

CONTACTLESS PAYMENT, A RFID DOMAIN AND ITS ACCEPTANCE BY CARD HOLDERS

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Abstract

The target group in a consumer environment often perceives RFID technology as a threat. The question, however, is: does the perception of RFID contain the potential to become a threat to the economic success of the investment in such technology?

The optimization potential of RFID technology - a driving factor in modern supply chain management - is increasingly opening up new market segments in other business processes. Among them are accelerated payments in the retail and service sector, for example the programs PayPass, ExpressPay and payWave issued by three global credit card companies or the new Girogo system for debit cards. Prototypes for the integration in smart phones are in the test stage already. The step of combining these two technologies opens up a mass market and offers the opportunity of developing a successful application on a worldwide scale.

This article examines the acceptance of RFID-based payment systems by the end user. It defines relevant factors based on existing literature and evaluates them empirically by using the Technology Acceptance Model in its version two.

JEL classification: D12, D81, L81

Keywords: RFID, TAM, acceptance, consumer, trade, retail, e-commerce, credit card, debit card, contactless, payment, process, risk, investment, radio frequency identification, e-passport, survey, usefulness, ease of use, petrol station, gas station, PayPass, payWave, ExpressPay, Girogo, NFC.

1. INTRODUCTION

In addition to being the year of the dragon, 2012 is also the year of contactless payments, if customers are to believe the Guardian or the industry behind the relatively new contactless payment system (Brignall; 2012). The United Kingdom, particularly London has been chosen for a rollout on a large scale for retailers with an international basis, public transport such as the Underground or taxis guaranteeing acceptance of the technology (Brignall; 2012). Visa takes on the challenge of introducing their contactless payment product to a wider clientele with maximum media attention during the Olympic Games. Although this is not the initial launch, the purpose of gaining international awareness for this relatively new payment product will be fulfilled.

Germany's retail industry is facing the challenge to implement a contactless payment process on a smaller scale within a test phase in the north of the country (Klick-Schmidt; 2012, Schneider; 2012). Accelerated payments, shorter queues and higher turnovers are some of the objectives for contactless payment processes and retailers are keen to benefit (Klick-Schmidt; 2012).

Asked for the future of smart phones as purses, Thomas Sontheimer, expert for payment systems at Accenture, describes that the path getting there will be difficult. In his opinion it would be useful to get users accustomed to contactless payments by introducing card based systems first (Schneider; 2012). But how do customers perceive this technology and which factors influence the acceptance or rejection of the technology besides the trust factor?

2. DIFFUSION OF CONTACTLESS PAYMENT

MasterCard's PayPass system is available to more than 100 million cardholders worldwide and the German share is over 1.2 million by now (Schneider; 2012). Visa is currently not providing that service in Germany but has over 30 million card holders in Europe and the German launch is planned (Schneider; 2012).

The rollout of Visa's payWave in Britain is based on a network of 8.000 buses with hop on payment availability and more than 2.000 taxis and railways across London accepting contactless payments (Brignall; 2012). Retail customers are addressed by various supermarkets and restaurant chains, such as McDonald's (Brignall; 2012).

Germany's contactless debit cards are in contrast to the concept of credit cards based on a prepaid payment model. The system will be provided at first in petrol stations, drugstores and bookshops in the Northern Germany (Schneider; 2012).

Initially all three card systems issued a significant number of cards and approached thereafter retailers and service providers to establish a certain level of acceptance for contactless payments. This procedure has been carefully chosen by card issuers to reach a critical mass on cards within the market to attract and influence retailers in investing in modern card terminals required for the new technology. The system can only start successfully, if new terminals and the number of issued cards reach a critical mass (Choi et al.; 1997, Braatz; 1999, 312, 322).

Besides the critical mass of cards and terminals the network effect is an important element for the success of a payment system. The more users are participating in a payment system, the higher the benefit for each individual user will be (Farrell and Klemperer; 2007, Katz and Shapiro; 1994).

Considering the concept of critical mass and network effect one trial of contactless payment is especially of interest. A Spanish consortium consisting of three companies assembled a mobile phone with a payment device. As many Spanish customers carry such artifact with them when leaving the house, a test environment was setup in the Spanish town of Sidges, near Barcelona. Customers were able to pay for various products or services, such as buying the newspaper or getting a haircut (Brignall; 2010). The idea behind a mobile phone as payment device is that an existing artifact of daily live is gaining the additional function of the legitimizing the payment processes. Embedded services in mobile phones could accelerate the intended critical mass and therefore lead into a positive network effect for the retail industry.

