

UDC 336.717:004.783.5(497.7)
336.717:336.745]:657.478.2(497.7)
Professional paper

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**OPPORTUNITIES FOR COST REDUCTION OF THE
MACEDONIAN BANKS BY INTRODUCING SOLUTIONS
FOR INTELLIGENT CASH MANAGEMENT IN THE
FIELD OF ATM OPERATIONS**

Abstract

Payment card business in Republic of Macedonia in past few years was one of the segments with biggest level of expansion into the banking sector. Except by the commercial banks, the growing tendency of credit card business was adequately supported by the government policy through the introduction of project payment cards for public administration as well as with many campaigns for promotion of payment cards as a payment instrument. Expansion of payment card business in the last decade was duly followed by an increase in the number of ATM devices on the Macedonian market.

The costs of the cash, without a doubt, presents a segment that should be given considerable attention in ATM operations. Banks in Macedonia, in the area of surplus funds immobilized in ATM devices, fall within the global average of around 35-40%. This part is especially important for banks that have ATM networks constituted by a large number of ATM devices. Most modern network solutions for cash management of ATM devices operate in order to ensure a satisfactory level of quality to users of ATM services and reduce operational costs in ATM operations. Almost all the solutions to anticipating the needs of cash in ATM devices on commercial banks as a basis for calculating future demand for cash has taken some historical values for shorter or longer period of time. Optimization of operating costs within the offered solutions, often despite projections of cash into account, includes other costs in this part of banking: financial costs, costs of transportation and cash management, and others. Some solutions have the opportunity for integrated alarm breach of the security level

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to the level of individual ATM device. By introducing methods for intelligent cash management, banks should expect higher profitability of their ATMs as a banking channel. Although banks must balance between the amount of funds, necessary to provide some solutions for intelligent cash management and the amount of saved costs connected to cash.

The benefits of introducing intelligent solutions for cash management would have real positive effects in the banking operations, only if the revenues exceed the costs of implementation and maintenance of systems. Therefore banks should perform analysis based on qualitative principles before choosing the solution for intelligent management of cash depending on its own market position and business opportunities.

Keywords: costs of the cash; optimization of operating costs; intelligent solution for cash management; market position; business opportunities.

Introduction

Payment card business in Republic of Macedonia in recent years was one of the segments with the highest degree of expansion in banking operations. Besides the activities by commercial banks, spreading payment card business was supported by public policy through the project for issuing cards to employees in public administration and a number of campaigns aimed to promote the cards as a payment instrument.

The expansion of the payment card operations in the last decade was adequately followed by an increase in the number of ATM devices on the Macedonian market. The use of ATM devices as self service banking terminals and benefits of their use are well known and they not need to be elaborated separately. However, despite the large number of advantages, both for customers and for commercial banks, ATM devices are generators of a many different types of costs in banking operations.

In recent years, a majority of developed economies have started activities related to optimization of the costs in ATM operations. In this field some of the banks conduct cost analysis of viability of the outsourcing contracts for maintenance of this type of specialized banking equipment, installation of security systems as a measure of protection of property as well as a measure of protection of vandalistic planting activities and acts intended to prevent abuses, measures designed to optimize the level of immobilized assets in the ATM devices and their maintenance at an optimal level and so on. The costs associated with cash are one of the highest expenditure items into ATM operations of commercial banks.

Therefore, the subject of the study in this paper are the costs of immobilized assets in ATM devices and the opportunities for their minimization/optimization by introducing intelligent methods for cash management. The research is mainly theoretical. Several research methods have been applied characteristic for the social sciences such as: inductive - deductive, logical, and analytical and comparative method.

