IDEA GROUP PUBLISHING

701 E. Chocolate Avenue, Suite 200, Hershey PA 17033, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com

ITP5156

This paper appears in *Managing Modern Organizations Through Information Technology*, Proceedings of the 2005 Information Resources Management Association International Conference, edited by Mehdi Khosrow-Pour. 

# Electronic Banking as a Direction for Development of Banking: What Makes the Application of Information Technology (IT) Effective in Development of Electronic Banking?

Jerzy A. Kisielnicki and Sylwia Filipek

Warsaw University, Business School, 02-678 Warsaw, ul. Szturmowa 3, jkis@wspiz.edu.pl, kis@mail.wz.uw.wedu.pl

## ABSTRACT

This paper answers the following question: Why do the investments in electronic banking not bring the expected returns? This research proves that there are two factors that limit the wide acceptance of electronic banking services: the clients do not trust the IT in electronic banking and are used to traditional forms of banking services. The researchers used the Data Envelopment Analysis (DEA) method to carry out the analysis of banks' resource utilization. The DEA was further enhanced with surveys sent to clients of selected banks. The research concluded that electronic banking is an attractive development strategy. The benefits however, are not always proportional to the costs. To be competitive, and thus to maintain and increase their business value, banks not only need to develop their electronic services but also improve their overall image of a trustworthy financial institution.

## INTRODUCTION

By electronic banking we understand a type of service that, due to the use of IT, does not require personal contact between a client and a bank employee. In subject literature, electronic banking has multiple definitions; most of the authors, however, agree that electronic banking defines banking transactions carried out via Internet or dedicated lines. (Turban, 2002).

Based on statistical analyses, the percentage of clients using electronic banking is lower than those who have access to this type of service and could use it. According to Young (2001), in the United States in 2001, 45% of households had a computer, 25% were using the Internet, but only 5% used electronic banking. The Tower Group published similar statistics (Murphy, 2002); according to their results, only 18% of American clients use electronic banking and 85% still visit a branch once a month. In the countries that have a lower level of IT infrastructure, the percentage of clients using electronic banking is lower than 3%. We could then ask the following question: Why there is such a disproportion between the clients who have the means to use electronic banking and those who actually do? What factors make electronic banking effective? This paper presents the analysis of these two problems. The research covers a wide area of Business-to-Client (B2C) relationships, business value, and - applied to banking - the expectation theory.

## HYPOTHESIS

In the famous novel *The Godfather*, Carlo Puzo describes a Family meeting where the main character criticizes one of the gangsters for not bringing expected profits from investments in Las Vegas hotels. I participated (as an expert) in the executive meeting of a big retail bank where we discussed similar problems. For example, why do the investments in electronic banking do not bring the expected returns? What factors govern the effectiveness of electronic banking?

Theoretically, we deal with several factors related to the performing organization, a bank, and the environment in which it operates. These factors are related to the overall economy, technology, organization, sociology, and psychology. We focused on the factors that that have the most significant influence on electronic banking and put forward the following hypothesis:

Investments in electronic banking do not bring the expected results for two (related) reasons:

1. Clients do not trust this new type of service (security of Internet transactions being the key reason).
2. Clients are used to the traditional form of banking services.

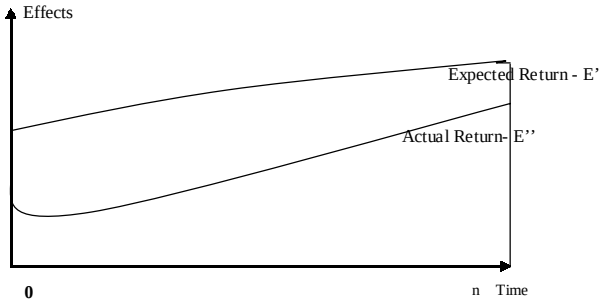
We could also add an additional hypothesis that since electronic banking technology is already quite sophisticated, specific hardware and software solutions do not make a significant difference when it comes to results (Carry, 2004). If selected hardware and software do not influence the usage of electronic banking, then what does? Based on the literature (Arnold (2002), Mazur (2002), Kisielnicki (2002), Turban (2003)), and our research, we can say that client education, a user-friendly front-end of electronic banking applications, and security of on-line transactions would improve the usage of electronic banking.

