IDENTIFYING INTER – RELATIONSHIPS BETWEEN THE STRATEGIC SECTORS OF THE COMPANY

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Objectives of the Research
Objectives

- Running an analysis of major components (ACP) to find the most important strategic sectors for the company
- Revealing the intensity of inter-relationships within the company and possible predictions of strategic interaction lines
- Identifying the kpi groups that best explain the variance of the outcomes of the strategic sectors highlighted by the ACP
- Using the least squares technique (PLS) to identify correlations between strategic sectors
Literature Review
**Balanced Scorecard Analysis (BSC)**, developed by Robert Kaplan and David Norton – an innovative concept of Strategic Management

<table>
<thead>
<tr>
<th>Financial</th>
<th>Increase Profitability</th>
<th>Increase Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Cost</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Customer</th>
<th>Improve Customer Retention</th>
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<tbody>
<tr>
<td>Lower Wait Time</td>
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<table>
<thead>
<tr>
<th>Internal Process</th>
<th>Lower Cycle Time</th>
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<tbody>
<tr>
<td>Increase Process Efficiency</td>
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<table>
<thead>
<tr>
<th>Organizational Capacity</th>
<th>Improve Knowledge and Skills</th>
<th>Improve Tools and Technology</th>
</tr>
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</table>

Source: *The Institute Way: Simplify Strategic Planning & Management with the Balanced Scorecard*, Balanced Scorecard Institute, 2010.
BSC exemplifies how value is created for the company and progressively presents the logical link between strategic objectives in the form of a *cause-effect chain*

**Limitations of BSC**

*Hanne Norreklit* () states that BSC identifies a logical relationship between the strategic perspectives under consideration, but not a *causal relationship* between them.

Because it does not take into account any link between the organization and competition, BSC is *not* a representative tool of strategic management.

*Kanji* () states that the model is too abstract and the measurement model and relationships between strategic perspectives are not clearly explained, and causal relationships are not strong enough being relationships of interdependence rather than real correlations.

*Malina & Selto* () have determined that the kpi’s identified in the BSC model are biased, and not objective
PLS Method

○ Is a useful tool for statistical modeling in general and financial management, management control, etc. and can be obtained good results with low data samples.

○ As a result of the less rigorous assumptions underpinning the statistical technique, PLS also has the ability to operate with non-normal data (Smith & Langfield-Smith, 2004).

Limitations of PLS

○ It is intended to maximize predictive power with little information but

  but

  ○ Creamer and Freund have exceeded these limits of PLS with the AdaBoost technique:
    - Alternate decision trees have been generated to explain the relationship between corporate governance variables and business performance;
    - The most important indicators of the BSC board for strategic planning of the company are selected (Creamer and Freund, 2010);
    - There were also developed models of structural equations based on covariance (SEM, Joreskog, 1973) or based on manifest and latent variables for situations where the company's performance is measured by a large number of indicators (LISREL, Haenlein and Kaplan, 2006).
3 Methodology and Database
General Considerations

- PLS generalizes and combines features of the main component analysis with multiple regression; it also operates with large (even very large) independent variables to make predictions of dependent variables on company strategic lines.

- From a large sample of economic, financial, social, etc. variables correlated with each other, the **Principal Components Analysis (PCA)** selects a small number of unrelated variables, called **core components**.

- Further, the PLS regression selects latent factors that can not be measured directly and accurately by directly observable indicators and measured by analyzing the main components.

- To highlight the relevance of the variables available, the **Principal Components Analysis (PCA)** grouped economic, financial, staff, etc. variables within **specific activity sectors**. For each sector, we selected economically justified indicators for these choices.

- Finally, the PLS regression generated the cause-to-effect chain between the sectors of activity and the intensity of these inter-relationships.
Methodology

- Identifying inter-relationships between strategic sectors enables company management to hierarchize its activities, and associated with their intensity coefficients, make possible the analysis of changing the various variables on company performance.

- As a tool for identifying the relationships and interactions between the analyzed variables we used a software developed by Prof. Bernard Morard with Dr. Alexandru Stancu and Dr. Christophe Jeannette of Geneva University.

Database

- Historical data was collected from the records available in the analyzed company; we standardized the data on the basis of deviations from the average and the standard deviation.

- Based on 31 economic and financial indicators with an annual frequency from 2010 till 2018, we identified four strategic sectors (axes):

  1. **Profitability** (PROFITAB);
  2. **Productivity and Research** (PROD & RES);
  3. **Capital and results** (CAP & RES);
  4. **Personnel** (PERSONEL).
PCA and PLS Results
Strategic Sectors represent the most relevant activities of the company.

For their correct definition, it is necessary to remove those variables that would not sufficiently explain the definition of the axis, variables that have approximate values, and those that would not fit well in the definition of the axis.