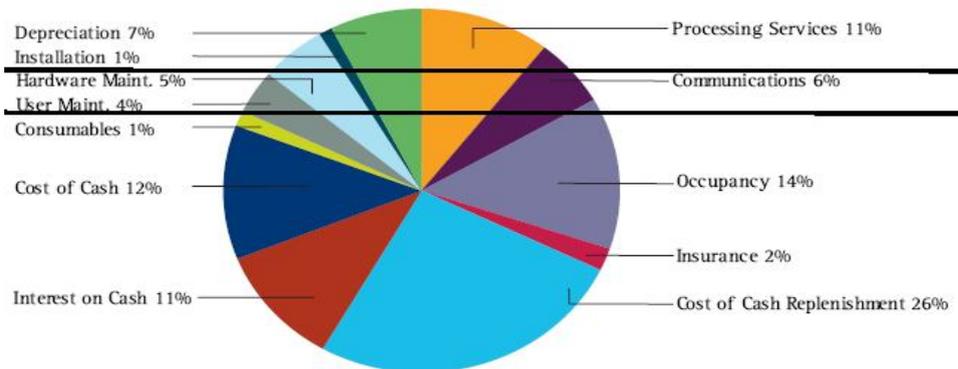
The main purpose of this research paper is introducing the topic to the Macedonian banks and encourage them to evaluate different solutions for intelligent management of cash. Basic assumption in this paper is that through the implementation of appropriate solutions for cash management on intelligent basis, could be realized significant savings of the costs in this field of banking operations. The information in this paper is mainly obtained from secondary data sources.

1. ROLE OF THE COSTS OF CASH AS A COST FACTOR INTO ATM OPERATIONS OF COMMERCIAL BANKS

Costs associated with deposits represent one of the largest generators of expenditures in banking operations. Their role is particularly expressed in the field of ATM operations. There are a number of factors affecting the amount of costs arising from cash in ATM operations. Therefore, this segment is drastically different from traditional banking products.

In ATM operations, there are a lot of cost categories such as: expenditures generated by the need of continuous pumping cash and charging ATM devices, costs arising from interest rates, fees for cash, etc... Through the Graph No. 1 are presented some of the key costs categories generated by ATM operations.

Figure 1: Average annual costs generated by an ATM device in the ATM industry



Source: UK Banking, Point of view series, Taking control of the cash Cycle, Accenture 2007, p.6.

¹⁾ BS2 Penki kontinental group, ATM IQ, April 2010, p.13.

From the figure 1, we come to the conclusion that the cost of cash representing more than 30% of total costs of ATM operations. According to results from a large number of surveys of relevant stakeholders, we come to conclusion that there is a consensus with the above calculations regarding the costs associated with cash into ATM operations. According BS2 Penki kontinentai group, the cost for provision of the cash is about 8%; costs of cash 9% and 9% are the calculated cost of interest rates.¹ According to the Simutis Rimvydas, Dilijonas Darius, Bastina Lidija, Friman Josif and Drobinov Pavel, some banks hold 40% more cash into their ATM devices than needed, while the amount of 15-20% according to the calculations of a number of experts would be quite sufficient. According to the research of these authors, the costs associated with the cash in ATM operations are ranging between 35-60% of total costs in this field of banking operations.²⁾

The costs associated with the cash of ATM operations largely depend on the level of interest rates in the national economy and the cost of deposit insurance. Regarding the costs of cash management, significant differences in the various commercial banks may arise depending on the prevalence of ATM networks of devices within the national economy. Commercial banks must conduct the transport of cash to fill the ATM devices from one location to another, which is a significant expense for the banks regardless of whether the banks in this area use their own resources or services by an external provider.

From the above we conclude that the cost of cash is undoubtedly a segment that should be given considerable attention in ATM operations. This section is particularly important for banks that have acceptance networks constituted by a large number of ATM devices. The sequel will be given the networks of ATM devices in Republic of Macedonia and existing approaches applied by commercial banks in the area of cash management.

2. EXISTING ATM NETWORKS AND COMMERCIAL BANKS APPROACHES FOR CASH MANAGEMENT IN THE MACEDONIAN MARKET

The networks of ATM devices on the Macedonian market show a tendency of continuous growth. Data on the movement of acceptance ATM networks can be seen through the payment reports published by the National Bank of Republic of Macedonia. A review of the movement in the number of ATM devices is summarized and presented through Table 1.