The trial in Sidges was a great success, as the participating customers declared already during the process that 90% of them would continue to use mobile payments. 50% of the payments have been received by supermarkets and 14% by restaurants (Brignall; 2010). An interesting factor was that the average payment was above the 20 Euro mark for non PIN authorization and customers were attracted by the system even if they had to enter a PIN into a terminal (Brignall; 2010). That fact could be interpreted by assuming that speed of payment will be of minor priority, once customers start using the contactless process.

3. SURVEY AND RESULTS

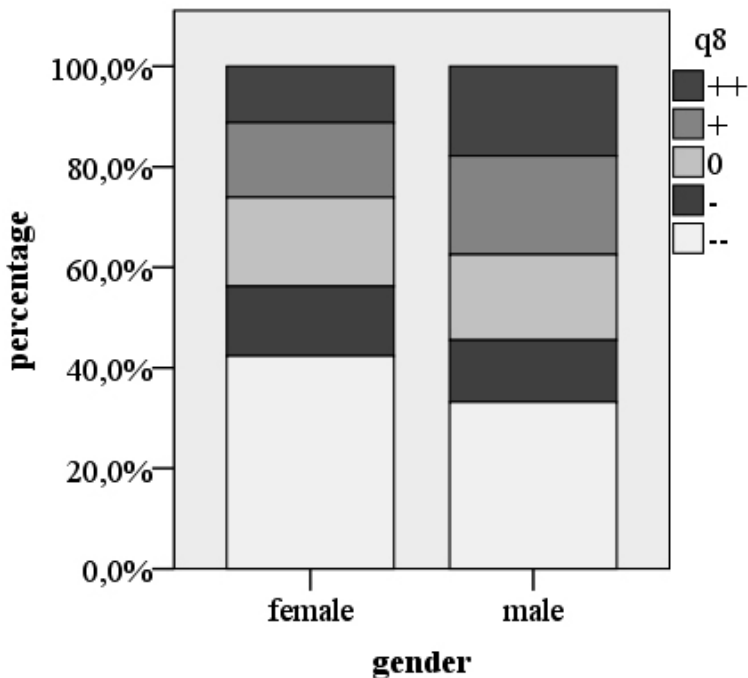
A quantitative survey was conducted at two German petrol stations in Hamburg to verify the impact of relevant factors for the acceptance of contactless payment. The stations of the Star brand have been chosen, as they are already offering contactless payments in Germany and have rolled out the payment process company-wide. Customers have had the chance to get familiar with the system or become at least acquainted with the process by seeing advertisements, even if they have no access to a contactless payment card. The city of Hamburg has been chosen due to the fact that the branch has well established business in the area and a sufficient number and diversity of stations to choose from. The two stations within Hamburg have been chosen requiring a 24 hour service frame, location on arterial roads with a significant number of commuters and a residential area and business district close by.

Altogether $n=1294$ customers have been interviewed by using a scheduled interview during their time on the premises of a petrol station. Each petrol station was staffed with three teams of at least two interviewers in an 8 hour shift system. Reinforcement was deployed during rush hours in the morning and evening by adding one more interviewer per station. Two weekdays - 48 hours - have been chosen for the process, Sunday, starting at 00:00 AM, with strong shop sales for beverages and snacks at night and bakery products and newspapers in the morning. Sundays were also strong in customer frequency at the car wash site, where customers more willingly participated in the survey as they had waiting time to spend. Mondays are traditionally known as strongest in sales of petrol products within the week.

The questionnaire included besides TAM questions the year of birth, questions with the answer yes or no and questions to be answered in a five point Likert scale with possible answers from 'I strongly disagree', referred to as '--', up to 'I strongly agree', noted as '++'.

Chart number one exhibits the perceived level of information subdivided according to gender. The rating asked for was: 'Contactless payment will improve my speed of payment'. There is a tendency that male customers answered that they feel better informed about contactless payments than female customers. Added up, the positive answers of '+' and '++' reach a level of 26.1% of the female and 37.3% of the male sample.

