EFFICIENCY ASSESSMENT TOOL FOR CREDIT GRANTING PROCESS

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Abstract

Credit granting process has experienced considerable changes in the last years. Households as well as bank officials admit that a credit granting process has become more complicated, excessively time-consuming and non-transparent. A pre-research conducted by the authors pointed out that commercial banks lack tools for proper reflection and evaluation of decision-making process in credit granting. This implies that commercial banks have little control over the process and are unable to measure its efficiency.

The purpose of the research presented in the paper is to develop a tool for assessment of efficiency of decision-making process in credit granting and to provide practical recommendations for its improvement.

To achieve the purpose of the research, the authors used a qualitative method – the modified Delphi method and a graphical tool – decision tree. In order to design it the authors applied two criteria – event probability and time component, which reflect time, spent by credit specialists to proceed each activity in all stages of credit granting process.

Results and findings of the research – The authors have developed a decision tree of credit granting process, which proved to be a credible tool for efficiency assessment of decision-making process in credit granting. Moreover, the developed tool ensures transparency and accountability of decision-making process and provide an opportunity to measure and analyze different parts of the decision making process. The authors have elaborated recommendations for efficiency improvement of credit granting process, which implies necessity of changes in the order of data proceeding in credit granting process. This means that information with higher degree of influence on the final decision has to be clarified during the first stage of decision-making process, whenever it is possible, and information that has less degree of influence on the final decision has to be left for clarification on the later stages of decision-making process. That sort of structure of decision-making process in credit granting ensures less time consumption leading to a negative decision on credit granting and, therefore, improves efficiency of the whole credit granting process.

Limitation of the research – This research is limited to the study of the decision-making process applied by commercial banks in granting mortgage credits to households.

Keywords: lending, credit granting, process analysis, decision making, decision tree.

1. INTRODUCTION

Credit granting process has experienced considerable changes in the last years. Households as well as bank officials admit that a credit-granting process has become more complicated, excessively time-consuming and non-transparent. It might be the result of the world financial crises that has taken place recently. Commercial banks under pressure of the state regulators and bad financial results were forced to revise their existing credit granting procedures and supplement them with new rules and standards. Introduced changes immediately complicated the way commercial banks assess credit risk and creditworthiness of credit applicants. Moreover, commercial banks have reduced the power of credit granting

decision-making to the only credit committees, which made the credit granting process less transparent and time-consuming.

There is no doubt that bad economical and financial results on the financial market required stiffening of standards in credit granting. Together with changes in the credit risk assessment the whole credit granting process was affected – it became more complicated, non-transparent and time-consuming. To the mind of the authors these drawbacks should be excluded and credit granting process should stay as simple and transparent as possible. Implementation of this strategy is a key element to balance drawbacks of changes in the credit risk assessment and keep a high level of customers' satisfaction.

The purpose of the research presented in the paper is to develop a tool for efficiency assessment of decision-making process in credit granting and to provide practical recommendations for the improvement of decision-making process in credit granting.

The authors of the paper define the following objectives to achieve the purpose of the study: (1) To design a process assessment algorithm based on the application of a graphical tool – decision tree and qualitative method – modified Delphi; (2) To itroduce a time component to a decision tree framework, which make it possible for the authors to evaluate duriation and probability of each alternative solution in the developed decision tree; (3) To identify both disputable areas of credit granting process and areas that have potential to be improved; (4) To develop practical recommendations for the improvement of decision-making process in credit granting.

To achieve the purpose of the research the authors used a qualitative method – the modified Delphi method and a graphical tool – decision tree. In order to design it the authors applied two criteria – event probability and time component, which reflect time, spent by credit specialists to porceed each activity in all stages of credit granting process.

The paper consists of 4 sections. Section 1 focuses on the background of the research. Section 2 deals with the research that has been taken to develop a decision-making efficiency assessment tool for credit granting. Section 3 represents the authors' recommendation for the improvement of credit granting process. And finally, section 4 presents the conclusions.

