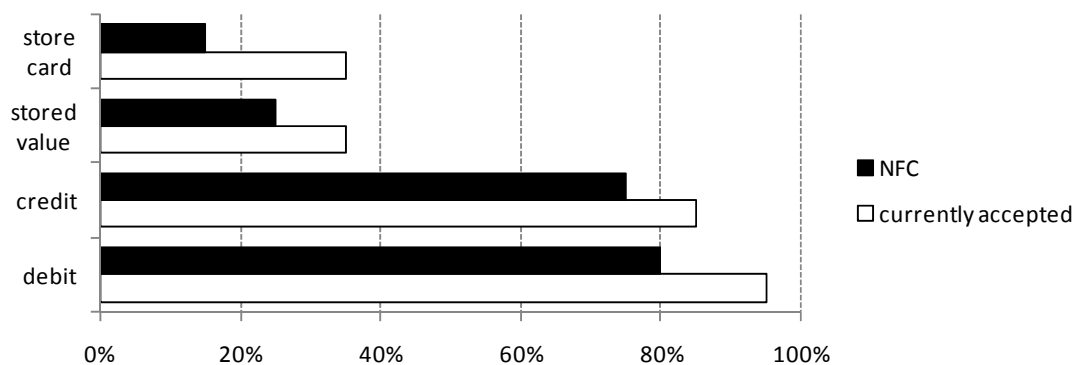

Figure 9: Accepted payment methods and favored NFC payment methods

When asked, whether transaction costs or the effects on their customers' convenience would influence the decision on adopting a new payment method in their stores stronger, most answers stated that both factors were equally influential. As Figure 10 illustrates, the other answers are almost equally distributed over the remaining options. This seems to indicate, that for a new payment method to reach wide adoption the payment method in question has to provide both, a reasonable transaction price to the retailer, and the ability to increase the customers convenience when shopping.
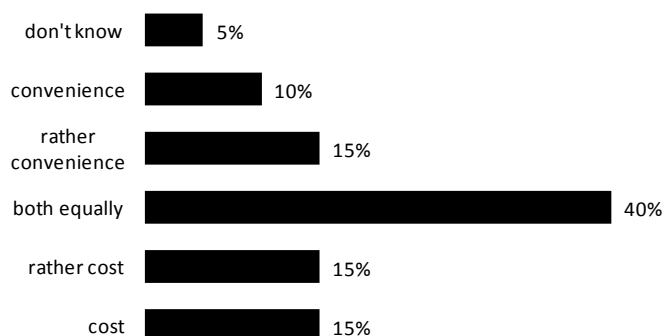
Figure 10: Factors influencing the adoption of new payment methods

4   CONCLUSIONS

This paper presented the results of a survey amongst European retailers conducted between October 2007 and April 2008 in order to find out how retailers evaluate NFC. The respondents agreed that NFC based payment had the potential to speed up the payment part of the check out process. They did however attribute this capability to NFC based loyalty applications and self scanning as well. Coupon applications were also attributed the same quality though the rate of agreement was lower in its regard. None of the proposed NFC applications is seen as a potential cost saver by the responding retailers. The respondents seem to expect that the implementation of NFC will rather cause additional costs. This feeling is particularly strong in the case of loyalty applications and payment. The respondents are unsure whether the implementation of NFC applications in their stores will lead to an increase in their customers' loyalty towards their company. The answers differ only slightly in between the different applications. The responding retailers, on average, agree that NFC based payment constitutes a more convenient way for their customers to settle payments with. However, NFC based self-scanning, loyalty applications and coupons are evaluated to be almost as beneficial to the shopper's convenience. NFC based product information applications are perceived to be the least beneficial for the customers' convenience.

The respondents are not convinced that their customers will be enthusiastic about NFC based services. They only expect a moderate acceptance of NFC on the part of their customers. Retailers are, on average, neither convinced that NFC based services would be greatly appreciated by their customers, nor that they would be rejected. This clearly contradicts the statements made by companies that have conducted NFC trials. Retailers and trial organizers which usually include NFC hardware vendors and service providers clearly have different views on the shoppers' preferences. If these hardware vendors and service providers wish to make these retailers their customers, they will have to convince them that customers will be fond of NFC.

None of the NFC applications clearly stand out as the NFC application yielding the largest to the improvement of the shopping process. While payment is highly ranked among the different applications in regards to its potential to increase the speed at the check-out and to bring additional convenience to the shopping process, other applications are evaluated similarly. The NFC application which the highest number of the respondents is currently planning to implement is payment. 8 respondents (40%) stated that they were currently planning to implement NFC based payment. This number is four times higher than that of the next most current answers. This result was somewhat surprising due to the fact, that payment had not been evaluated significantly more beneficial to retailers than the other applications. A possible explanation for this predominance of payment could however be found in the answers to another question: A clear majority of 70% think of payment applications as the driving force of NFC in the retail industry.

The respondents' preferences as to the payment instruments that their customers use to pay for their purchases with are clearly dependent on the amount to be settled. While cash is clearly preferred for

the settlement of small amounts, debit cards are the preferred payment method for larger purchases. The majority of the respondents would like to see both debit and credit cards implemented as NFC payment instruments. In order for such NFC-based payment services to be adopted by a large majority of the responding retailers, such services will have to be convenient for shoppers and feature an acceptable price tag.

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