

Contactless payments in Poland - advantages and disadvantages based on surveys of a selected group of users over the years 2011-2018

Lukasz Zakonnik^{1,*}, Piotr Czerwonka², and Radosław Zajdel¹

¹University of Łódź, Faculty of Economics and Sociology, 22/26 Matejki St., 90-237 Łódź, Poland

²University of Łódź, Faculty of Management, 22/26 Matejki St., 90-237 Łódź, Poland

Abstract. The aim of the article is to evaluate changes in the perception of advantages and disadvantages of contactless payments by a specific group of users. Young and well-educated people were considered to be an interesting research group. The presented analysis was made from the perspective of three points in time - the first point was the end of 2011, the second turn of 2015/2016, and finally the third beginning of 2018. The research tool was an online survey. The research material was subjected to statistical assessment. The conducted research has shown that within a decade from the introduction of contactless payments in Poland, these payments became something obvious for a group of young people - and more importantly - something they regularly use. The knowledge about the concept of contactless payments is supported by the relatively high general knowledge of the technical aspect of making payments. Interestingly, gaps in knowledge correspond perfectly with security concerns - there are still serious concerns about not only the act of making contactless payments, but also those related to the storage of the payment instrument.

1 Introduction

Contactless payments in Poland have been developing dynamically already since the middle of the decade. Already at the beginning of 2012, the VISA research indicated that the largest number of contactless payments in Europe (more than 2 million operations) is made in our country [1]. While at the end of 2010 in Poland there were about 2 million cards with built-in functionality for making contactless payments, in the fourth quarter of 2017, there were 31.1 million such cards (which accounts for nearly 80% of all issued cards) [2]. Similarly - while in the beginning of 2011 there were only about 20,000 terminals where you could pay contactless payments - the current data (4th quarter of 2017) mention the number of 590.5 thousand terminals (which is already nearly 95% of those operating at device market) [2]. Since the hypothesis about the widespread use of contactless payments on the Polish market is highly probable, it can be interesting whether the payments of the type considered are actually so attractive and safe for the user? It is

* Corresponding author: lukasz.zakonnik@uni.lodz.pl

worth adding here that the aforementioned data generally refer to contactless payments made with a payment card - and this is not the only opportunity to perform this type of operation. Of the other options, mainly mobile payments using NFC technology should be considered. Nevertheless, despite favorable forecasts, contactless payments made with the use of mobile phones do not constitute a significant share in the total contactless payments at present (pan-European data mention 5% of this type of payments [3]) - therefore they were not subject to examination in this study.

The subject of contactless payments in Polish conditions attracts considerable interest from researchers. The publications appearing were of a very different nature - from press publications (eg [4]), through specialist reports (eg [5, 3]), passing through academic publications dedicated to the problem (e.g. [6, 7]) or generally regarding topic (eg [8, 9]) and ending with the reports of the supervising units (or advisory function) on the widely understood financial market in Poland (e.g. [10, 11]). Due to the limited nature of the work (even the research group adopted in the article), the research was limited to the Polish market.

2 Advantages and disadvantages of contactless payments - compilation

The introduction presented above clearly shows that contactless payments are a very significant and widely described method of making payments. However, like all methods it has its pros and its cons. This set of advantages and disadvantages becomes very important especially from the perspective of the client (as the group of entities that actually decide about the success or failure of the entire solution).

The aim of this article is to analyze changes in the perception of individual advantages and disadvantages of contactless payments by a specific group of users. As very interesting for the entities introducing the solution (generally banks), young and well-educated people who started their practical experience with banking were considered. (from this point of view, a group of students seems to be interesting). In addition to the advantages and disadvantages, the general knowledge of the method among the subjects was analyzed (as the actual factor determining the possibility of properly perceiving the advantages and disadvantages). All analyzes were made from the perspective of three points in time - the first point was the end of 2011, the second turn of 2015/2016, and finally the third beginning of 2018. The first of the studies - from 2011 - was presented in two publications ([12, 13]), the second presented in: [14].