Limitation of the research: The research is limited to the study of decision-making process applied by commercial banks for granting mortgage credits to households.

2. BACKGROUND OF THE RESEARCH

The authors have conducted the pre-research to explore the process of granting credits to households applied by commercial banks in different European countries. The results of the pre-research displayed that there is no significant difference in credit granting process between commercial banks from different European countries and identified that credit granting process consists of two interrelated components: credit-granting procedures and a decision-making process.

The credit granting procedures represent methodology of credit risk assessment and evaluation of creditworthiness of the credit applicants. A decision-making process, at the same time, represents a set of consistent and sequential actions that are carried out by credit specialists in order to meet all standards and requirements established in credit granting procedures leading to a decision on credit granting or denial.

The pre-research helped to identify that commercial banks lack a tool for proper reflection and evaluation of decision-making process that takes place in credit granting. Some commercial banks have made an attempt to reflect the credit granting process either in descriptive or visual way. However, such techniques as flow-charts and Entity-relationship model are not sophisticated enough to provide comprehensive precept of a complicated, multiple staged and diversified process of a credit granting decision-making process. This led to the understanding that commercial banks have not enough control over the decision-making process that plays significant role in credit granting. They are unable to measure effectiveness of decision-making process due to the lack of appropriate tool. According to the authors decision-making process is underestimated by commercial banks and encloses significant potential for improvement that would streamline to the desirable simplicity and transparency of the credit granting process. The decision-making process encloses considerable opportunities to improve customers' satisfaction as well as the efficiency of the whole credit granting process by consuming less human and financial resources.

Credit granting is a trade-off between the perceived default risk of a credit applicant and potential returns from granting credit (Keasey, Veronesi, 2008), which makes crediting to be the most risky products offered

by commercial banks. However, the pay off from bearing this risk is so attractive that commercial banks are highly interested in being presented on this market. In their attempt to minimize losses from the potential default risk of a credit applicant, commercial banks pay a lot of attention to opportunities for risk minimization. They are still eager to find a sophisticated credit risk assessment system, which would help them to identify good applicants and exclude bad ones on an early stage of credit granting process.

High interest of commercials banks and importance of the problem triggered a series of research that made attempts to solve the addressed problem by proposing different approaches for credit risk assessment. Over the period the researchers tried to address the problem by paying attention to deferent components of credit risk management. For example, Myer and Forgy (1953) introduces a numerical credit evaluation system that is based on discriminant and regression analysis. Liebman (1972), however, highlights the importance of a better credit control in order to lower total costs that crediting (granting and monitoring) causes. This approach is based on the Markov model, which is transformed into equivalent linear program. Orgler (1970), however, admits that the biggest concern of commercial banks and state regulators is loan review and control. Orgler addresses the problem of credit evaluation to improper standard and techniques used by commercial banks in credit-granting process. The author introduces a solution that is supposed to deal with evaluation of credit applications and decrease rate of granting credit to "bad" applicants.

While earlier studies concentrated mostly on the development of a system (scoring, numerical, liner regression or credit portfolio risk management) based on mathematical and statistical methods, later studies have tried to research credit granting process based on information applied by commercial banks in their decision-making on credit granting or denial. For example, Kim (2004) in the research investigates the importance of financial statements in credit granting decisions in large commercial banks comparing to small ones. Kim proves that large commercial banks rely on hard financial information, computer models and centralized decision-making, but small banks rely more on non-financial information collected by personal contacts, community ties and close lender-borrower relationships. Cole, Goldberg and White

(2004) in their research also came to the conclusion that lending decisions in large banks are more likely to be a function of financial variables, versus the lending decisions of small banks, which are more likely to be a function of variables indicating pre-existing relationships between a bank and a loan applicant. Taking into account the results of above-mentioned researches Liberti (2005) analyses the hierarchy of the credit granting process and the importance of transmission of soft and hard information across and within an organization. Liberti supports the view that hard information is relatively more important than soft information as a loan moves up the hierarchy. However, Liberti admits that the importance of hard information decreases and reliance on soft information increases when hard information is questionable or unreliable. E.Zelgalve (2004) has made an attempt to combine the above-mentioned approaches and designs the scheme to systemize indicators and create the optimal set of indicators that would shorten the time spent on investigation of a customer's creditworthiness. The scheme combines a financial and non-financial analysis, as well as the analysis of the past and the future.

