Comparative Analysis of e-Banking Services in Poland in 2016

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Abstract. The objective of this article is to identify the best e-banking services in the most popular banks in Poland in 2016 from the point of view of an individual client. Electronic banking leads to strengthening the position of a particular bank in the competitive market environment. Thus, the high quality of its website frequently plays a major role regarding the perception of the bank. This paper focuses on the ways to secure and strengthen the position of a bank in the sector using its website to enhance its image, improve usability and communication with clients. Following a brief introduction describing the situation of electronic banking in Poland, the authors present the assumptions adopted for the conducted research. Subsequently, on the basis of the obtained findings, the authors have carried out multidimensional analyses and presented the resultant conclusions and recommendations. The authors original contribution was specifying the criteria used for websites evaluation and applying the conversion method constructed by them for conducting such analyses.

Keywords: e-Banking · e-Services · Evaluation of web sites

1 Introduction

The pace of the development of e-banking services in Poland may constitute a model for other sectors of the economy. Compared to the second quarter of 2015, the number of individual clients with potential access to accounts increased by nearly 13% in relation to the second quarter of 2016, reaching the value of 31.509 million users; out of which, the number of active individual clients increased by almost 8%, reaching the level of 15.200 million [13]. This is undoubtedly the fastest growing banking sector, and nothing points to the fact that the positive trend might be changed. Every year the population of new clients using the opportunities offered by the Internet to handle banking transactions is growing. Among all the clients having electronic access to account, there are over 48% of active users of e-banking.

The problems connected with the evaluation of websites, in particular, access to e-banking services are widely discussed in literature; however, there is no single solution which would prevent them. The literature review [1,3,6,10–12,15,16] shows that e-banking websites may be analysed from the point of view of:

– usability,
– functionality (search, navigation, the relevance of content),
– interactivity (availability and responsiveness),
– visualization (color scheme, background, graphics, text),
– reliability,
– effectiveness.

Most of the methods applied in the evaluation of e-banking websites are traditional scoring methods based on specific sets of criteria, assessed according to a standardized scale. Technical and functional criteria are usually among the factors which appear most frequently. Many of the considered factors may be evaluated in a very subjective way: text clarity, attractive color scheme, images and photos, the speed and intuitiveness of navigation), etc. What is more, some users do not treat the particular criteria sets in an equivalent way. On the other hand, there occur numerous problems with determining particular preferences and the evaluation of relations between them. This type of comparative analysis is carried out in three major cases which allow:

– specification and accurate examination of the area where particular software is applied,
– construction of the ranking of IT solutions existing in the market,
– identification of the qualities for creating recommendations for websites analysis and design.

The presented studies focus on the first and the second of the cases mentioned above. So the main problem being analyzed is the specification of the determinants influencing the evaluation of e-banking services by an individual client in Polish banks and showing which ones are the most important.

2   The Population Sample and the Research Method Analysis

In June 2016, the authors carried out studies into the quality of e-banking websites of the banks which are most popular among individual clients in Poland. The sample included 146 respondents. The research was the case of purposive sampling – the study was conducted by electronic questionnaires among the students of the last years of accounting, finance and Insurance specialization studies at Faculty of Management University of Warsaw, in the age of 19–45, in randomly selected student groups. Among the survey participants, there were 74% of women and 26% of men, mainly from Warsaw and surrounding areas. Each respondent declared having at least one electronic access to an account, in at

least one of the banks operating in the territory of Poland (21 participants to two accounts, and 6 to three). It means that even then when 135 people filled the questionnaire correctly, thus, the present study examined the data concerning 168 active accounts with access to e-banking services.

The biggest number of internet access accounts were indicated in the case of mBank clients (24.39%), next position was taken by Inteligo PKO BP S.A. (18.29%) and ING Bank Slaski (14.63%). The smallest number of users in the examined sample declared having accounts in: Bank Pocztowy (2.44%), Credit Agricole (2.44%) and BPH (3.66%). Out of the first ten bank most popular amongst respondent were eg. Deutsche Bank or Toyota Bank.