During the work on the study in 2011, a certain range of advantages was identified, which has now been modified from the perspective of the passage of time. It may be presented as follows:

- Time saving, which results from the lack of the need to authorize payments by entering the card's PIN, often off-line (under certain conditions).
- Convenience (of course also related to the issue of time saving), which results, for example, from the lack of the necessity of inserting the card into the terminal or the lack of having to look for cash (also under certain conditions).
- Increasing the level of security, which results from the lack of the need to provide the card to the seller (and theoretically prevent the fraudulent use of information contained on the card).

In the case of drawbacks, the list requires a longer presentation. Disadvantages described here are not even due to the technical construction of the solution, but to the inconsistent application of appropriate safeguards. The list of problem situations presented below is the result of a combination of practical remarks regarding contactless payments

(the source of helpfull information were - on the one hand, the formal guidelines mentioned earlier [10, 11] - and on the other hand the opinions of users and, for example, people specializing in financial problems [15]). Interestingly, in the aforementioned previous author's works, some of the disadvantages were defined as definitely exaggerated and definitely unlikely. Practice showed that sometimes it was different. The most important disadvantages include:

- Security vulnerabilities that allow you to steal cash associated with the card. No need to enter a PIN number in case of theft, give the thief the possibility of very easy cash withdrawal from the card. In practice, this threat should be (though not always) less severe for the client. First of all, upper transaction limits are applicable to which payments can be made without providing a PIN (usually PLN 50). Secondly, there is a possibility to determine the number of consecutive operations that can be done without entering a PIN (that is usually only three operations are possible without on-line authorization). Thirdly, the distance between the card and the payment terminal must be relatively small - in the order of at most several centimeters. Fourth, the terminal - to make a transaction - should be authorized in the appropriate payment organization, and therefore it is possible to identify and block such organization. Fifthly, the existing legal regulations assume the client's liability only to a certain sum of lost funds (the maximum liability of the client is limited to 150 euros, but some banks have reduced it to, say, 50 euros).
- Multiple payment for the same product. Fear of the described situation is based on the assumptions mentioned in the point above. It should be noted, however, that we are not dealing with theft, but with an error - the card owner may inadvertently several times approach the card to the payment terminal (and theoretically make a payment). This problem is largely illusory. First of all, the payment terminal is programmed to handle a specific payment (that is, we pay "for the goods" and not for "approximating" the card). Secondly, if the payment has been collected by mistake, there are procedures to recover the money.
- Loss of anonymity, tracking user preferences. Sometimes, the potential disadvantage of using contactless payments is the possibility of installing, for example, in door frames special scanners to register entering and leaving to / from rooms. In this way, the information obtained would be used to collect customer preferences (installation in stores), or even to surveillance of citizens (if such data is collected by state institutions). It is difficult to argue with such allegations. For people who are extremely suspicious or just very cautious, there is a suggestion to use special card covers that prevent unwanted communication (which also works for the first described defect).

3 Assumptions, method of carrying out the research

In order to conduct relevant analyzes, the Authors decided to conduct a questionnaire (online survey) among the group of academic youth. As already mentioned, the first survey took place less than 7 years ago (it was carried out in December 2011), the second survey was conducted nearly 2 years ago (December 2015-March 2016), the third was carried out in January 2018. The questionnaire from 2016 and 2018 was slightly different in terms of the number of questions asked compared to the 2011 survey (some of the questions turned out to be quite outdated). A group of students was chosen at random and the questionnaire was asked to complete the questionnaire - in all cases - from about 500 to 1000 people. Of course, not all respondents decided to complete the survey. The first study received 160 responses, in the second 101 and in the third one only 97 responses.

In order to ensure the representativeness of the obtained results, the formula for the minimum sample size was used (formula no. 1 [16]):

$$N_{min} = \frac{N_p(\alpha^2 * f(1-f))}{N_p * e^2 + \alpha^2 * f(1-f)} \quad (1)$$

where: N_{min} – minimum sample size; N_p – the size of the population from which the sample comes; α – confidence level (α value); f – fraction size; e – margin of error.