²⁾ Simutis Rimvydas, Dilijonas Darius, Bastina Lidija, Friman Josif, Drobinov Pavel, Optimization of Cash Management for ATM Network, ISSN 1392 – 124X INFORMATION TECHNOLOGY AND CONTROL, 2007, Vol.36, No.1A, p.117.

Table 1

**Preview of the number of ATM devices installed on the Macedonian market
31.12.2005 - 31.12.2009.**

Year	2005	2006	2007	2008	2009
Number of ATM devices at the end of period	157	297	529	761	832
The net increase in the number of installed devices	/	140	232	232	71
Growth rate - %	/	89.2	78.1	43.9	9.3

*Source: National Bank of Republic of Macedonia, Reports of the usage of payment cards and number of devices on which they are used in the country,
<http://www.nbrm.gov.mk/?ItemID=20D183EF6CE94947A7A2274A89161B37>.*

From Table 1, we can conclude that the number of ATM devices on the Macedonian market has already passed the period of its greatest expansion. In the following period, it could be expected that ATM network on Macedonian market will grow with significantly slower pace, compared with the previous period. A brief comparative analysis of the number of ATM devices in RM with EU economies is presented through Table 2.

Table 2

Comparison of the number of ATM terminals per million inhabitants in the Republic of Macedonia and certain members of the European Union ³⁾

Country	Number of credit institutions*	Number of ATM terminals per million inhabitants
Macedonia	18	411
Bulgaria	30	667
Greece	66	692
Slovenia	24	848
Slovakia	26	416
Poland	712	356
Romania	43	431
Estonia	17	692
Czech Republic	54	327
Italy	818	914
Netherlands	302	526
Belgium	105	1,456
Germany	1,989	968
Spain	362	1,353
France	728	832
Hungary	197	460
Malta	23	395
Austria	803	916
Sweden	182	305
UK	391	1,047
EU 27	8,510	855

Source: National Bank of Macedonia, Report on Banking System and Banking Supervision of the Republic of Macedonia in 2009.

³⁾ Excerpt from Annex 1 Comparison of the activity indicators of credit institutions in the Republic and certain countries of the European Union report on the banking system

From the comparative analysis presented by Table 2, it can be concluded that Macedonian banks for the purposes of 1 (one) million inhabitants set 411 devices. This number is quite close to the situation into the markets in many of these European economies. According to these data, is objective to be expected that the investments in ATM equipment into the Macedonian banking sector in the forthcoming period will be drastically reduced to a lower level compared with the last few years. On the other hand, the networks of ATM devices are large enough for banks to begin to create a strategy aimed for optimization of the costs in this segment of its work.

Currently the most commercial in Republic of Macedonia are projecting the cash needs of ATM their devices according on the movements of the indicators and historical trends of cash withdrawing. A key role in this part has the experience of banking experts and their use in current operations.

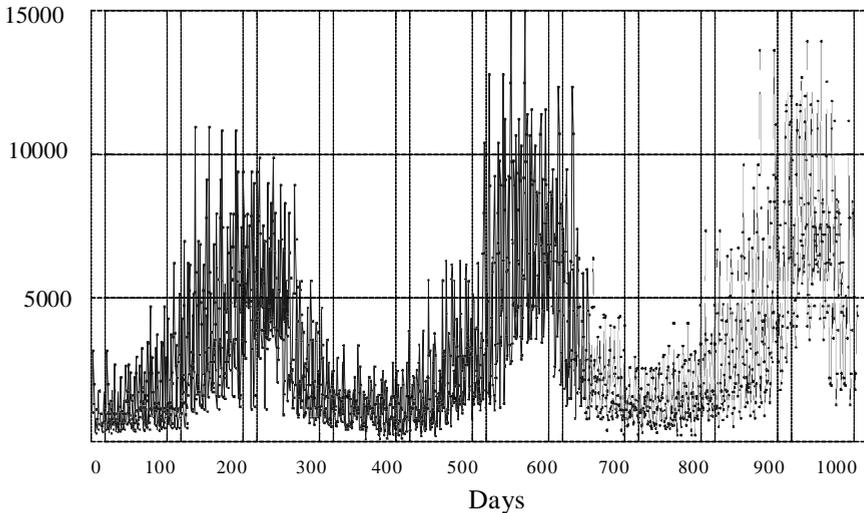
The historical demand model is overlaid with additional factors, such as pay-days, holidays, and seasonal demand in a specific area. Analytical models are aligned with the experience of resources that have intimate knowledge of the banks daily operations. The bank experts know additional events that occur under certain conditions so their qualitative input could be reflected in the overall currency management plan. ⁴