If banks want to have the benefits from their investments in electronic banking, they need to change their clients' perception of electronic banking and gain their trust. They also need to remember that in the electronic banking business, the competition is a *mouse-click away.* In the end, it is the client that decides whether the investment in electronic banking is effective or not.

Clients who deposit their financial assets make a two-stage decision. Stage one is selection of a bank, and stage two is selection of service. Both of these decisions are driven by expected benefits within a given period. Selection of the bank is driven by trust to a particular financial institution as well the terms and condition of banking services and product use. Also of importance is the bank's past performance and its reputation. Large and well-established banks have a significant advantage over newer and smaller banks.

There is a lot of research dedicated to the effectiveness of electronic banking. Since it is impossible to relate to all of them within the scope this paper, we have selected the key ones. Sutherland and Tan (2004)

*Figure 1. Dependency Between the Expected and Actual Returns Over Time*




have provided a comprehensive review and analysis of the effectiveness of electronic banking and proved that clients' trust is a critical success factor in this endeavor. Reichheld & Schefter(2000) and Reichheld (2000) went one step further – they showed that gaining clients' trust in electronic banking is more difficult than in traditional banking services.

## EXPECTED RETURN AND ACTUAL RETURN: A MODEL AND RESEARCH METHOD

The diagram below presents the expected returns versus actual returns within a given period. The upper curve represents the expected returns while the bottom curve represents the actual returns.

In this diagram, the bottom curve shows that at the beginning, the growth of electronic banking is quite substantial and then it slows down. It represents the quick jump into the new form of banking by those of the clients who are innovators or early adopters, and then plateaus when the more cautious clients join in.

The financial returns are calculated as the area under the curve (an integral) in a period from t=0 to t=n. Investors who finance an electronic bank expect certain returns. The actual returns, however, are lower than the expected ones. As Figure 1 shows, at the beginning the gap between expected returns (E') and actual returns (E") is significant but it closes with time. The factors that help to close the gap are clients' education and improved security of the electronic transactions. The key factor that prevents it, according to our hypothesis, is the lack of trust in electronic banking.

Our research was conducted in three stages:

1. The first stage focused on the analysis of the investors' expectations. Are their expected returns too high compared to their investments? To answer this question, we selected banks that invested 70% to 80% of their budget in electronic banking. We then selected the appropriate analytical method for the economical calculation.
2. The second stage of our research included the survey of a selected bank's clients. The survey focused on why clients do not use Internet services.
3. The third stage of our research used the simulation method to answer the following question: how the financial indexes would change if clients switch from traditional banking into electronic banking.

## EMPIRICAL ANALYSIS: EXPECTED AND ACTUAL RETURNS

All banks selected for our analysis have implemented sophisticated technical solutions and have excellent reputations. All banks (except for one, the Mail Bank that operates locally in Poland) have an international presence. The analysis, however, is limited to the performance of their branches in Poland, a recent member of European Union. The complete list of banks selected for our analysis is in Table 1.

As noted earlier, the current strategy of these banks includes significant investments into electronic banking geared towards individual clients.

There are many methods to evaluate banks' ROI. The difficulties lie in the fact that there is little data available for the public at large; banks are generally reluctant to release data related to their internal investments and returns. Therefore calculations included in this paper are based on three types of data:

1. Official statistics that publicly traded banks have to publish.
2. Derived data published by various consulting firms.
3. Derived data based on our research.