The calculations presented in this paper were carried out with the application of the authors' own set of criteria, established based on the literature and consultations with experts, used by the authors since 2009, applied to evaluate the electronic access to the services of selected banks. The criteria applied in the study may be divided into two basic groups:

– economical – annual nominal fee, a fee for maintaining an account PLN/month, a surcharge for access to electronic channels, a fee for a transfer to a parent bank, a fee for a transfer to another bank, interest rate on deposits – a deposit of PLN 10,000, a fee for issuing a card and a monthly fee for a card – PLN/month,
– technical – functional – due to considerable similarity of basic services the authors only selected non-standard additional services such as: insurance, investment funds, cross-border transfer or foreign currency account; technological – the number of surcharge-free ATMs, quantites of account access channels; and security.

At the time of the economic crisis, the criteria used to evaluate the websites offering access to e-banking services as presented above, were supplied with the set of psychological criteria, including the so-called anti-crisis measures which comprised all – as regarded by the consultants cooperating with the authors – manifestations of activity undertaken to counteract the potential effects of the crisis in e-banking sector [8]. The set of these factors has been presented for consideration of interviewees during the most recent evaluation of e-banking websites. The proposed set of anti-crisis measures included:

– the dynamics of interest rates on deposits,
– the dynamics of interest rates on credits,
– stability of the bank policies concerning basic charges,
– the level of clients' trust,
– the average of positions occupied in internet rankings.

The presented study is the latest in the series of cyclical rankings whose basic aim is to evaluate the factors impacting the usability of the websites offering access to individual accounts in banks. The same sets of evaluation criteria were applied in the analyses of the condition and the changes in electronic banking in 2013, 2014 and 2015. They were originally established during an internet discussion,

initiated by the authors, involving the researchers from reputable universities carrying out research into the issue of electronic banking in Poland. In order to evaluate particular criteria in the banks selected by students, the authors used a simplified, standardized Likert scale [9]. The study was carried out with the application of a simple scoring method. In the simple scoring method the authors measured the distance from the maximum score to be obtained. This concerns the value of criterion measure and in the sense of the distance it is the same when we measure the distance from the first criterion to the second one, and the other way round. However, we do not define the relations between particular criteria. Scoring methods are regarded as subjective, though its subjectivity appears to be reduced with increasing the number of respondents in the research sample. AHP method (T. Saaty), Promethee II, Electre I and III, and other similar methods are believed to be more objective. The experience of the authors [4,6,17], primarily related to the application of AHP method in the websites' evaluation shows, however, that from the point of view of the respondents completing the survey questionnaires proves very difficult. As a result, it frequently leads to illconsidered and accidental judgments, and the score is often affected by the order in which particular criteria appear. To eliminate the above-described problems, the authors have developed their own author's evaluation method – a conversion method which combines simplicity and unambiguity of the scoring method with the precision of relational methods (full description see [5]). This method consists in determining the relation of each criterion to other criteria, based on averaged distances from the maximum potential value established on the basis of previous scoring evaluation. Data received from scoring evaluation is the starting point for a conversion method. Then, we adopt the following assumptions: after constructing the experts' table of evaluations of particular criteria for each website, we need to perform the conversion with the established preference vector of the superior level criteria. Next, the authors perform the transformation of the combined scoring table into the preference vector (first converter).

The next steps are:

– constructing a matrix of distances from the maximum value for each criterion in every website, establishing the maximum value:

$$P_{i,max} = Max\{f_i(a_j), ..., f_n(a_m)\}$$

for

$$i = 1, ..., n$$

and

$$j = 1, ..., m;$$

– establishing the matrix of the distances from the maximum value

$$\delta(f_j(aj) = P_{i,max} - f_i(a_j)$$

for

$$i = 1, ..., n$$

and
$$j = 1, ..., m;$$

– calculating the average distance from the maximum value for each criterion,

$$\overline{F_{i,j}} = \frac{\sum_{jm1}^{m} \delta(f_i(a_j))}{m}$$

– as a result of the above operation, constructing a matrix of differences in the distance from the maximum value and the average distance according to criteria,
– for each bank website: constructing conversion matrices - modules of relative distances of particular criteria to remaining criteria (the distance from the same criterion is 0), the obtained distances below the diagonal are the converse of the values over the diagonal,
– averaging criteria conversion matrices - creating one matrix of average modules of values for all criteria:

$$\overline{A_{i,j}} = \frac{\sum_{i=1,j=1}^{n,m} (\alpha_{i,j} - \alpha_{i+2,j})}{n}$$

