DECISION MAKING IN CREDIT GRANTING PROCESS

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Why this topic is worth to be researched?
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- In recent years many countries, including USA, United Kingdom, Germany as well as Latvia, experienced stagnation or the granted amount of mortgage credits to households has even declined.

- Households and bank officials admit that the credit-granting process has become more complicated, excessively time-consuming, and non-transparent compared to previous years.

- Bank officials excuses with significant changes that took place in commercial banks practices since the beginning of the crisis.

Agenda

- Theoretical background
- Concept of Research – Decision Making in Credit Granting Process
- Methodology
- Case study and Results
- Conclusions
Theoretical background

- The credit granting process, according to common understanding, consists of two interrelated components:
  - **credit granting policy** (procedures) - represents credit granting methodology to assess credit risk by establishing a wide range of requirements and standards for credit granting.
  - **decision-making** - represents a set of consistent and sequential actions that should be carried out by the loan officers in order to meet all standards and requirements established in the credit granting procedures.

- The main task of the decision-making process in credit granting is to obtain approval or denial of credit granting from relevant authority of commercial banks (in most cases - the credit committees).
Theoretical background – prior research

- Decision-making process in credit granting is rarely documented and analyzed in scientific literature and in procedures of commercial banks.
- At best commercial banks have done is an attempt to reflect the credit granting process either in descriptive or visual way.
- For this purpose banks use techniques such as flow-charts and Entity-relationship model.
- Used techniques are not sophisticated enough to provide comprehensive precept of complicated, multiple staged and diversified process of decision-making in credit granting process.
- Such conclusions implies that commercial banks have not paid detailed attention to that and might have little control over this process.
**Theoretical background**

- Can efficiency of the credit granting process be measured? **by time and labor costs spent on proceeding of a credit application**

- Can Knowledge and clear understanding of the decision-making process in credit granting increase customer’s satisfaction? **by achieving better efficiency and by quality of the credit granting process itself**
Concept of Research

Decision Making in Credit Granting Process
Concept of Research – Decision Making in Credit Granting Process

- This paper seeks to define opportunities to sophisticate credit granting process in commercial banks through creation of a simple, transparent and accountable framework of the decision-making process.
- The developed framework is meant to help commercial banks to improve quality and efficiency, and reduce the cost of their decision-making processes in credit granting.
- The authors define the following objectives to reach the purpose of the study:
  - to transform complicated household mortgage credit granting process into a simple, transparent and accountable framework by using a graphical tool – a decision tree;
  - to identify problem areas of decision-making process in credit granting;
  - to develop practical recommendations for commercial banks on how to improve the decision-making process in credit granting;
  - to assess the potential of the developed framework.
To achieve the objectives of the study the authors defined four tasks:

- Conduct structured interviews with loan officers from Latvian commercial banks;
- Transform results of interviews to a decision tree and fix the time and probability of each alternative solution;
- Carry-out the verification of the developed credit granting decision-making tree;
- Remark the results of the credit granting process decision-making tree.
Methodology
Methodology

- Authors find that a graphical tool, particularly a decision tree, is the proper concept that allows overcoming of drawbacks of previous mentioned techniques – flow charts and ER models.
- Decision Tree allows to transform the decision-making process of the credit granting into a simple, transparent and accountable framework.
- Decision tree is an instrument that explicitly interprets any process and can be stated as a strategy where actions of decision makers can be determined, in the same time the stochastic state of nature can be kept as given.
- By using a decision tree the decision makers can easily decide how to act in each decision node and follow their decision further in depth. In that case, the pace of the process execution depends mainly on the state of nature.
- A decision tree also provides the opportunity for decision makers to analyze and compare different paths of a decision tree.
Methodology

- To achieve the task of the research, the authors have carried out the experiment based on adjusted methodology provided by Reizins and Rutitis\(^1\), who introduced formalization of experts’ opinion method consisted of several iterations.

**Classical Delphi approach**

- Decision tree as a support tool to expert team decision making was found to be efficient and revealed synergy in expert team dynamics.


Classical Delphi approach

1. Start
2. Define the research questions
3. Select panel
4. Design survey
5. Conduct survey
6. Consensus?
   - Y: Summarize conclusions
   - N: Panel reviews survey results

Decision Tree approach

1. **Iteration 1**
   - Familiarize with problem
   - Formulate individual opinion
   - Moderator analyze individual opinion and draw decision tree as reflection of opinion

2. **Iteration 2**
   - Validations of individual decision tree
   - Adjustments if necessary

3. **Iteration 3**
   - Comparison table for a decision tree
   - Consensus decision tree
   - Validations of consensus decision tree
   - Adjustments if necessary

4. **Iteration 4**
   - Step by step. Weights for decision nodes/
     Probabilities for event nodes

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Adopted approach

<table>
<thead>
<tr>
<th>Iteration</th>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(^{st}) Iteration</td>
<td>A)</td>
<td>Finding the experts</td>
</tr>
<tr>
<td></td>
<td>B)</td>
<td>Interviewing of the experts</td>
</tr>
<tr>
<td></td>
<td>C)</td>
<td>Interviews' results evaluation and creation of the decision tree as reflection of experts' opinion</td>
</tr>
<tr>
<td>2(^{nd}) Iteration</td>
<td>D)</td>
<td>Validation of the decision tree</td>
</tr>
<tr>
<td></td>
<td>E)</td>
<td>Adjustments (if any)</td>
</tr>
<tr>
<td>3(^{rd}) Iteration</td>
<td>F)</td>
<td><strong>Step by step. Weight for decision nodes / Probabilities for event nodes</strong></td>
</tr>
</tbody>
</table>
Case study and Results
Case study
- Expert interviews – experts with more than 10 years of experience in credit granting field.
- Experts’ extensive experience in banking sector decrease subjectivity error typical for qualitative methods.