The historical cash demand for every ATM varies with time and is often overlaid non stationary behavior of users and with additional factors, such ad payday, holidays, and seasonal demand in a specific area. Cash drawings are subject to trends and generally follow weekly, monthly and annual cycles. For example, people tend to draw relatively large sums of cash at the beginning of each month. Before Christmas, drawings rates soar, whereas in August, during the summer holidays, rates tend to drop considerably. ATMs that are located in shopping centers, for example, are most heaped on Fridays and Saturdays. Typical example for real ATM during three years time interval is presented in figure 2. ⁵⁾

and banking supervision of the Republic of Macedonia in 2009, published by the National Bank of Macedonia, http://www.nbrm.gov.mk/default.asp?ItemID=3AE17B38DABA984DBA132A61DCD297E8_30.08.2010.

- 4) Simutis Rimvydas, Dilijonas Darius, Bastina Lidija, Friman Josif, Drobinov Pavel, *Optimization of Cash Management for ATM Network*, ISSN 1392 – 124X INFORMATION TECHNOLOGY AND CONTROL, 2007, Vol.36, No.1A, p.118.
- 5) Rimvydas Simutis, Darius Dilijonas, Lidija Bastina, CASH DEMAND FORECASTING FOR ATM USING NEURAL NETWORKS AND SUPPORT VECTOR REGRESSION ALGORITHMS, International Conference, 20th EURO Mini Conference “Continuous Optimization and Knowledge-Based Technologies”(EurOPT-2008), May 20–23, 2008, Neringa, LITHUANIA, p.417.

Figure 2 Cash demand for real ATM during three years time interval



Source: Rimvydas Simutis, Darius Dilijonas, Lidija Bastina, *CASH DEMAND FORECASTING FOR ATM USING NEURAL NETWORKS AND SUPPORT VECTOR REGRESSION ALGORITHMS*.⁶⁾

It should be noted that most of the solutions for intelligent cash management, generate projections based on historical cash needs. Banks in Macedonia, in the area of surplus funds immobilized in ATM devices, fall within the global average of around 35-40%. However, it is necessary to note that experienced banking experts in certain commercial banks, can make measurements with greater precision, creating quality reports and advanced analysis. The following section will be referred to specific advanced solutions for predicting the need for cash at ATM devices and the benefits of their implementation for commercial banks in ATM operations on the Macedonian market.

3. SOLUTIONS FOR INTELLIGENT CASH MANAGEMENT IN ATM OPERATIONS AND EXPECTED EFFECTS OF THEIR IMPLEMENTATION FOR COMMERCIAL BANKS

There are a number of solutions that provide intelligent management of the amount of cash required to serve the users of ATM devices. The different solutions provide varying degrees of success in the realization of the projections in this domain.

⁶⁾ Rimvydas Simutis, Darius Dilijonas, Lidija Bastina, *CASH DEMAND FORECASTING FOR ATM USING NEURAL NETWORKS AND SUPPORT VECTOR REGRESSION ALGORITHMS*, International Conference, 20th EURO Mini Conference “Continuous Optimization and Knowledge-Based Technologies”(EurOPT-2008), May 20–23, 2008, Neringa, LITHUANIA, p.417.