Chart 1, Perceived Level of Information about Contactless Payment by Gender



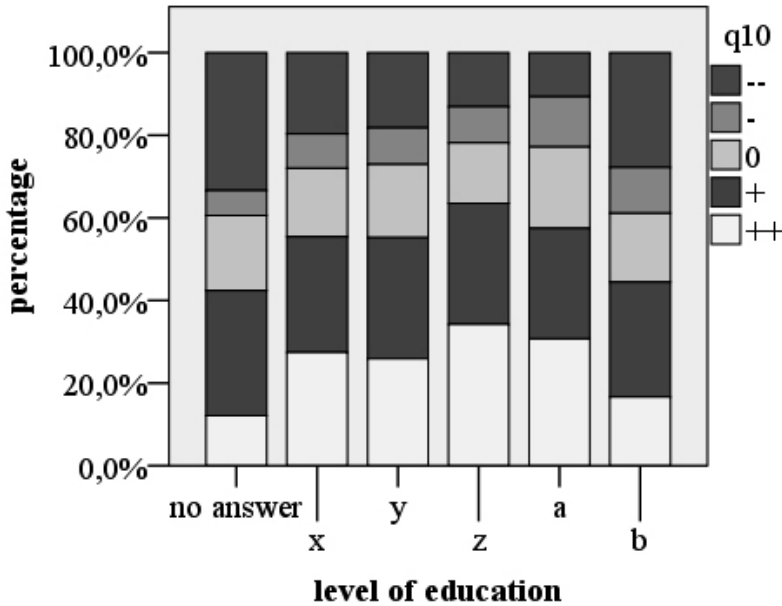
Source, author's calculation

Chart number two illustrates the prediction on speed of payment for the contactless payment process. It is sectioned by the highest level of education in ascending order, whereat 'x' represents the 'Qualifizierter Hauptschulabschluss', the lowest German school degree, and 'a' stands for a university degree. Interviewees declining answers are quoted as 'no answer' and section 'b' represents the group with no school degree.

As a result the prediction on the speed of payment can be seen as a positive effect of contactless payments overall, with a total of 57.3% answers in category '+' and '++'. 17.2% of all interviewees were of the opinion that speed of payment will be equal to the conventional process and 25.5% even predicted a negative development. Broken down on the level of education the groups of 'z' (a-level status) and 'a' (university degree) have the strongest expectation on positive speed effects with 63.6% and 57.5% of answer in category '+' and '++'. The strongest negative answers came from the category of 'no answer' and the group of interviewees with no degree, where 39.4% and 38.9% answered negatively in sections '-' and '--'.

An average of 17.2% of the respondents was of the opinion that both payment processes are of the same speed. The maximum here was within the group of ‘a’ with 19.7% and the minimum of 14.6% in the group of ‘z’.

Chart 2, Prediction on Speed of Payment by Level of Education



Source, author’s calculation

The hypothesis that it will be easier for customers using a smart phone to adopt contactless payment devices due to a reduced processing time cannot be supported. Question ten (q10_um), ‘contactless payment will improve my speed of payment’, was answered by 51.3% of customers with a smart phone believing that the payment process will be shorter with a contactless system (‘+’ and ‘++’ answers), whereas 65.4% customers without such mobile device maintain such belief.

Chart 3, Prediction of Speed of Payment by Possession of a Smart Phone

	q10_um									
	--		-		0		+		++	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
yes	151	21,0%	72	10,0%	128	17,8%	213	29,6%	156	21,7%
no	54	9,8%	47	8,6%	89	16,2%	150	27,3%	209	38,1%

Source, author’s calculation

Looking at the extremes of ‘++’ and ‘--’, such situation will be supported. 21.0% of customers with smart phone believe that the payment process will be delayed and 21.7% believe in faster process time. 9.8% of the sample of non-smart-phone users believes in delays but 38.1% of them believe in an improvement. Conclusive information on different opinions partitioned by gender could not be found.

The survey revealed that customers being members in social online media like Facebook or Xing had more often a smart phone than the group of customers not participating in such service. 56.69% of the respondents claimed to be in possession of a smart phone. The question: ‘Do you participate in social online networks like Facebook or Xing?’ (‘social_online’) was answered by 51.7% of women and only 40.5% of men positively.

60.5% of members of a social online service possess a smart phone compared to only 39.5% of the group without that type of online presence. The other side of users without social online presence shows nearly the same values in the opposite direction with 29.4% of customers possessing a smart phone and 70.6% without one.