The methods used to analyze data belong to three categories:

1. Standard financial analysis.
2. Econometric analysis: it encompasses statistical methods to study economic data and problems based on functions of production and costs.
3. Mathematical programming analysis (also called non-parametrical methods, as opposed to econometric methods which are parametrical).

Having analyzed the above groups of methods, we decided to use the non-parametrical method called DEA. This method allows us find out the maximal expected value and compare to actual return and thus provide a basis for assessing a business value or an organization. This method was introduced by Charnes, Cooper and Rhodes (1978) and further enhanced by Shao and Lin (2002). The DEA method has been described in detail in literature by Charnes *et. al.* (1995), as well as by Berger and Humphery (1997). The bibliography of the application of this method was presented by Seiford (1992). The key reason for using this method is that it illustrates the effectiveness of a bank's functioning based on investments and results without the functional dependency between them. The additional benefit of this approach is that it minimizes the influence of unexpected events. The calculations of effectiveness do not require the calculations of individual weights of investments and returns; they are only estimated when necessary. According to Anderson (2004) and Schefczyk (1996), the DEA method has the following pros and cons:

Pros:

1. It does not depend on the presumption of researchers since it does not require the use of subjective weights.
2. It allows for the evaluation of multiple factors.
3. It allows for the use of multiple units of measure.
4. It allows to estimate the savings and to estimate the results based on a given investments.

Cons:

1. It is data sensitive.
2. It evaluates only relative measures of effectiveness.
3. The calculations are labour-intensive.
4. The number of factors cannot be too high.

The results presented in Table 1 below were done using the application built by Scheel (2000) and published on the website of the University of Dortmund.

The effectiveness indicator is within [0,1] range, where one means that all investments transformed into results (and thus generated the higher business value), and zero means that the investments brought no results at all. The investment indicator can be also expressed in percentages. Based on the calculations presented in Table 1, it seems that none of the banks managed to get full utilization of their investments. Further research indicated that banks with a balanced development strategy (i.e., where investments are equally divided between all forms of services) had the highest effectiveness indicator at approximately 0.9. Interestingly, the Mail Bank has the lowest ranking. Additional financial analysis combined with the experts evaluation indicated that the Mail Bank is mismanaged and the past investment decisions did not meet market needs. In general, we could confirm that banks' executives were right

*Table 1. The Value of Effectiveness Indicators Calculated Using the DEA Method for Selected Banks that Include the Development of Internet in their Strategy*

| Name of the bank | Effectiveness indicators in years: | | |
|---|---|---|---|
| | 2001 | 2002 | 2003 |
| Invest – Bank | 0.6523 | 0.6054 | 0.6993 |
| WestLB | 0.8308 | 0.8772 | 0.8267 |
| BISE | 0.7994 | 0.9732 | 0.7229 |
| Mail Bank | 0.5330 | 0.4883 | 0.6694 |
| BNP Paribas Bank | 0.8517 | 0.7278 | 0.8724 |
| American Bank | 0.8979 | 0.7901 | 0.7852 |
| Deustsche Bank PBC | 0.7962 | 0.6842 | 0.7437 |

*Source: Own research*

when they said that their investments were not optimal. It is difficult, however, to say whether their expected returns are realistic.

## EMPIRICAL ANALYSIS: WHY EXPECTED RETURNS AND ACTUAL RETURNS DIFFER?

To answer this question, and thus to verify the second part of our hypothesis, we selected the Deustsche Bank data. The reasons for selecting this bank were as follows:

1. Deustsche Bank is a retail bank where 92% of clients are individuals. They provide 80% of overall banks' deposits.
2. The development of Internet services is part of their current strategy.
3. The bank has started the promotional campaign to sell the Internet banking services to its client base.
4. The executives from Deustsche Bank were deeply concerned with the fact that their effectiveness indicator is low and wanted to know why

For this phase of the research, we created a survey. It consisted of three sections: clients' personal data (age, education, etc.), questions related to the services that the bank provides (including the electronic banking services), and open-ended questions related to the clients' evaluation of banking products, services, and security. The survey was carried out by banking employees during three weeks in December 2003 and involved 385 clients.