According to current CSO research, currently there are 1 348 822 students in Poland [17]. Taking into account the sample size, the value for the normal distribution was read - 1.96 (assuming the confidence level $\alpha = 0.05$). The fraction size was assumed at 0.5 (default level). The assumed maximum error rate was 5% -10%. As a final result - substituting the data for formula no. 1 - it was established that for error $e = 5\%$ the sample size should be 384 people. For an error of $e = 10\%$, the sample size should be 96 people. In the last survey - from 2018 - 97 returns were obtained, which allowed to achieve the required minimum sample size (it was in the range $<96;338>$). Analogously, this took place in earlier studies.

In order to analyze the results obtained and formulate the conclusions, it was carried out in two ways. In the first part of the analysis, a simple comparison of answers obtained in questionnaires from three years was made. In the second part of the analysis, statistical methods were used and the calculations were carried out using the IBM SPSS Statistics software (version 24). In the case of statistical tests, independence tests with the pair of hypotheses were used:

H_0 : surveyed characteristics are independent

H_1 : $\sim H_0$

H_0 hypothesis test was the chi-square statistic, which for a two-dimensional table is defined by the formula presented below (formula no. 2 [18]):

$$\chi^2 = \sum_{i=1}^2 \sum_{j=1}^2 \frac{(n_{ij} - n'_{ij})^2}{n'_{ij}} \quad (2)$$

where: n_{ij} – empirical values; n'_{ij} – theoretical values.

In the article, in the part dedicated to the presentation of results, the calculated level of bilateral significance (denoted by p) was given. Statistically significant results were those not exceeding the set level (0.1). Determining the strength of the relationship, the Kendall Tau-b ratio from the SPSS package was used, calculated using the formula given below (formula no. 3 [19]):

$$\tau_B = \frac{n_c - n_d}{\sqrt{(n_0 - n_1)(n_0 - n_2)}} \quad (3)$$

where: n_c – numer of concordant pairs; n_d – numer of discordant pairs; $n_0 = n * (n-1) / 2$.

Kendall's Tau-b coefficient can reach from -1 to 1. Where absolute values from 0 to 0,199 speak of a very weak relationship, values from 0.2 to 0.399 with observable but relatively weak relationship, 0.4 to 0.699 with moderate dependence - and finally values from 0.7 to 1 with a strong dependency [20]. In the further part of the article, with the results presented, the calculated value of the coefficient (referred to as Tau-b) was given.

4 Obtained results

4.1 Analysis of answers obtained in the survey

In the case of a standard question referring to the awareness of respondents, what are contactless payments, if in 2011, 3/4 of respondents declared their knowledge regarding the subject of the study, in 2016 such knowledge did not have only 2 people (less than 2% of

respondents) - in 2018 there were no such persons. In addition, it is worth mentioning that in 2016 and 2018 only 1 in 10 people did not associate the symbol of a place where you can pay contactless. It is worth noting that the symbol used by MasterCard was almost twice as easily identifiable as the VISA symbol. These results confirm the success of the promotion of contactless payments - although, of course, they do not determine their actual usefulness.

Another group of questions related to the actual knowledge of the mechanism of contactless payments. When asked about the knowledge of the respondents regarding the possibility of making payments without providing a PIN, in 2011 a little over 80% respondents answered yes, in 2016 (and 2018) this issue was obvious (almost 99% of respondents answered yes). In the case of a question regarding the awareness of the existence of an upper limit on the amount for which the card PIN is not required to make a payment, in 2011 almost 60% of respondents answered yes - five years later, this percentage exceeded 96% of respondents, in 2018 it was 100%. Turning to the question about the knowledge of the recommended limit of operations, which can be carried out without entering a PIN, more than 70% of respondents answered in the affirmative survey, in 2016, less than 60% of respondents - while in the earliest study, this percentage reached less than 50%. In the case of a question about the possible maximum distance of the card from the terminal for the payment to be made, in 2011 the correct distance was indicated by only 15% of respondents, in 2016 the correct answer was given by 30% of respondents and in 2018 already 50%.