Though, there are a lot of researchers, who attempt to solve complex and ambiguous problems related to the credit risk management, but only some of them tried to solve the addressed problem by application of a decision tree framework. One of them is Mehta (1968) whose research focuses on credit-granting process and develops a system of indices. The developed system is supposed to become as a control mechanism for credit-granting process, which helps to assess the efficiency of credit-granting process in monetary terms. In order to develop an indices system Mehta used a decision tree framework and suggested assessing efficiency of credit-granting process by evaluating bad credits, credit receivables and other measurements, which correspond to the particular stage of credit-granting process. Johnson and Stowe (2007) continued the development of the approach suggested by Mehta (1968) and in their research they used a decision tree framework to identify the efficiency of credit-granting process by assessing credit granting and credit denial costs to commercial banks. The main condition of Johnson and Stowe research is enclosed in the fact that applicant's credit rating should be obtained from rating agencies. The offered approach assumes that banks in their credit granting policies trust credibility of the outsourced credit rating. However, currently, commercial banks prefer to have their own credit risk assessment procedures or internal rating systems for evaluation of creditworthiness of a credit applicant and are not willing to trust and outsource ratings from rating companies.

Notwithstanding the fact that some of researchers applied a decision tree framework in their research to solve the addressed problems in the field of credit granting the authors assume that this approach has not fulfilled its potential yet and might help to solve the problem addressed in the paper. For example, Magee (1964) considers a decision tree framework as a suitable and valuable a tool for the evaluation of decisions

under uncertainty, which is the case for credit granting. Magee introduces readers with basic concept and variables used for the development of a decision tree. Magee considers a decision tree framework as a unique tool that combines analytical techniques with clear visual representation of the impact of the future decision alternatives and events.

Taking into account the results of the pre-research and brief literature review, the authors came to the conclusion that decision-making process in credit granting has never been properly emphasized. And this research provides a valuable insight into acknowledgment of interdependencies, critical issues and areas for improvements in the decision-making process of credit granting.

The aim of this paper is to examine decision-making process in credit granting process as a set of consistent and sequential actions that is carried out to reach the final decision - approval or denial of granting a credit. The aim of this paper is not to introduce new standards and rules for credit risk management. The authors' intention is to propose a solution for optimization of the decision-making process to improve the efficiency of the credit granting process.

3. EFFICENCY ASSESSMENT TOOL

During the first stage of the research the authors made the experiment – structured interviews with credit specialists from different European countries having extended working experience (not less than ten years) in credit granting. To define experts groups the authors applied the methodology of formalization of experts' opinion provided by T.Reizinsh and D.Rutitis (Reizinsh, Rutitis, 2006). This methodology implies development of an expert group consisting from three to six experts with a condition that for each two interviewed credit specialists there is at least one expert, who had taken a leading role in the development of a credit granting process. The methodology suggests adjustments of Classical Delphi method for the reason to be implemented in a decision tree approach as it shown in Figure 1.

During the 1st iteration of formalization of experts' opinion, the selected experts were interviewed by the authors to provide detailed information on decisions that have to be taken in credit granting to achieve a final decision – approval or denial of granting credit to a credit applicant. After that the authors became aware of the exact sequence of decisions that take place in credit granting process.

According to the authors, credit-granting process might be divided into 6 stages having 40 statements. This means that before decision-making process can be moved to a credit committee, a credit specialist has to proceed information obtained from a credit applicant to all 40 statements.