For hypothesis verification, we used the $Ç^2$ test with a confidence level of p=0.05.

The survey brought very interesting results. For example, 80% of the Deustsche Bank clients use a bankcard but only 40% of those clients use electronic banking. Those who do not use Internet banking state that:

1. They do not need the Internet banking service (66%).
2. They do not like Internet services (24%).
3. They do not trust Internet transactions (14%).

Further analysis indicated that the use of electronic banking depends on:

1. Clients' age: 60% of clients younger than 35 use electronic banking, as compared to 10% of clients older than 51.
2. Education: 55% of clients with a post-secondary education use electronic banking, as compared to 10% of clients with an elementary school education.
3. Profession: 67% of white-collar workers use electronic banking, as compared to 20% of blue-collar workers.

Clients' gender does not influence the use of electronic banking.

Detailed quantitative analysis further indicated that using a scale of 1 to 5 (where five is the best and one is the worst):

1. Banking services delivered through the branch are considered the most useful and safe: they were ranked 4, compared to the electronic services that were ranked 1.
2. Internet banking services ease-of-use was ranked 4 by the clients younger than 35 and 1 by the clients older than 51.

It seems that the most important element of the electronic banking strategy is to convince the 51 and over clients to use this form of services. This group is critical for two reasons: it has 50% of the overall financial assets, and it is 30% of the overall population. As stated earlier, only 10% of clients from this demographic group use electronic banking. From the remaining 90%, only 8% stated that they intended to use electronic banking in the (unspecified) future. The reason for their uncertainty is as mentioned earlier: lack of trust of this form of banking. In a few years, the situation will be different, since already 46% of clients between 36-50 use electronic banking.

The majority of the current electronic banking clients are well-educated people under 35. 40% of clients from this demographic group use electronic banking, while a further 27% intends to use it in the future. The remaining 33% does not trust this form of banking.

What is the relationship between the number of clients using electronic banking and the bank's expected financial results?

In essence, this question is one of effectiveness of the electronic banking strategy. It tells us to what extent the usage of electronic banking influences the profitability of a financial institution and thus how it affects its business value. The answer to this question requires the 'what if' analysis. We will answer this question based on the analysis of the Deustsche Bank data.

The 'what if' analysis was done as follows:

For a typical time period defined by the experts, we analyzed the actual operating costs. Then for the same time period and for the same number of clients, we estimated the operating cost, assuming that the clients would use electronic rather than traditional banking. The comparison of the results indicated that the bank's operating costs would be 13.3% lower, should the clients switch from traditional to electronic banking.

We have also compared the actual ROI index of the Deustsche Bank to the estimated ROI, assuming the use of electronic rather than traditional banking. The actual ROI was 6.8%, while the ROI for electronic services implementation was 12.8%.

## SUMMARY AND CONCLUSIONS

Electronic banking is an attractive development strategy for retail banks. However, the financial results are still not proportional to the overall costs of this type of service. In order for traditional banks to increase their market share, they need to invest in electronic services. As the 'what if' analysis indicated, increased use of electronic banking services would lower the operating costs. Additionally, the effective use of IT in electronic banking implementation can improve the overall financial results. There are, however, several factors that influence it. Most of them depend on the clients' behaviour and their usage of electronic banking services. Thus the key success factor in implementing electronic services is convincing the clients to use this form of banking. Even those clients who use electronic banking prefer the face-to-face contact in the branches (75% of all surveyed clients come to the branches just for this reason). Thus we have a situation where the more friendly and professional the branch employees are, the more the clients would prefer traditional banking over electronic banking.

Our research indicated that the clients over 51 represent the most important group (from the financial assets perspective) are generally not interested in electronic banking services.