In the case of questions about the feelings of respondents related to potential drawbacks of contactless payments, the first of a series of questions - "does not it seem potentially dangerous to you that you do not need a PIN to authorize at least some payment transactions?" - in all of the studies it was practically identical the result - 3/4 of the subjects concerned such fears. In the case of a question about the fear of the possibility of extorting money by bringing the appropriate payment terminal closer to the card, for example stored in the wallet, quite similar responses between 65% and 55% were obtained in all surveys (for affirmative answers). Once again, in each of the surveys, very similar answers were given in the case of the question about the possibility of collecting information about user behavior / preferences using the proximity card (both variants of the answer were indicated practically at 50%). In the case of a general question asking for the indication of the biggest disadvantages (problems) related to card-based contactless payments, respondents in 2011 indicated mainly the fear of no need to enter the PIN each time (75%). In 2016, concerns related to the theft of funds unsecured with a PIN indicated - as the main disadvantage - only 30% of respondents, in 2018 it was difficult to indicate a significant defect highlighted by respondents.

Turning to indicating potential advantages, in 2011 the distribution of these advantages was as follows: the speed of transactions (56%), no need to enter PIN every time and convenience (20%), increased level of transaction security (1%). In 2016, respondents spread their votes with a definitely different intensity: speed (96%), no need to enter PIN every time and convenience (43%), increased level of transaction security (2%). In 2018, 85% indicated speed, 20% for convenience and 4% for safety. The above answers concerned the indication of what the respondents considered the most attractive in contactless payments. It should be clearly stated that in all the years the respondents in the vast majority (over or about 80% in each study) answered the question about convenience and speed, that they notice this advantage. In the case of a question whether the fact of not providing the card directly to the seller increases the security level of the transaction, in 2018 80% and in 2016 60% answered "yes" - five years earlier, it claimed only a little over 40% of respondents.

In the group of remaining questions, the following answers were obtained. In the case of the question whether the respondent has a card with contactless functionality, in the case of

the first-responding study, nearly 40% respondents answered, while in the 2016 and 2018 tests, 90% respondents answered yes (including 3 respondents who indicated that they use mobile contactless payments). In case of a question - "would you be willing to block the proximity functionality of the card" in the case of two previous studies, "for" was about 1/3 of those surveyed, in the study from 2018 it was only 1/4 of the respondents. Finally, in the case of the question whether the respondent would give up cash in favour of the contactless card - the research in each of the three years yielded similar results – respondents' answers divided into two equal groups (although interestingly, the percentage of people wishing to give up their money dropped with each survey).

4.2 Found dependencies and their strength

In this part of the analysis, the results of verification of hypotheses about the dependence of individual features examined have been presented (for the survey from 2018). During the analysis, several significant relationships were detected, although it should be noted that the strength of the relationship was almost always weak (and at best moderate).

Weak relationship was found between the concern about the possibility of reading data from the card by the dishonest employee and the fact of the bank's question about whether the issued card should be issued with a contactless function ($p = 0.028$, $\text{Tau-b} = 0.236$). Also, a weak relationship was noticed between the knowledge of existing daily transaction limits without using a PIN code and the desire to block the proximity card functionality ($p = 0.032$, $\text{Tau-b} = 0.226$). In the survey - which should not be surprising - a moderate relationship was observed between the fact of noticing the convenience of using contactless payment and the speed of transactions ($p = 0.000$, $\text{Tau-b} = 0.378$). The study found that people who do not see the possibility of raising the level of security of card use by not giving it to the seller are willing to block proximity functionality ($p = 0.012$, $\text{Tau-b} = 0.265$). There is also a moderate relationship between the fear of not having to provide a PIN for each transaction and the fear of being able to scan the card by unauthorized persons ($p = 0.003$, $\text{Tau-b} = 0.318$). The lack of the necessity to enter the PIN co-occurs also with the desire to block proximity functionality ($p = 0.033$, $\text{Tau-b} = 0.226$). It was also noticed - which again seems intuitively right - that people who are afraid of being able to scan the card by unauthorized persons (and thus theft of funds) are not willing to give up cash ($p = 0.004$, $\text{Tau-b} = 0.304$). In the case of questions with the so-called it was stated that persons with technical education are less afraid of using contactless cards ($p = 0.013$, $\text{Tau-b} = 0.263$). There were no major differences between the answers given and the gender - except for one situation - women are more worried about the possibility of scanning the card by unauthorized persons ($p = 0.008$, $\text{Tau-b} = 0.278$).