For example, the CAPITAL AND RESULTS sector has a very good reflection (coefficients between 0.9 and 0.7) of the variability of the six explanatory indicators, as shown in the following figure:
The coefficients of variability of the 9 explanatory indicators of Capital and Results sector

Source: Own processing of statistical data with the Geneva University software “Optimal PLS”
Interpretation (1):

○ The performance of the CAPITAL AND RESULTS sector is mainly explained by the Turnover, Total Assets and Quality of Professional Training;

○ The result of these close inter-relationships is found in Net Profit;

○ As a result, significant changes in these variables will strongly influence CAPITAL AND RESULTS;

○ The cause-effect relationships between these indicators and the analyzed sector, on the other hand, highlight the fact that an increase in the fixed and current assets (and as a consequence—sales), for example, will have a positive influence on CAPITAL AND RESULTS.

○ Similar considerations can be performed to inter-relationships in the other sectors: PROFITABILITY, PRODUCTIVITY and RESEARCH, as well as PERSONNEL.
Interpretation (2):

The cause – effect Assets vs. Capital & Results relationship is industry-specific - capital-intensive - and successful companies are those who invest in performing assets with increased efficiency, times, implicitly lower investment costs and fixed costs per produced.

Regarding the intense negative correlation of -0.978 on Sales of toilet paper / Total Revenue it is also confirmed by the existing concerns within the company to find the best alternative (de-invest / re-invest / preserve) for this line of production, the only one with significant moral wear and tear.

The cause-effect inter-relationships are identified and finalized by PLS regression and are not predetermined. The model of this PLS regression has the advantage of being statistically stable, the most stable among all interaction models (validated by the Bootstrap technique). The most relevant results of this PLS model are inter-relationships between sectors - possible cause-effect links between them, as presented by the further diagram:
Possible causal links between the sectors of the company

Source: Own processing of statistical data with the Geneva University software “Optimal PLS”
Interpretation:

- PROFITABILITY has a significant impact (0.892) on PRODUCTIVITY AND RESEARCH (0.86), with a further effect on CAPITAL AND RESULTS, which in turn have a strong effect (0.972) on PERSONNEL.

- Our research highlights the relevant strategic indicators and the logic of the company's management, investing the company's capital in performing assets and training the staff, which influenced the Turnover indicator as well as the Profitability.

- The intensity of the cause and effect connections in the model allows a better understanding of the company's trend. It also suggests measures to be taken by the management to update, correct and anticipate the company's strategy with the help of selected sectorial indicators.
The diagram of axle interrelations in detail, as well as the explanatory power of each sector with the meaningful variables

Source: Own processing of statistical data with the Geneva University software “Optimal PLS”
The statistical validation of the model reveals high values on the consistency of the model's reliability (exception, axis 2) of the extracted variance (exception, axis 4) and the determination coefficient $R^2$ (with values of 0.889, 0.611 and 0.503 respectively).

The explanation of the cause-effect link between axes 1, 5 and 2 is shown further:
Statistical validation of the PLS^2 model application

<table>
<thead>
<tr>
<th>Sectors</th>
<th>Composite Reliability</th>
<th>Medium variable extracted</th>
<th>Determination Coefficient R^2</th>
<th>Redundancy Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFITAB</td>
<td>0.111</td>
<td>0.268</td>
<td>-</td>
<td>0.343</td>
</tr>
<tr>
<td>PROD&amp;RES</td>
<td>0.775</td>
<td>0.493</td>
<td>0.796</td>
<td>0.600</td>
</tr>
<tr>
<td>PROD&amp;RES</td>
<td>0.983</td>
<td>0.915</td>
<td>0.740</td>
<td>0.897</td>
</tr>
<tr>
<td>CAP&amp;RES</td>
<td>0.509</td>
<td>0.318</td>
<td>0.945</td>
<td>0.454</td>
</tr>
</tbody>
</table>

Source: Own processing of statistical data with the Geneva University software “Optimal PLS”
CONCLUSION
Determining the right strategic sectors is essential for gaining added value, as well as efficient resource management, risk control and success in competition.

If the purpose of the study is the **performance strategy**, it is necessary for the variables to explain the sector well.

The correct determination of the sectors is determined by the collection of performance indicators, resource management, risk control, competition success, etc.

The increased relevance of performance indicators gives more power to the optimum BSC model. Further, the PLS regression selects latent factors that cannot be measured directly and accurately by directly observable indicators and measured by analyzing the main components.

The intensity of the cause-effect inter-relationships in the model allows for a better understanding of the company's trend. We have thus identified how much of the variability of each indicator is captured by the strategic sector it is part of. It also suggests steps to be taken to update, correct and anticipate the company strategy using industry-specific indicators.

PLS addresses the synthesis of strategic performance by identifying cause-effect relationships between variables and sectors on one hand, and between sectors (their hierarchy), on the other. This approach allows understanding the causal chain of strategic performance. **The PLS approach could give the company a real advantage in economic competition.**
Thank You!

Any questions?