The most important drawbacks of electronic banking, as seen by the clients, are the security of electronic transactions, the learning curve required to perform the transactions (the front end interface of electronic banking services is not always user-friendly and intuitive), and

a requirement to have a certain infrastructure to perform electronic banking transactions.

It also seems that the benefits of electronic banking (i.e., the ability to carry out banking transactions in any place at any time) lower transaction costs of electronic transactions, and higher interest rates on deposits opened through electronic channels do not outweigh the earlier mentioned drawbacks. The knowledge of the current and future clients' behavioral patterns and preferences allows banks to make wise investments and have realistic expectations of financial returns, and thus consistently increase their business value.

In conclusion, it is the clients who make electronic banking a success or failure, not the technology. Each organization strives to have the best and the most cost-effective combination of hardware and software, but it is not a technical solution that determines their success. Rather, it is convincing the clients to use electronic banking services over traditional ones that determine the successful implementation of electronic banking. Clients, even though they appreciate the convenience of electronic banking (for example, availability 24/7), do not always prefer it to traditional banking. Therefore, further multi-disciplinary research is required to find out if preference for traditional banking is characteristic to Poland, or if it exists in countries that have wider experience with electronic financial services. .

## BIBLIOGRAPHY


Anderson, T. (1996). DEA: Data Envelopment Analysis. http://www.emp.pdx.edu/dea/wvdea.html

Arnold, M. (2002, January). Servis is servise. General Management, No 1 p. 20

Berger, A.N.,& Humphrey, D.B. (1997). Efficiency of Financial Institutions: International Survey and Directions for Future Research. European Journal of Operational Research nr 98.

Charnes, A., Cooper, W.W., Lewin, A.Y.,& Seiford, L.M. (Ed). (1995). Data Envelopment Analysis: Theory, Methodology and applications. Kluwer Academic Publishers.

Charnes, A., Cooper, W.W.,& Rhodes, A. (1978). Measuring the Efficiency of Decision Making Units, European Journal of Operational Research nr 2.

Carr, N.G. (2004). Does IT Matter? Information Technology and the Corrosion of Competitive Advantage, HBS Press Book.

Kisielnicki, J.A. (Ed.). (2002). Modern Organizations in Virtual Communities, IRM Press

Mazur, L. (2002, January). Internet has put convenience on consumers' list, Marketing, No 1 p.16.

Murphy, P., (2002) Why WingspanBank couldn't stay allot, Bank Technology News, http://www.electronicbanker.com/btn/articles

Reichheld, F.F. ( 2001, July-August). Lead for the Loyalty, Harvard Business Review, p.76.

Reichheld, F.F.& Schefter, P.( 2000, July-August). E-Loyalty, Your secret weapon on the Web, Harvard Business Review, p. 105.

Schell, H. (2000). EMS: Efficiency Measurement System, User's Manual version 1.3, http://www.wiso.uni-dortmund.de/lsfg/or/schel/ems/

Seiford, L. M. (1992). A Bibliography of Data Envelopment Analysis 1978-1992.Technical Report, The University of Massachusetts

Seiford, L.M.& Thrall, R.M. (1990). Recent developments in DEA. The mathematical programming Approach to Frontier Analysis. Journal of Econometrics, No 46.

Shao, M. & Lin, W. (2002). Technical efficiency analysis of information technology investments: Information & Management, p 391-401.

Schefczyk, M. (1996). Data Envelopment Analysis. DBW No 56 p.178.

Sutherland, P.& Tan, B.F. (2004). The Nature of Consumer Trust in B2C Electronic Commerce: A Multi – Dimensional Conceptualism, IRMA.

Turban, E., King, J., Lee, J., Warkentin, M.,& Chung, H. M.(2002). Electronic Commerce, Prentice Hall.

Young, D. (2001). The Impact of the Internet within the retail financial services industry, paying particular attention to banking, http://intra.som.umass.edu/ejournal/bank.html