At the end of the first iteration the authors can draw an initial decision tree. A decision tree is an instrument that explicitly interprets any process and can be stated as strategy where actions of decision makers can be determined and the stochastic state of nature can be kept as given. The main purpose of creating a tree is that afterwards the decision makers can easily decide how to act in each decision node and follow their decision further in depth. Decision tree provides the possibility for decision makers to analyze and compare different paths of the decision tree. These characteristics make application of the decision tree method relevant to solve the addressed in the research problem and provide a tool to ensure accountability and transparency of the decision-making process in credit granting.

The 2nd iteration is about validation and adjustment of the drawn decision tree. This stage of formalization of experts' opinion includes: (1) adjustments to the need of legislation framework of each particular country and (2) revision and changes of some parts of previously identified statements in the drawn decision tree. This stage of process's formalization proved to be the most time-consuming and hard for explanation to the experts.

The 3rd iteration is the most crucial part of formalization of experts' opinion and consists of setting empirical distribution of probabilities for each alternative branch of the drawn decision tree. Afterwards a combined probability has been formulated as a product of all probabilities enclosed in a particular decision tree branch. In the same way the experts shared their experience regarding the time required to perform tasks enclosed in each statement. In the end of the third iteration the authors calculated the cumulative time that describes particular decision tree branch.

After formalization of the experts' opinion had been finished the authors were able to develop stable decision tree of decision-making process in credit granting, consisting of 1st meeting, 1st analysis, intermediate stage, 2nd meeting, 2nd analysis and credit committee. The developed decision tree appeared to be excessively voluminous and unsuitable for graphical representation in the paper. Due to this drawback the

authors in Figure 2 offer light insight to the developed decision tree and propose a tiny fragment of the decision tree that corresponds to 1st appointment.

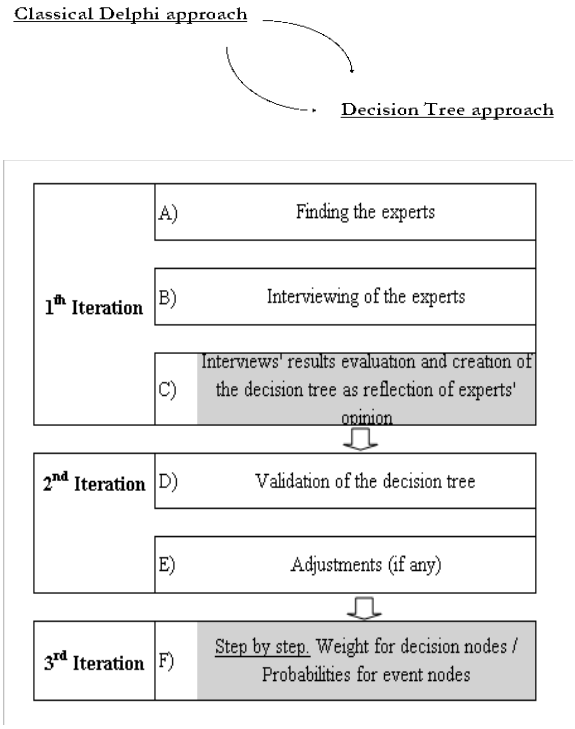

Figure 1. Transformation of Classical Delphi approach to Decision Tree approach

At the second stage of the research the authors worked on the interpretation of the results derived form the developed credit granting decision tree. To perform the analysis of the decision-making process the authors transformed the developed graphical decision tree into numerical matrix and applied mathematical statistics to proceed data. This approach gave leave to identify that positive decisions (approval of credit granting) take place in 14,60% cases of realized alternative solutions, but negative decisions (denial of credit granting) take place in 85,40% cases of realized alternative solutions. To verify the result the authors refer to the credit granting statistic data provided by the experts. The experts' statistic data state that from 100 experts' meetings with credit applicants per month only 15 results in signing of loan agreements. The conducted verification confirmed that the developed credit granting decision tree provide reliable and truthful results. This made possible to conclude that the developed credit granting decision tree is valid and can be used as a credible tool that provides an opportunity to measure the efficiency of credit granting process by setting relevant criteria and variables.