– transforming the conversion matrix of criteria into a superior preference matrix (calculating squared matrix, adding up rows, standardization of the obtained preference vector; repeated squaring, adding up rows, standardization of preference vector - repeating this iteration until there are minimum differences in subsequent preference vectors).

As a result of the above operations we establish a criteria conversion matrix Ta_{mx1}. Subsequently, the authors performed a transformation of the scores presented by experts on the level of a matrix specifying expert websites' evaluations for particular criteria (second converter). The results have been obtained in an analogical way:

– constructing a matrix of distances from the maximum value for each criterion and each website:
  • establishing the maximum value

$$P_{i,max} = Max\{f_i(a_j), ..., f_n(a_m)\}$$

  for
$$i = 1, ..., n$$

  and
$$j = 1, ..., m;$$

  • establishing the matrix of distances from the maximum value

$$\delta(f_i(a_j)) = P_{i,max} - f_i(a_j)$$

  for
$$i = 1, ..., n$$

and
$$j = 1, ..., m;$$

- calculating the average distance from the maximum value for each website,

$$\overline{F_i} = \frac{\sum_{j=1}^{m} \delta(f_i(a_j))}{m}$$

  – constructing a matrix of the differences of deviations from the maximum value and the average distance of the features from the maximum,
  – for each criterion: constructing a matrix of transformations (conversions) of the differences of the average distance from the maximum value between the websites, analogically as presented above values below the diagonal are the converse of the values over the diagonal,
  – constructing a module matrix of transformations of the differences of average distance from the maximum value between the websites, for each criterion,

$$\overline{A_{i,j}} = \frac{\sum_{i=1,j=1}^{n,m} (\alpha_{i,j} - \alpha_{i+2,j})}{n}$$

  – for each module matrix of transformation of the differences of the average distance from the maximum value between the websites, squaring it, adding up rows, standardization of the obtained ranking vector and repeating this operation until the obtained differences between two ranking vectors for each criterion will be minimal,

As a result of the above presented operations we obtain a conversion matrix of websites' evaluations: Tf_{mx1}

  – using the obtained vectors to construct a combined ranking matrix - returning to the matrix where in
  – its side-heading there are criteria, in the heading names of bank websites by appropriate transfer of the obtained preference vectors for each criterion,
  – multiplying the matrix obtained in such a way by the previously calculated preference vector,

$$T' = Tf \otimes Ta$$

  – analysing final results and drawing conclusions (Note: the lowest distances in this case are the most favourable, comparability adjustments to other methods can be obtained by subtracting these values from 1 and their repeated standardization).

The basis for the creation of the presented method was the assumption that it should be easy to apply. The objective has been reached, which is visible in the number of the advantages presented below. The only disadvantage of the method is the fact that the transformation of the results of the survey is connected with carrying out many complex operations. The advantages of this method are:

– the ease of application (similar to the implementation of the scoring method) which results from the fact that in the survey, analogically to the scoring method, there are questions concerning the subjective evaluation of the element,

– in the case of considering a large number of evaluation criteria, or alternatives there is no significant increase in the number of questions contained in the survey, necessary to consider (as in the AHP method),

– the possibility of the application of the method in the studies conducted with the participation of respondents who are not experts in the field,

– there are no measures, as in the case of ELECTRE method - veto threshold, which may be not fully understandable for the respondents [2],

– the result of the calculations is relatively easy to interpret since it takes the form of the rank of the evaluations of the examined objects.