Chart 4, Participation in Online Media and Possession of a Smart Phone

		pos_smartphone		Total
		yes	no	
social_online	Count	344	225	569
	yes % within social_online	60,5%	39,5%	100,0%
	% within pos_smartphone	62,5%	31,3%	44,8%
	no Count	206	495	701
	% within social_online	29,4%	70,6%	100,0%
	% within pos_smartphone	37,5%	68,8%	55,2%
Total	Count	550	720	1270
	% within social_online	43,3%	56,7%	100,0%
	% within pos_smartphone	100,0%	100,0%	100,0%

Source, author's calculation

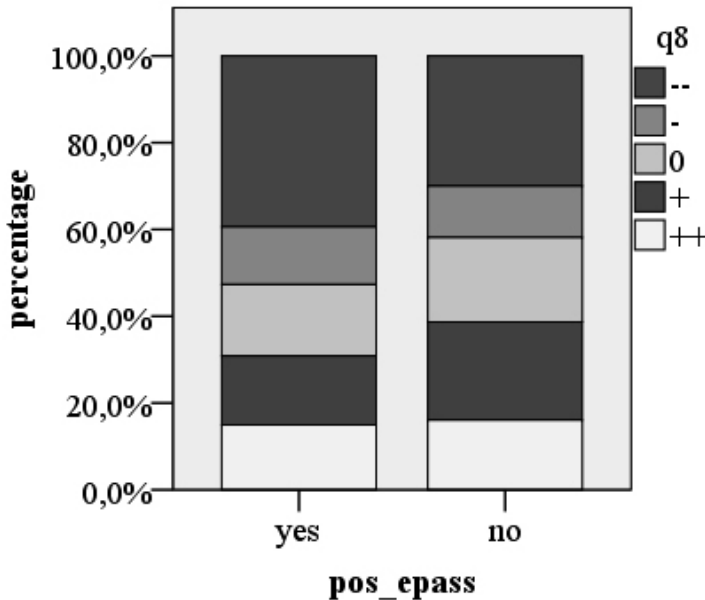
Further of interest was the possession of an electronic passport, an e-passport, for the analysis of customers as to the acceptance of contactless payments. The composition of such identification document is defined in the International Civil Aviation Organization's Document 9303 (ICAO; 2006). The core element is a contactless interface whereby the information stored can be transmitted over a short distance. Such electronic passports or identity cards are handed over by Germany's

government agencies along with an explanation and demonstration of how the device is to be used. Customers holding such passports should be acquainted with the technology and, therefore, influenced by the explanation procedure.

Chart number five illustrates the influence on the perceived level of information of the customer about contactless payments by holding an e-passport. Only 30.3% of customers holding an e-passport are rating their level of information about contactless payment as good or excellent ('+' and '++'), whereas 38.7% of non e-passport holders rate their level equivalently. Validating this output with the negative values ('-' and '--') reproduces the complementary situation. 52.7% of e-passport holders and 41.8% of non e-passport holders feel themselves not well informed about contactless payments.

The interpretation of this graph might be difficult to understand due to its dichotomy. On one hand it could be argued that the instruction procedure in the government's office leads to an increasing demand for information about the technology, on the other hand one could bring forward the argument that the explanation leads to more confusion.

Chart 5, level of information on contactless payment by possession of an e-passport



Source, author's calculation

Comparing the predicted speed of payment for contactless processes and the possession of an e-passport does not give a conclusive statement that could confirm one theory. 56.5% of e-passport holders and 59.6% of customers without e-passport predict the duration of the payment process to be reduced by contactless devices.

This result leads to the theory that the gained need for information about contactless payments may be found in the area of security and trust. Both elements have not been addressed by this survey.

4. CONCLUSION

Communicating the advantages of contactless payments will be a different task. Higher educated customers tend to see the argument for increasing speed in the payment process more than the less educated number of customers. Possessing a smart phone is on the other side an obstructive argument for seeing payment speed as an advantage of the new technology. The same point is valid for the possession of an e-passport. Customers with such instrument feel not as well informed about contactless payment technologies than customers without, even if a similar technology has been demonstrated to them in person.

An interesting element of the sample is the combination of social online media and the possession of a smart phone. Users participating in social online platforms have nearly doubled the probability to be in possession of a smart phone. An upcoming integration of such payment instruments in mobile phones will make this group a valuable field of customers, even if they do not see the benefits of contactless payments at the point of writing. A mobile phone user has after all paid for his device himself.

The perceived advantages from network effects for social online platforms pulls many users into buying a mobile internet device or smart phone to participate anywhere and anytime in the exchange of information with their closed user group. The benefits of this development can also be seen as being pushed by the technology of mobile internet access by manufacturers and network providers who established their devices before social online platforms became popular.

Contactless payments have one great advantage over the beginning of regular card payment systems. The essential chicken-and-egg-problem has been solved on the side of customers by the possibility to launch mobile applications on various

smart phone systems in advance. There is only one problem: sufficient technical devices to make the payment process profitable are still missing.

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