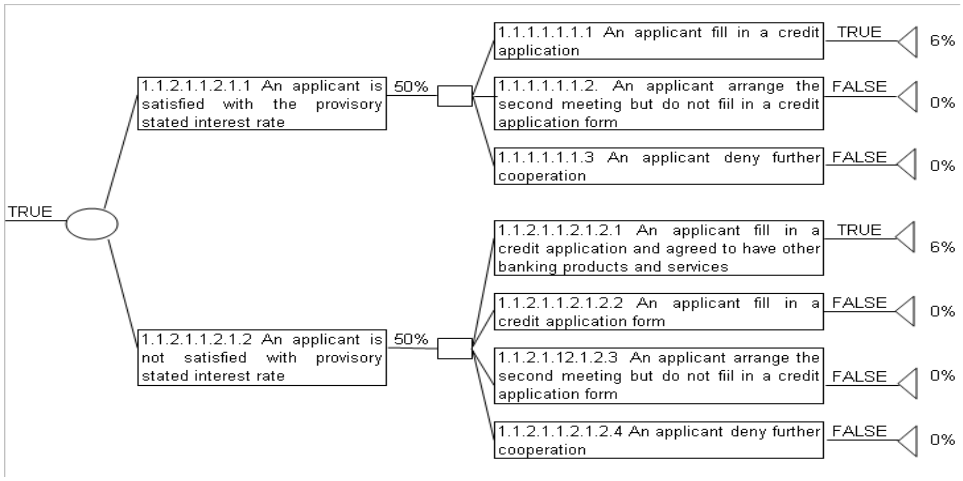

Figure 2. Graphical fragment of the credit granting decision tree

To achieve the purpose of the research the authors decided to set a time standard for optimal duration of the alternatives solutions. This stage of the research consisted of calculation of several variables, including the average decision duration, the median and the mode. The results of calculation are shown in Table 1 and present measurements that can be applied for evaluation and description of the decision-making process in credit granting.

Table 1

Measurements for evaluation of decision-making process in credit granting

Alternative solutions with	*Variable*	*Value*	
		minutes	*working days*
Positive decision	*Maximum duration*	*4064*	*8.47*
	Minimum duration	*564*	*1.18*
	Average duration	*2412*	*5.03*
	Mathematical expectation	*782*	*1.63*
	Median	*2441*	*5.09*
	Mode	*1591*	*3.31*
Negative decision	*Maximum duration*	*3764*	*7.84*
	Minimum duration	*3*	*0.01*
	Average duration	*2130*	*4.44*
	Mathematical expectation	*107*	*0.22*
	Media	*2081*	*4.33*
	Mode	*2431*	*5.07*

Presented in Table 1 variables are valuable measurement criteria for commercial banks to compare duration of each alternative solution that take place in the credit granting process and get understanding of how efficiently is organized a credit granting process in a particular commercial bank. Alternative solutions which decision-making duration exceeds the average duration have to become a subject for further analysis, because they are a source for improvements of the decision-making process in credit granting.

A considerable dispersion between the maximum and the minimum duration time of the alternatives solutions is appropriate for both - positive and negative decision branches. Therefore in order to set standards for optimal duration time of the alternative solutions, new variable - the "Mathematical expectation" was introduced. This variable identifies the highest probability of the decision to take place and represents the most common duration time to achieve a final decision – credit granting approval or denial. According to the data provided in Table 1 the Mathematical expectation for the alternative solutions with a positive decision corresponds to 782 minutes or 1.63 working days, but in case of a negative decision corresponds to only 107 minutes. These ranges should be considered as a standard for optimal duration of the alternatives solutions to achieve a decision on credit granting approval or denial.