The above mentioned induced the authors to apply it to verify the subjectivity of the evaluations carried out by means of a scoring method.

3   Analysis of the Findings and Discussion

To evaluate economical, technical and anti-crisis criteria, the authors used a preliminary table presenting bank offers related to e-banking services used by the respondents and fees connected with using bank accounts operated via the Internet, created on the basis of data obtained from websites of particular banks. On the basis of the completed questionnaires, the authors created an averaged combined table of the criteria generated by the users. The best in the present classification are: Credit Agricole (79.86%) and T-Mobile Uslugi Bankowe (79.44%). Immediately behind are: Bank Pocztowy and ING Bank Slaski. Interestingly, the second position is taken by a mobile bank which has been established as a result of cooperation between the most innovative Alior Bank (taking the 11th position in our ranking) and the largest mobile operator T-Mobile, basing upon the experience of Alior Sync. Remarkably low position – sixth place – was taken by mBank, which so far was a leader in the ranking and was hugely popular in the analyzed group of respondents (interestingly, the low scores were assigned for: functionality, clarity and user-friendliness and anti-crisis measures – 0.68. In the rankings carried out until May 2010 the bank maintained its first position. The second conclusion, which seems to be characteristic of this study – the overall scores for the quality of websites tend to increase. The worst in the ranking were: Bank BPH and Getin Bank. The first four banks in the classification were placed above the average amounting to 75.50%. The results of the ranking are presented in Fig. 1.

In the case of most banks examined in the study, there are no additional charges for issuing a debit card, and transfers to a parent bank are usually free of charge. The level of security may be seen as sufficient for the clients. Basically, this has not changed since 2008. The summary table shows that the fee for issuing a card (usually, no charge), reached the level which at present is satisfactory for the client in 100% (96%). The satisfaction related to the fee for a transfer to
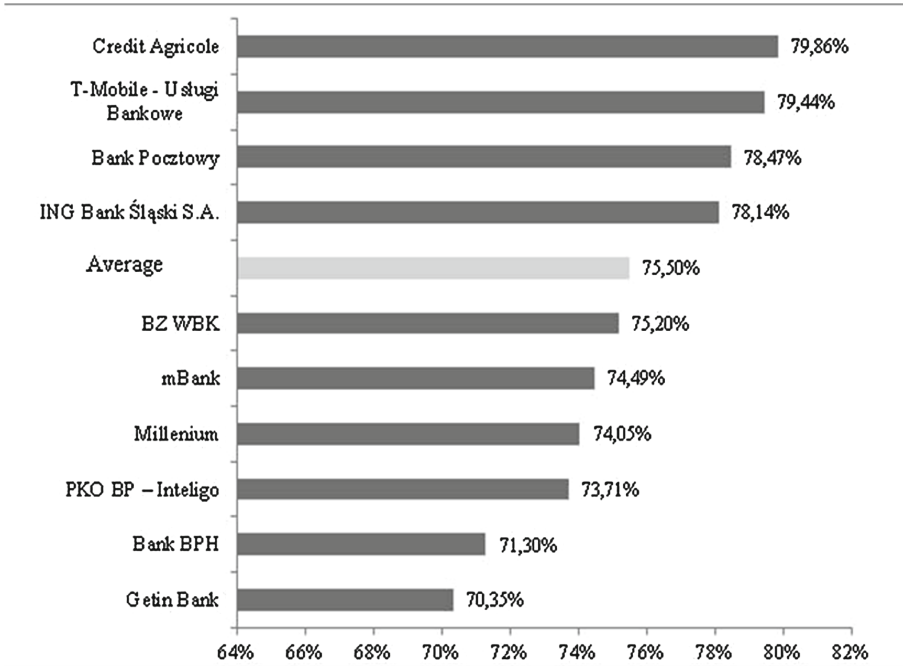
Fig. 1. Ranking of the quality of e-banking websites of selected banks in Poland in 2016 according to the scoring method

a parent bank is usually also very high (over 96%). Undoubtedly, the worst indicator in the ranking is annual nominal interest rate (in most cases assessed by the users as too low – 34.20% of the maximum score). In fact, we may see that the savings accounts which tend to appear are a specific response to the decrease in annual nominal interest of accounts. Over 91% of the maximum scores were obtained by the fee to another bank. Following the recent implementation of the government regulations, most of the economical indicators were placed below the users' average assessment of 75.5% (Fig. 2).