5 Final conclusions

The conducted research has shown that during the 7 years of functioning of contactless payments in Poland, payments of this type have become - at least within the studied group - something obvious, with which they come in direct contact - and more importantly, which they regularly use. The knowledge about the concept of contactless payments is currently supported by a relatively high general knowledge of the technical aspect of payment (no PIN required for specific transactions, upper transaction limit without PIN authorization) - although this does not apply to all aspects (e.g. on the maximum distance of the card from the terminal during the transaction, or the number of possible operations without PIN authorization). Interestingly, gaps in information possessed correspond perfectly with security concerns (users are afraid of accidental card payment, unintended - or directly resulting from theft - multiple paying the maximum amount allowed even to the

uncontrolled formation of debit). It is worth emphasizing, however, that within 7 years the general knowledge in each of the aspects has improved quite decisively.

Turning to the opinions of the respondents related to the security of contactless payments, surprising results were obtained. Over the period of time included in the survey, respondents are still characterized by a relatively high level of doubt and concern. In the analyzed aspect, there was no significant evolution of views.

In the case of advantages, there was a clear increase in the perception of the positive sides of contactless payments - speed and convenience (especially the first one) became obvious. However, the question in the questionnaire (regarding the possibility of withdrawing cash for a new payment method) shows that the feelings on this issue are still relatively self-restrained.

Making the final conclusion, it seems that the surveyed group of contactless payments, quite well understood what contactless payments are and is able to successfully use this solution. However, there are still very serious security concerns and not just the act of making a contactless payment but also the storage of a payment instrument. It seems that the blame for this situation lies with the issuers of individual contactless cards who either considered the case as already explained or simply do not meet the expectations of clients (this can be confirmed by the previously mentioned issue that the respondents in half of cases stated that the bank did not give them a chance of blocking or a reasonable restriction on the possibility of making a contactless payment). Such - not exactly worrying - approach can be the basis for the development of mobile contactless payments.

References

1. www.visa.pl
2. Informacje NBP o kartach płatniczych IV kwartał 2017 r.
3. <http://newsroom.mastercard.com>
4. www.forbes.pl
5. Płatności zbliżeniowe w Polsce. Raport badawczy Polasik Research (2009- 2012)
6. J. Banaś, *Zeszyty Naukowe UE w Katowicach*, **186**, **1**,13-22 (2014)
7. J. Kunkowski, *Copernican Journal of Finance & Accounting*, **2**, **1**, 107-118 (2013)
8. J. Harasim, *Zeszyty Naukowe UE w Krakowie*, **2** (**938**), 17-30 (2015)
9. www.nbp.pl/
10. www.knf.gov.pl
11. Rekomendacja RdSP w zakresie bezpieczeństwa kart zbliżeniowych, 30 września 2013
12. Ł. Zakonnik, *Ekonomiczne problemy usług*, **702**, **87**, **I**, 594-606 (2012)
13. Ł. Zakonnik, *Pragmata Tes Oikonomias*, **VII**, 195-210 (2013)
14. Ł. Zakonnik, *Przedsiębiorczość i Zarządzanie*, **XVII**, **11**, **II**, 241-251 (2016)
15. <http://samcik.blox.pl>
16. www.naukowiec.org
17. <http://stat.gov.pl>
18. S. Ostasiewicz, Z. Rusnak, U. Siedlecki, *Statystyka. Elementy teorii i zadania* (Wydawnictwo AE, Wrocław, 1997)
19. W. Knight, *Journal of the American Statistical Association*, **61** (**314**), 436-439 (1966)
20. M. Sobczak, *Statystyka. Aspekty praktyczne i teoretyczne* (Wydawnictwo UMCS, Lublin, 2006)