The value of mathematical expectation for positive and negative decisions of the alternative solutions indicates that negative decisions can be achieved faster than positive decisions. This should be considered as a reasonable approach, because each minute spent to reach a decision generates expenses and can be defined as a waste of time for both participants of the credit granting process - commercial banks and credit applicants. Negative decisions of alternative solutions don't generate income for commercial banks and is waste of time for credit applicants. Therefore duration time of the alternatives solutions with negative decisions should take as less time as possible to ensure efficiency of the credit granting process.

4. DEVELOPMENT OF RECOMMENDATION

After the efficiency assessment tool for credit granting process was developed and tested the authors turn their attention to the development of recommendation for process optimization. The authors followed the assumption that optimization of credit granting process could be achieved by changing the order of statements enclosed in 5 stages of the developed credit granting decision tree. This approach would provide an opportunity for commercial banks to decrease duration time of credit granting process, which would result in more efficient employment of their human resources.

At this stage of the research the authors have analyzed and compared the influence of different factors to the decision to grant a loan. All information enquired and assessed by credit specialists to lead a credit

application to the final decision should be classified according to its influence on the final decision. The authors followed the classification suggested by I.Purinsh (Purinsh, 2010), which implies that all information can be grouped in five groups consisting from 23 factors. However, each commercial bank can develop its own criteria for factors and groups formation according to their experience and preferences. At this point experts of a commercial bank should agree on the scale, which will be used to measure factors influence to the final decision. The authors suggest to rank all identified factors only from the point of its influence on the final decision, for example, no influence, irrelevant influence, influence and high influence. This approach brings clear understanding of what kind of information plays essential role in decision of commercial banks to grand a loan.

During the following stage of the research the authors worked together with the experts groups to combine two approaches and identify place of all 23 factors within the developed credit granting decision tree. This implies that the experts had to trace the moment, when each of the factors appears for the first (and preferably also the only) time in 5 stages of the developed credit granting decision tree. Afterwards, the authors were able to establish a comparative image showing appearance of the factors within the developed credit granting decision tree according to the factors' ranking scale. The image, presented in Figure 3, is a key element for getting understanding about importance of each stage in crediting granting process.

By looking at the image it becomes obvious that decision-influencing factors are clarified during all stages of credit granting process. This observation implies that credit granting process does not have an optimal structure and this might cause inefficient utilization of commercial banks' resources. The authors suggest rebuilding of credit granting process's structure in the order when the factors having high degree of influence on the final decision are clarified and analyzed before the factors having less degree of influence. This approach would help to build an optimal structure of credit granting process and reduce time required by commercial banks to achieve a final decision. Following the authors' recommendation on the structure of credit granting process, commercial banks will be able to make a negative decision on earlier stages of credit granting process, which is a key element to achieve efficiency of whole credit granting process.

Application of the suggested approach implies that commercial banks have to identify the existing structure of credit granting process and evaluate homogeneity of each stage of credit granting process. Afterwards they have to consider an opportunity to change the place of the factors by transmitting the most influencing factors on earlier stages of credit granting process. This implies that commercial banks have to analyze whether a factor transition might cause distortion of credit granting process or not. If not, then a factor should be transmitted and change in structure of an interview with a credit applicant should be applied. After each factor and each stage of credit granting process have been analyzed in that way an optimal structure will be established. The last stage of the suggested process optimization requires development of a new credit granting decision tree, which results should be compared to the results provided by the existing credit granting process.