Among the factors which were not listed within the criteria, the clients pointed to the lack of possibility to make a cross-border transfer (e.g. SWIFT in Inteligo) or no possibility of fully automatic obtaining a credit. In 2008 there were no anti-crisis measures among the criteria – if we compare the study with the research carried out in 2014, we need to admit that during the crisis e-banking clients did not notice any signs of the crisis and they were not able to define the anti-crisis measures undertaken by the banks, and at present they sometimes suggest the relevant criteria to be applied for their evaluation. The first three banks in the ranking this year are new players in the e-banking market, which in the last three years ranked below the top ten positions in the rankings. The present-day leaders owe their present position to banking applications running on smartphones and tablets. However, generally, in recent years the highest scores
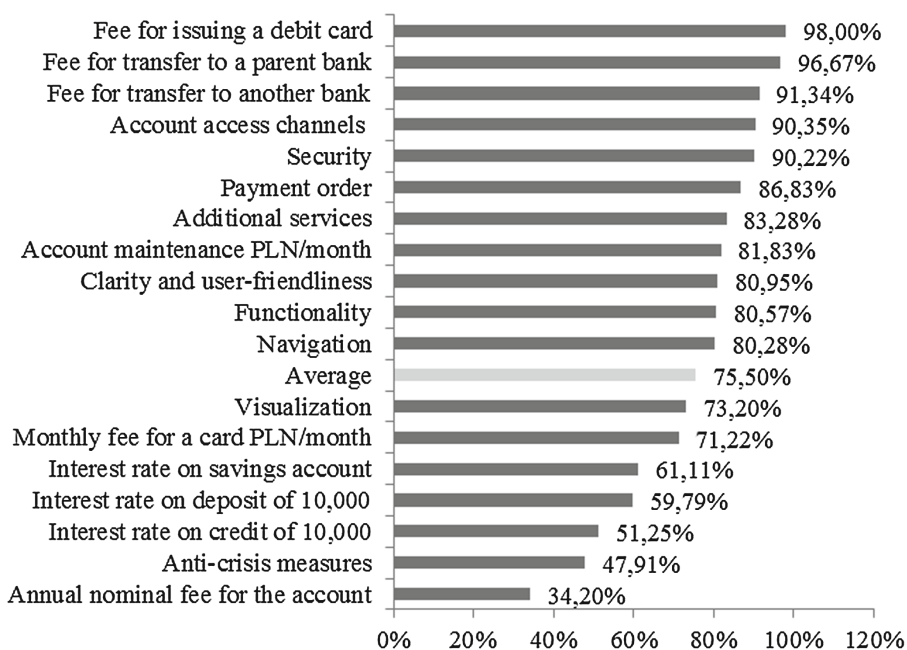
Fig. 2. Ranking of the criteria used for the evaluation of electronic access to individual accounts in selected banks in Poland in 2016 according to the scoring method

were awarded to established banks with a strong position in traditional internet banking, such as ING Bank Śląski S.A., Bank BPH or BZ WBK. Among the top ten positions, Millenium and Getin Bank held their positions, as well as the banks which were pioneers with regard to electronic banking services in Poland and have a large group of loyal customers, especially middle-aged clients.