A number of companies operating in this field, for realization of the projections of cash, offer different types of software solutions. Some of the most famous systems for cash management of ATM networks are provided by the following companies: iCom (Carreker Corporation), MorphisCM (Morphis, Inc), OptiCa\$h (Transsoft International), Pro Cash Analyzer (Wincor Nixdorf), Simutis et al., etc.⁷⁾

Most modern solutions for intelligent management of ATM cash devices operate in order to provide a satisfactory level of quality to users of ATM services and reduce operational costs generated from ATM operations. Banks in this part have the choice between simple software solutions, advanced solutions based on artificial neural intelligence, or solutions based on vector regression etc. Almost all of the solutions for predicting the need for cash at ATM devices on commercial banks as a basis for calculating future demand for cash taken some historical values ??for shorter or longer period of time.

The optimization of operating costs within the solutions offered often despite projections of cash into account includes other costs in this part of banking operations: financial costs, transportation costs and cash management, etc...

Table 3

ATM cash management systems comparison ⁸⁾

Feature/System*	PCA	OptiCash	iCom	Siemens	GTM Cash Master
Single CP (cash point)	Yes	Yes	Yes	Yes	Yes
Multiple location	Yes	Yes	No data	Yes	No data
Location	Yes	Yes	Yes	No data	Yes
Multiple CP as one location (single CP may run empty)	No	Yes	No data	No	No data
CIT route planning	No	No	No data	No	No data
Stamp and coupon Forecasting	No	Yes	No data	No data	No data
Considering weather forecast	No	No	No	No	No

Source: Retail banking optimization system based on multi-agents technology ⁹⁾

⁷⁾ http://www.scribd.com/doc/18194999/Cash-Management-at-Atm_15.10.2010.

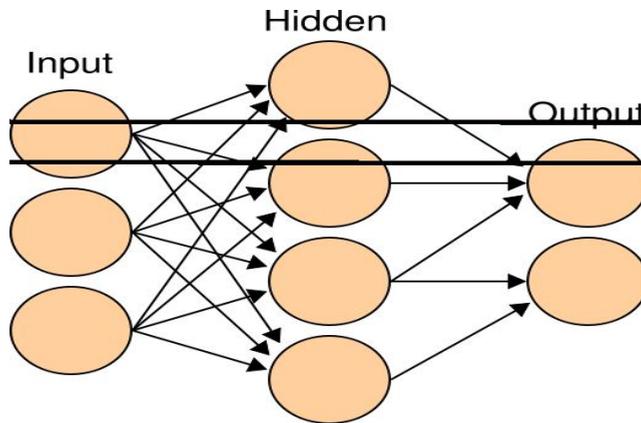
⁸⁾ It should be pointed out that the evaluation of the solutions presented is not intended to favor / advertise any of the above solutions. It presents one of the possible ways of evaluating systems for intelligent management of cash. The presented solutions do not necessarily represent the latest version/cash management solution released from individual companies.

⁹⁾ Bastina Lidija, Dilijonas Darius, Kaunas Faculty of Humanities, Vilnius University, LT-44280 Kaunas Lithuania, JSC "Penkiu kontinentu bankines technologijos", LT-08221 Vilnius Lithuania, 6th WSEAS Int., **Retail banking optimization system based on multi-agents technology**, Conference on Computational Intelligence, Man-Machine Systems and Cybernetics, Tenerife, Spain, December 14-16, 2007, p.205.

Some solutions have an integrated option for alarm breach of the security level to the level of individual ATM device. In Table 3 is presented one of the possible approaches for evaluation of different solutions for cash management based of an intelligent platform. Most of the solutions offered by different vendors, allowing saving rate of the costs connected to cash ranging between 20 and 40%. Certainly, in this area should be mentioned the improved quality of service and time saving management of employees. Many of the offered solutions have integrated automated procedures and controls for monitoring of the results of operation. Especially important in this part is the visibility of the decision and the possibility for easy management by the end users.

In recent years, many experts work on the field of designing and implementation of cash management solutions based on artificial intelligence. An artificial neural network (ANN) is a system based on the operation of biological neural networks, in other words, is an emulation of biological neural system.¹⁰⁾ Artificial Neural Networks are universal and highly flexible function approximators first used in pattern recognition, classification and time series forecasting (Haykin, 1999; Bishop, 2006,; Nrgaard and Norgaard, 2006)...¹¹⁾ Through figure 3 is presented a typical example of the key parameters of the ANN.