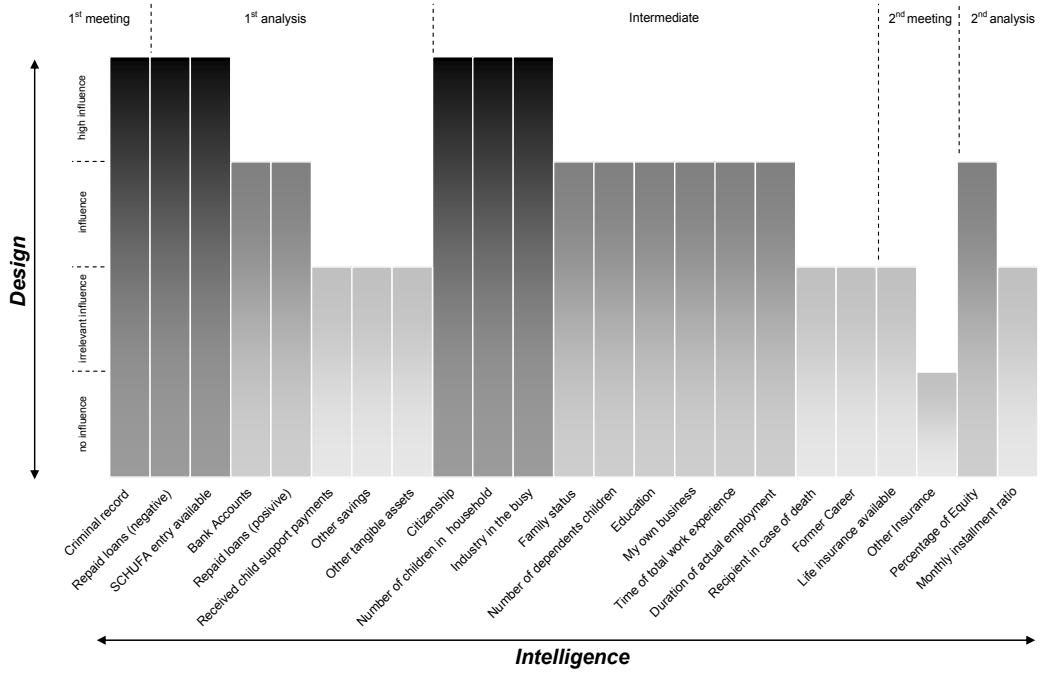

Figure 3. Factors distribution within credit granting process

Credit granting process efficiency will be achieved at the moment when commercial banks will develop a structure of credit granting process that ensures better results of the developed credit granting decision tree.

5. CONCLUSIONS

Credit granting process significantly influences the speed of decision-making in commercial banks. That is why it is so important to organize credit-granting process in most efficient way it is possible. Efficiently structured credit granting process is a source for better customers' satisfaction, efficient employment of human and financial resources and commercial banks' competitiveness.

The authors have developed efficiency assessment tool - credit granting decision tree that provides clear understanding, transparency and accountability of credit granting process. Statistical mathematics method applied by the authors to derive and interpret the results of the developed credit granting decision tree provide an opportunity to measure efficiency of the process. Better efficiency of credit granting process is achieved at the moment when time spent by commercial banks to achieve a negative decision (refusal to grant a credit) is shortened to minimally possible.

The authors have developed the recommendation for commercial banks to reduce the duration of alternatives solutions with a negative decision. This approach implies incorporation of decision-making factors into the developed decision tree. The result of the introduced approach indentified that decision-making factors that have the most considerable influence on a final decision are clarified during all stages of credit granting process. This implies that commercial banks will be able to achieve better efficiency of credit granting process at the time when factors with higher degree of influence on a final decision will be clarified on earlier stages of credit granting process.

The main benefit of the developed efficiency assessment tool is ability to measure efficiency of credit granting process as well as an opportunity to shorten the duration time of alternative solution with a negative decision. Decision time is the key indicator to determine costs of the human resources. Cost component provides opportunity to define the break – even point, where process becomes unprofitable and may cause loss to commercial banks.