In the present study, the applied conversion method produced interesting results. Due to a large degree of discrepancy with reference to the users' opinions on the e-banking services in the same banks, not only it averaged and reduced the differences, but also, taking into account the relationship between the maximum and average values obtained as a result of calculations, it caused a significant change in the scores. Previously, a similar effect was achieved using the Saaty's AHP method. "Flattening" the extreme opinions allowed the authors to obtain results closer to the opinions of the most active clients than in the case of the scoring method. In the case of the classification carried out with the application of the conversion method, the top positions were taken by the banks which pursue the most stable policy from the perspective of the clients. Thus, these were not the services which relatively recently emerged in the market, since the users' opinions concerning their activity are still largely unstable (a wide spread of responses). Here, the results were markedly lower for the banks which in the scoring evaluation ranked higher.
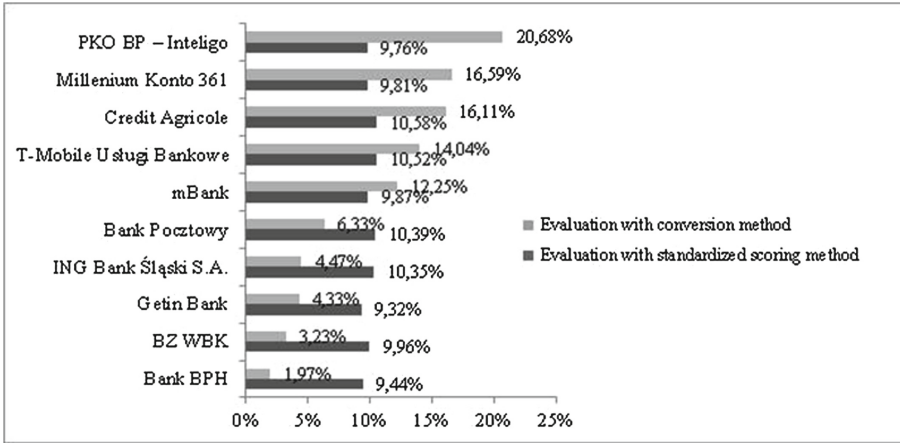
Fig. 3. Comparison of the evaluations carried out with the scoring method and the conversion method for ten most popular banks in Poland in 2016

It appears to be the result, on the one hand, of the increased awareness of the clients; on the other, this was due to the fact that in the case of "their" e-banking websites the changes (not always seen as improvements) were too rarely introduced. Also, the results of the ranking have changed, sometimes to a considerable degree. PKO Inteligo was a leader in the ranking, moving from the previous eighth position; the second place was taken by Bank Millenium (from the seventh position), and the subsequent positions were taken by the banks which took leading positions in the "scoring" ranking: Credit Agricole, T-Mobile Uslugi Bankowe and Bank Pocztowy. BZ WBK fell by four positions. Bank BPH, similarly to previous rankings, took the last position (Fig. 3).

The position of mBank appears to be the most stable one – the difference between the scores slightly exceeds two percentage points. In the evaluation carried out with the conversion method, the discrepancy between the scores amounted to nearly 19%, in the standardized scoring method it was about 20 times lower (the difference of 9.5 of the percentage point was indicated in the case of the share in the maximum scores of particular criteria).

4   Conclusions

The presented analysis has indicated the great diversification of the opinions of individual clients on the issue of the application of e-banking systems, particularly the views concerning the selection and use of websites to deal with everyday e-banking transactions and operations. Despite the 80% of available e-banking services and above 40% of clients who are actively using their accounts, it is estimated that further development of this sector in Poland has considerable potential.

If we relate the present findings to the results of previous studies [4], we may note that the analysis indicates the changes taking place in recent years was regards the clients' awareness and activity. An individual client of e-banking services changes from the user of its simplest functions into an experienced user who can point to advantages and disadvantages of this modern form of communication. Also, the consumers are able to recognize the benefits obtained from using an electronic access account and show where they can obtain the greatest benefits. The results are the choices made by the clients reflected in the presented study and commented on in the survey. To recapitulate – they lead to the following conclusions:

– the most significant phenomenon occurring in the electronic banking market is mobile access to banking services. It takes two forms: access via banking websites and by means of banking applications on the devices such as smartphones and tablets. Banks which offer access to Windows websites via mobile devices start to move to leading positions in all the rankings. Surprisingly, T-Mobile Uslugi Bankowe (founded on the basis of Sync Bank) receive much better scores than the multi-channel partnership, Alior Bank,