Figure 3. An example of the principles of operation of the ANN



Source: http://glennwatson.net/wp-content/uploads/2010/06/560px-Artificial_neural_network.svg_.png.

¹⁰⁾ http://www.learnartificialneuralnetworks.com/_14.11.2010.

¹¹⁾ Rimvydas Simutis, Darius Dilijonas, Lidija Bastina, CASH DEMAND FORECASTING FOR ATM USING NEURAL NETWORKS AND SUPPORT VECTOR REGRESSION ALGORITHMS, International Conference, 20th EURO Mini Conference “Continuous Optimization and Knowledge-Based Technologies”(EurOPT-2008), May 20–23, 2008, Neriga, LITHUANIA, p.417-418.

Neural network is a distributed information processing structure that is able to perform both linear and non-linear mappings for several difficult tasks, such as pattern recognition and adaptive control. Neural prediction of traffic pattern basically involves four stages. The first stage involves designing neural network architecture. Next is the generation of training data. The third stage is neural network training where it will adapt itself to the desired characteristic. The final stage is using the neural network to predict different data series and evaluate its performance. ¹²⁾

Neural networks are noted for their ability to process large amounts of data quickly using a copious number of highly interconnected processors. ¹³⁾ The general idea behind the ANN is to allow the network to map the nonlinear relationships between various factors affecting the cash withdrawal and the actual cash demand. Once this relationship between inputs and outputs is identified, it gives the output variable-cash demand forecast using values of various input variables. One of the most important components in the success of neural network is the structure of the ANN and the data necessary to train the network. ¹⁴⁾

Cost reduction via one of the solutions based on ANN, are presented through figure 4 and 5

Figure 4: ATMs network management costs

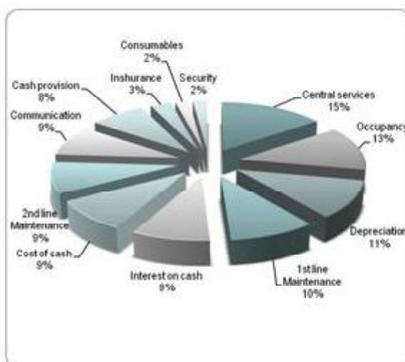
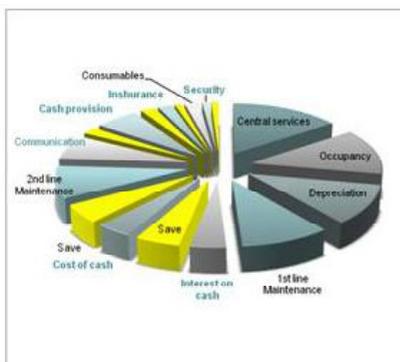


Figure 5: Cost reduction with Cash Management. ¹⁰⁾



Source: BS2 Penki continental group, ATM IQ, April 2010, p.13.

- 12) Chow C.O., Noordin K.A, *Neural Approach Self-Similar Traffic Prediction in ATM Networks*, Department of Electrical Engineering, Faculty of Engineering, university of Malaya, 50603 Kuala Lumpur, Malaysia, *Georgian Electronic Scientific Journal: Computer Science and Telecommunications* 2005, No.1 (5), p.28.
- 13) VIJAYAKUMAR Dr. R., SUSHAMA G., *Neural Network Based Switching Models for VLSI Design of ATM Networks*, *Computer Science & Engg*, N.S.S. College of Engg., Palakkad, Kerala, India, May, 2009, p.387.
- 14) Rimvydas Simutis, Darius Dilijonas, Lidija Bastina, CASH DEMAND FORECASTING FOR ATM USING NEURAL NETWORKS AND SUPPORT VECTOR REGRESSION ALGORITHMS, *International Conference, 20th EURO Mini Conference "Continuous Optimization and Knowledge-Based Technologies"* (EurOPT-2008), May 20–23, 2008, Neringa, LITHUANIA, p.418.