1st Iteration
- During the interviews the selected experts provided the authors with the decisions that are involved in credit granting process.
- Results obtained from the interviews made it possible to draw an initial decision tree.
- It appeared that the credit granting process consists of 6 phases:
  - 1st appointment
  - 1st analysis of gathered data performed by a loan officer
  - intermediate
  - 2nd appointment
  - 2nd analysis of gathered data performed by a loan officer
  - credit committee
Case study

- A total of 40 statements to which an answer is required before decision-making process can be moved to the credit committee.

2nd Iteration

- Starts with the validation of the decision tree drawn during the first iteration
- Experts paraphrase their statements that has been changed by the authors due to legislative framework during the first iteration.
- The structure of the decision tree became stable and the third stage of the formalization can be performed.

Case study

3rd Iteration

- The essence of the experiment
- Each expert provided the empirical distribution of probabilities of each alternative branch of the developed decision tree. Afterwards a combined probability was formulated
- experts shared their experience regarding the time required to perform tasks enclosed in each statement. Afterwards a cumulative time were calculated
- The formalization process was finalized by the development of the decision tree, which bring desired and expected transparency and accountability of a decision-making process in credit granting.
Results

- The carried out experiment brought clarity and complete understanding of the decision-making process.
- Obtained knowledge allowed to develop a decision-making tree, which brought transparency and accountability to the decision-making process of the credit granting, as well as to define execution time of each particular outcome.
- The most important outcome gained from the transformation of the decision-making process into decision tree is development of a flexible framework, which encloses opportunity to analyze and evaluate decision-making process in credit granting from different sides.
Part of voluminous Decision Tree

Zoomed fragment

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Results

- Total amount of alternative solutions are 17554
- Empty sets – alternative solutions that theoretically might take place in the credit granting process, but according to the experts' experience have never took place and their realization probability is close to zero.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realized alternatives solutions</td>
<td>29.17% (5120)</td>
</tr>
<tr>
<td>Rejected alternative solutions</td>
<td>35.82% (6287)</td>
</tr>
<tr>
<td>“Empty sets”</td>
<td>35.02% (6147)</td>
</tr>
</tbody>
</table>
Results

- Before the experiment experts identified that 100 experts’ meetings with the credit applicants per month turn into only 15 signed agreements.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of Positive outcome (approval of credit granting)</td>
<td>14.60%</td>
</tr>
<tr>
<td>Probability of Negative outcome (denial of credit granting)</td>
<td>85.40%</td>
</tr>
</tbody>
</table>
### EWG-DSS Liverpool-2012 Workshop: Decision Support Systems & Operations Management Trends and Solutions in Industries

<table>
<thead>
<tr>
<th>Groups of alternative solutions</th>
<th>Variable</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minutes</td>
<td>Working days</td>
</tr>
<tr>
<td>Overall in the credit granting process</td>
<td>Maximum duration</td>
<td>4064</td>
<td>8.47</td>
</tr>
<tr>
<td></td>
<td>Minimum duration</td>
<td>3</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Average duration</td>
<td>2512</td>
<td>5.23</td>
</tr>
<tr>
<td>Positive decisions</td>
<td>Maximum duration</td>
<td>4064</td>
<td>8.47</td>
</tr>
<tr>
<td></td>
<td>Minimum duration</td>
<td>564</td>
<td>1.18</td>
</tr>
<tr>
<td></td>
<td>Average duration</td>
<td>2412</td>
<td>5.03</td>
</tr>
<tr>
<td></td>
<td>Mathematical expectation</td>
<td>782</td>
<td>1.63</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>2441</td>
<td>5.09</td>
</tr>
<tr>
<td></td>
<td>Mode</td>
<td>1591</td>
<td>3.31</td>
</tr>
<tr>
<td>Negative decisions</td>
<td>Maximum duration</td>
<td>3764</td>
<td>7.84</td>
</tr>
<tr>
<td></td>
<td>Minimum duration</td>
<td>3</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Average duration</td>
<td>2130</td>
<td>4.44</td>
</tr>
<tr>
<td></td>
<td>Mathematical expectation</td>
<td>107.28</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>2081</td>
<td>4.33</td>
</tr>
<tr>
<td></td>
<td>Mode</td>
<td>2431</td>
<td>5.07</td>
</tr>
</tbody>
</table>
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Credit granting process result

Negative response

Percent

Total time in minutes

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Results

- A collateral result of the credit granting process formulation is profile of the whole process in the aspect of field where the interaction between commercial banks and credit applicants is taking place.

![Diagram showing distribution of parameters for decision making in credit granting process.](image)
Conclusions
Conclusions

- The developed credit granting decision tree provides a significant material for further analysis of the credit granting process, which might result in a wider range of recommendation for improvements of the process itself, process quality, efficiency and customer satisfaction.

- The authors suggest comparing of decision-making duration of alternative solutions to a value of the mathematical expectation.
  - Alternative solutions which cumulative time exceeds a value of the mathematical expectation for particular group of the alternative solutions (positive or negative outcome) most likely contains opportunities for improvements.
  - Therefore, the improvement of the credit granting process can be achieved by finding, understanding and negotiating the reason of a decision-making duration of alternative solution that exceed the mathematical expectation.
Conclusions

Time component of the credit granting process introduced by the authors is a key indicator in assessment of the costs caused by the process to commercial banks – they might calculate a cost of each alternative solution.

This study presents the first research in the field of decision-making process analysis in credit granting and provides material for further analysis and research. The authors find that the presented framework of the credit granting process is a helpful tool to overcome at least a part of challenges present in the credit granting process.
Thank you for your attention!