– in 2016 most banks operating in Poland experienced a wave of increases caused by rapidly falling interest rates and the externally imposed statutory reduced interchange fees levied on trade. In 2017 we may expect next increases resulting from both low interest rates and bank tax (0.44% of assets) and higher contributions to the Bank Guarantee Fund (Bankowy Fundusz Gwarancyjny) (expenditure allocated to bailing out bankrupt credit and savings unions (SKOK)). Unfortunately, the specific inactivity of clients, result in low mobility in relation to changes introduced by particular banks,

– further increases which are to be expected in 2017 may cause major changes in the rankings due to their almost universal character. In 2016 there occurred an increase in the account maintenance fee, cards and cash withdrawals from ATMs, e.g. ING, Pekao. At present, many banks plan to introduce changes in their pricing policies: Bank Handlowy (account maintenance, using a debit card, payment order and ATM withdrawals), Citi Bank (using cards, selected charges for transfers, withdrawals from ATM of another bank, an increase of fee in the case of not using accounts, ING Bank – changes in the terms concerning deposits, withdrawals, transfers in the bank branch, etc. The unclear and complicated way of introducing the changes once again may delay the transformations in the consumer market, but perhaps the actual shifts may finally take place,

– since few customers dynamically react to changes of basic evaluation criteria for banking services. Their reasons for the lack of mobility are as follows: a confusing and complicated structure of banking services; changes implemented without informing clients (banks tend to believe that it is sufficient to post information on a website etc.); eventually, habit and resistance to changes which require time and patience to arrange for and handle the changes),

– Bank Credit Agricole is popular due to intuitive communication both with regard to traditional contacts – using a browser and mobile access with a smartphone or a tablet, as well as, at the time of the survey, reasonable and competitive terms of using the account and other e-banking tools (cards),

- T-Mobile Uslugi Bankowe is a leader in the market not only due to the mobile access to services, but also other attractive terms e.g. the fact that it pays interest on the funds regularly deposited in a personal account, and offers withdrawals from all ATMS in Poland and abroad without additional charges,
- vast majority of active bank customers regard economical factors as the most important criteria for the evaluation of electronic access to banking services – usually the prices of the most frequently used services. The prices, however, tend to be more and more similar, even the banks with the highest scores in the ranking, as a result of amended governmental regulations and the behavior of competitors establish e.g. "punitive" card charges for the clients who do not use it to a "sufficient" degree,
- more and more people, however, admit that when selecting a website they tend to focus more on the user-friendliness of the website, its visual attractiveness or unlimited access to the account in any place and at any time (e.g. using m-banking application). As far as basic account operations are concerned, they even speak of the substitutability of these criteria,
- some customers pay attention to the redundancy of banking services offered by websites in relation to the most essential needs, lack of tailor-made offers, intrusive advertising which appears to be most profitable for the bank, not for the clients, and on the other hand, limiting such redundancy not only in mobile applications, but also mobile device access to Windows systems of these banks,
- the number of non-active users is worryingly high in relation to those who may potentially use e-banking services. Until a few years ago, these estimates did not exceed 20%, which indicates a deliberate action of banks towards "pushing" products rather than meeting their customers' needs. Such a phenomenon could be observed previously in the case of using payment cards and – with time this percentage started to decrease, which has not occurred in relation to internet or mobile access to electronic account.

The diversity and dynamics of the evaluations is important for practice - confirm the thesis concerning the necessity to regularly examine this sphere in the matter of the clients' use of e-banking services and the tendencies concerning designing websites which are characterized by high usability from the clients' point of view. It also points to the need for further studies aimed at constructing a multi-dimensional, multi-criteria, hierarchical and multi-faceted system of the evaluation of websites, with the consideration of additional, more specific criteria such as e.g. customer profile [7], which, so far, has not been considered to a sufficient degree. And of course making the survey on a larger sample of bank customers, because we are aware that the selected, specific sample is one of the weaknesses of this study.