According to the research and simulation created by BS2 Penki kontinentai group, *ATM IQ*, the results showed that Cash Management^{iQ} allows keeping the average daily cash demands' forecasting error under 10%. In practice, the optimization procedure allows to decrease daily costs for ATMs network maintenance approximately **18% - 25%** based on present cost and expected cost optimization.¹⁵⁾

Software implementation of a neural network can be made with their advantages and disadvantages:¹⁶⁾

A) Advantages

- a. A neural network can perform tasks that a linear program cannot.
- b. When an element of the neural network fails, it can continue without any problem by their parallel nature.
- c. A neural network learns and does not need to be reprogrammed.
- d. It can be implemented in any application.
- e. It can be implemented without any problem.

B) Disadvantages

- a. The neural network needs training to operate.
- b. The architecture of a neural network is different from the architecture of microprocessors therefore needs to be emulated.
- c. Requires high processing time for large neural networks.

Most solutions for intelligent management of cash in ATM devices present on the global market, enabling more accurate rate of successful prediction of the cash needs of ATM devices in comparison with the analysis carried out by applying the historical model of projection by the banking experts. Part of the presented solutions can be applied on the Macedonian market whereby we should expect to be achieved substantial improvements.

4. POSSIBLE BARRIERS AND KEY ELEMENTS THAT SHOULD BE EVALUATED WITH THE INTRODUCTION OF CASH MANAGEMENT INTELLIGENT SOLUTIONS IN THE MACEDONIAN MARKET

The introduction of cash management solutions based on intelligent platform initiate evaluation of number of elements and potential barriers that may occur during the processes of evaluation, implementation and usage. The elements are generally common to all commercial banks. However, every segment must be adequately eval-

¹⁵⁾ BS2 Penki kontinentai group, *ATM IQ*, April 2010, p.14.

¹⁶⁾ http://www.learnartificialneuralnetworks.com/_14.11.2010.

uated by each commercial bank individually, depending on its position in this domain of operations.

The number of ATM devices is a key factor that should be taken into consideration during the evaluation of offered cash management solutions. Certainly, the cost of implementing of the chosen solution is viable only if the amount of savings allows exceeding the cost of an optimal time period. Here, we suggest that the banks that have ATM network constituted by smaller number of ATM devices, should review certain opportunities for internal development through creating number of reports for cash demand based on the historical events.

No less important factor that appears as a generator of the costs in ATM operations represents the amount of immobilized cash into each individual ATM device. Charging with higher amounts of cash is drastically increasing the expenditures for commercial banks. On the other hand, lower amounts of supplying of cash initiate more frequent need for service activities by the banks resource which generates additional costs of operations.

As part of the potential barriers in the process of evaluation, implementation and usage of solutions for management of cash based on intelligent platform, we can specify:

- The vendor of the cash management solution should have local establishment which will be able to provide adequate support and maintenance of the cash management solution;
- Compatibility of the cash management solution with the existing (core) banking infrastructure and banking system;
- Software platform and opportunities for further upgrading;
- Risks in the ATM operations and degree of autonomy of each individual bank in this domain;
- Degree of reliability of data exchange with external service provider;
- Inspect of the external service provider into the banking confidential data;
- Required knowledge and competence of the staff in the commercial banks;
- Adaptation of the chosen solution to the specific characteristics of each individual cash point.

Optimal cash management and services availability is one of the most important factors in the ATM network services business. ATM software support companies implement computer-based tools for cash prognosis and cash loading routes planning of the ATM network both at a strategic level and for short-term optimization. Traditional ATM cash optimization and management software solutions are able to automatically create cash loading plans, describe or make prognosis on cash need, but cannot adequately handle unexpected events and produce the necessary plan deviations in real-time. In cases of last minute changes of cash withdrawals amounts or unexpected unavailability of ATMs due to technical or environment problems, break-

downs or accidents, static planning systems cannot be used, and human effort is needed to adapt the dispatch plans and control their execution, to make services available all the time. This is because these planning systems are designed for relatively stable and not overly complex ATM networks.¹⁷⁾