REFERENCES

1. Association of Commercial Banks of Latvia. (2011). Data on banking performance 2007 – 2010. [on-line] Available at: http://www.bankasoc.lv/lka/statistika/bankas/index2.php.
2. Association of Commercial Banks of Latvia. (2011). Macroeconomic review of Latvia, February 2011. [on-line] Available at: http://www.bankasoc.lv/lka/publikacijas/index2.php.
3. Coles S., Rowley J. (1995). Revisiting decision trees. Management decision, 33(8), 46-50.
4. Goldberg L. and White, L. (2004). Cookie Cutter vs. Character: The micro structure of small business lending by large and small banks. Journal of Financial and Quantitative Analysis, 29(2), 227-251.
5. Hartmann W. (2009). Large enterprises are like nuclear power stations Bank to assess. Institute of Risk and Regulation IRM, Risk Manager No 21. [on-line] Available at: http://www.risiko-manager.com/index.php?id=162&tx_ttnews%5Bcat%5D=118&tx_ttnews%5Btt_news%5D=12362&tx_ttnews%5BbackPid%5D=161&cHash=2e14b74e3d.
6. International Monetary Fund, Crisis Assessment: IMF Support Helping Restore Growth but Key Risks Ahead, IMF Survey, April, 2011. [on-line] Available at: http://www.imf.org/external/pubs/ft/survey/so/2011/new041511a.htm.
7. Jaunzems A., Reizinsh T. (2008). Pareto (μ, σ) – efficient Sub-branches of the Decision Tree. Latvian University articles, 721.sej., Vadibas zinatne, 61-75.
8. Johnson A.D., Stowe J.D. (1984), Credit Investigation Policy and Management Planning. Managerial Finance, 10(2), 12-19.
9. Keasey K., Veronesi G. (2008), Lessons from the Northern Rock Affair. Journal of Financial Regulation and Compliance, 16(1), 8 - 18.
10. Kim J.N. (2008). Financial Statements and Lending Decisions by Large Banks and Small Banks, International Review of Business Research Papers, Volume 4 No. 4 Aug – Sept 2008, 199-207
11. Kremer J. (2011), Norway banks face tighter mortgage rules on record private debt, Bloomberg. [on-line] Available at: http://www.bloomberg.com/news/2011-09-05/norway-banks-face-tighter-mortgage-rules.html.
12. Liberti J.M. (2005), How does Organizational Form Matter? Comunication, Distance and Soft Information. London Business School, 1-29.

13. Liebman, L.H. (1972), A Markov Decision Model for Selecting Optimal Credit Control Policies. Management Science, 18(10), 519-525.
14. Longbottom, D.A. "Decision Making – a Review: The Application of Decision Analysis in Management." Management Decision, Vol. 10 Issue: 3 (1972): 224-242.
15. Magee J.F. (1964), Decision Trees for Decision Making. Harvard Business Review, July 1967, 78-79.
16. Mehta D. (1968), The formulation of Credit Policy Models. Management Science, Volume 15 No.2, 30-50.
17. Myers J.H. and Forgy E.W. (1963). The Development of Numerical Credit Evaluation Systems. Journal of the American Statistical association, Volume 58, Issue 303, 799-806.
18. Olivas R. (2007), Decision Tree. A Primer Decision-making Professionals. Rev.5, 04/05/07, 1-27.
19. Orgler Y.B., "Evaluation of Bank Consumer Loans with Credit Scoring Models", Journal of Bank Research, (Spring, 1971), PP- 31-37.
20. Purinsh I. (2010), Comparison of Latvian and German Household Credit Solvency Assessment Methodology. Conference "New Socio-economic Challenges of Development in Europe-2010", University of Latvia, Riga, 516-527.
21. Purinsh I., Rutitis D. (2011), Decision making in Household Credit Granting Process. The 12th Annual Doctoral Conference, Prague, 117-133.
22. Reizinsh T., Rutitis D. (2006). Decision Tree as a Support Tool in Expert Team Decision Making. Management Theory and Practice: Synergy in Organization, Tartu, 324-339.
23. The Bank of Latvia (2011), Survey of banks results in lending to nonfinancial organizations and households in January 2011. [on-line] Available at: http://www.bank.lv/publikacijas/banku-aptauja-par-nefinansu-sabiedribu-un-majsaimniecibu-kreditesanu/4884.
24. Zelgalve E. (2004), Assesment of Creditworthiness. Articles of Latvian University Volume 671, 431-438.