One may observe that mobile account access is becoming a more and more important channel, and it takes the place previously taken by traditional access to an account with personal and desktop computers. Undoubtedly, this development irrevocably changes clients' expectations, perceptions and habits related to using banking services, and also simultaneously – it urges the banks to introduce quick changes of the medium which would take into account users' requirements.

References

1. Bauer, H.H., Hammerschmidt, M., Falk, T.: Measuring the quality of e-banking portals. International Journal of Bank Marketing **23**(2), 153–175 (2005)
2. Buchanan, J., Sheppard, P., Lamsade, D.V.: Project ranking using ELECTRE III. http://130.217.168.130/departments/staff/jtb/Electwp.pdf. Accessed Jan 2015
3. Chiou, W.C., Lin, C.C., Perng, C.: A strategic framework for website evaluation based on a review of the literature from 1995–2006. Information & Management **47**(5–6), 282–290 (2010)
4. Chmielarz, W., Zborowski, M.: Comparative analysis of electronic banking websites in Poland in 2014 and 2015. In: Ziemba, E. (ed.) Information Technology for Management. LNBIP, vol. 243, pp. 147–161. Springer, Cham (2016). doi:10.1007/978-3-319-30528-8_9
5. Chmielarz, W., Zborowski, M.: Conversion method in comparative analysis of e-banking services in Poland. In: Kobyliński, A., Sobczak, A. (eds.) BIR 2013. LNBIP, vol. 158, pp. 227–240. Springer, Heidelberg (2013). doi:10.1007/978-3-642-40823-6_18
6. Chmielarz, W., Szumski, O., Zborowski, M.: Kompleksowe metody ewaluacji jakości serwisów internetowych. Wydawnictwo Naukowe WZ UW, Warsaw (2011)
7. Chmielarz, W.: Methodological aspects of the evaluation of individual E-Usługi Bankowe for selected banks in Poland. In: Pańkowska, M. (ed.) Infonomics for Distributed Business and Decision-Making Environments. Creating Information System Ecology. IGI Global, Business Science Reference, Hershey-New York (2010)
8. Cyfrowa Polska: Szansa na technologiczny skok do globalnej pierwszej ligi gospodarczej, McKinsey, Forbes Polska (2016). www.mc.kinsey.pl, www.forbes.pl
9. Likert, R.: A technique for the measurement of attitudes. Arch. Psychol. **140**, 1–55 (1932)
10. Mateos, M.B., Mera, A.C., Gonzales, F.J., Lopez, O.R.: A new Web assessment index: Spanish universities analysis. Internet Res. Electron. Appl. Policy **11**(3), 226–234 (2001)
11. Migdadi, Y.K.: Quantitative evaluation of the internet banking service encounter's quality: comparative study between Jordan and the UK Retail Banks. J. Internet Banking Commer. **2**(13), 1 (2008)
12. Miranda, F.J., Cortes, R., Barriuso, C.: Quantitative evaluation of e-banking web sites: an empirical study of Spanish Banks. Electron. J. Inf. Syst. Eval. **2**(9) (2004). http://www.eiise.com
13. NETB@nk Raport Bankowość internetowa i płatności bezgotówkowe. Podsumowanie II kwartału 2016 r., Związek Banków Polskich (The Polish Bank Association) (2016). http://www.zbp.pl/Netbank_Q2_20160927.pdf. Accessed 15 Dec 2016
14. Webb, H.W., Webb, L.A.: SiteQual: an integrated measure of web site quality. J. Enterp. Inf. Manage. **17**(6), 430–444 (2004)
15. Wielki, J.: Modele wpływu przestrzeni elektronicznej na organizacje gospodarcze. Wydawnictwo UE we Wrocławiu, Wrocław (2012)
16. Yang, Z., Cai, S., Zhou, Z., Zhou, N.: Development and validation of an instrument to measure user perceived service quality of information presenting Web Portals. Inf. Manage. **42**(4), 575–589 (2005)
17. Zborowski, M.: Modelowanie witryn internetowych uczelni wyższych o profilu ekonomicznym, Faculty of Management, University of Warsaw, doctoral dissertation (2013)