The development of a model for projecting cash needs of a complex procedure, because it must take into account changes in customer behavior and the various input parameters. Based on the model for predicting the need for cash, the optimization procedure determines the optimal amount of cash for each individual ATM device through the calculation of costs of transport and charge the device versus the costs arising from interest rates.¹⁸⁾

Cash management system has to guarantee the availability of cash in the ATMs network, should estimate optimal amount of stocked money plus efficiently manage and control day-to-day cash handling, transportation with reducing of currency transportation and servicing costs. The system should be flexible enough to allow the bank to re-forecast future demand, perform WHAT – IF analyses, and optimize the network as the cash distribution environment evolves.¹⁹⁾

However, according to the author of this paper, the possible solutions that could be implemented on the Macedonian market don't have to be based on the most sophisticated platform. According to the author, the banks are essential to perform calculations of the period required for return on investment, their own capacity/opportunities for implementation of the solutions and adequate management of the resources. The author believes that the degree of deviation that may arise as a result of non-standard movements should be considered as tolerant or risk in the cost of managing this risk and in any case must not exceed the benefits of such management.

Conclusion

The costs associated with the cash immobilized in ATM devices and dependent costs associated with cash used into ATM operations, undoubtedly represent a segment that should be followed by substantial degree of attention in order to optimization of the costs for the commercial banks. The degree of costs optimization in this area of

17) Bastina Lidija, Dilijonas Darius, Kaunas Faculty of Humanities, Vilnius University, LT-44280 Kaunas Lithuania, JSC "Penkiu kontinentu bankines technologijos", LT-08221 Vilnius Lithuania, 6th WSEAS Int., *Retail banking optimization system based on multi-agents technology*, Conference on Computational Intelligence, Man-Machine Systems and Cybernetics, Tenerife, Spain, December 14-16, 2007, p.206.

18) http://www.scribd.com/doc/18194999/Cash-Management-at-Atm_15.10.2010.

19) Simutis Rimvydas, Dilijonas Darius, Bastina Lidija, Friman Josif, Drobinov Pavel, *Optimization of Cash Management for ATM Network*, ISSN 1392 – 124X INFORMATION TECHNOLOGY AND CONTROL, 2007, Vol.36, No.1A., p.118.

operations is particularly important in periods when the market price of the interest rate is high and/or the sources of financing of the banking operations are expensive.

ATM network devices on the Macedonian market are quite developed, so the implementations of intelligent solutions for cash management are appropriate direction to which the banking sector should be focused in the period ahead. Additionally, the rates of borrowing in the market in recent years have been extremely high, while the ability to increase revenues in the payment card operations are quite limited due to limited market.

Technological solutions for intelligent management of cash, offered by various renowned companies operating on the global market, present a satisfactory degree of accuracy in predicting the required level of resources for continuous handling of cash, for the users of ATM devices. Many of the offered solutions, in addition to optimizing the required amount of cash, have also integrated a number of additional functionalities as: security parameters that provide opportunities for raising the level of safety in ATM operations, functionalities into the field of improving the quality of services, management tools that allow adequate control during the management activities and better time management, integrated automated procedures, controls and systems for monitoring of the results.

Before choosing a cash management solution, is particularly important for the bank to evaluate all of the solutions offered in the market and the degree of their accuracy in prediction, and the opportunities for implementation and maintenance of appropriate systems. The banks must perform an adequate evaluation of potential barriers before and after the introduction of the cash management solution. Especially important parameters that should be taken into consideration by the commercial banks are solutions visibility and there simplicity for management by the end users.

Banks must balance between the expenditures necessary to provide a solution for cash management and the amount of cost savings for immobilized cash. The advantages of introducing a solution for cash management on intelligent platform would have a real positive effect in the bank ATM operations only if revenues exceed the costs of implementation and maintenance of the systems. Otherwise, commercial banks should continue to operate on the basis of traditional historical models for projections of cash needs based on the expertise of banking experts.

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