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C O M M U N I C A T I O N S

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NEW METHODS OF DESIGNING THE BALANCED SCORECARD METHOD FOR MANAGEMENT IN INDUSTRIAL COMPANIES

The Balanced Scorecard (BSC) is a strategic performance measurement system for enterprises, which allows managers of industrial corporations to measure variables that are based on strategic goals of a company. The issue while creating and implementing the BSC system could lay in a mere copying of its traditional forms without incorporating specific needs of a particular enterprise. This article aims to present the research results of a team of authors that was, in cooperation with managers of selected companies in the Moravian-Silesian region, searching for an answer to a question, whether it is possible to simplify the creation process of the BSC without losing the information value of the whole method or of its individual parts. At the same time it was examined whether, in the case of heavy industry, there are different priorities against others.

Keywords: strategic management, BSC method, industrial companies, managers, competitiveness, consistency analysis, item analysis, focus groups, questioning

1. Introduction

The on - going processes of the market globalisation and computerization, management's internationalisation and product and technological innovations bring to the market both - opportunities, as well as threats. Early anticipation of these changes and ability to deal with potential problems of a strategic nature, bring to these enterprises certain competitive advantages [1]. The core of successful company management consists of strategic management that cannot be effective without relevant information serving as a basis of manager's knowledge needed for their decision - making processes. In industrial corporations, in particular, well - done implementation and management of innovations play a great role [2].

When forming a strategy one should work with the results of strategic analysis. To do that you need to have an appropriate IT support with all the types of companies: large industrial enterprises [3] or small and medium - sized enterprises [4], or the public sector organizations [5]. Current managers are in need of a complex tool to measure variables derived from strategic goals of a company. A tool that besides financial indicators also focuses on areas of company's operation dealing with external as well as internal customers and consequent innovative activities. And that is exactly what the strategic performance measurement system for

enterprises - the Balanced Scorecard (BSC) can provide. In Czech conditions, this system is often implemented from the bottom, i.e. the demand to create the usually structured BSC is requested, as it is a tool used by the largest number of companies. After putting individual factors and indicators to four areas (dimensions) of the BSC, it is then consequently and at regular intervals, verified whether the numerical scales are in this company met or not. However, thus constructed BSCs are not based on the company's strategic goals and represent only a set of figures, not a tool for performance measurement. That is why the authors of this article, in cooperation with managers of selected enterprises, have decided to revise the current approach towards the BSC creation, consisting merely in copying of the usual BSC, and find a new, simpler procedure based on the specific needs of local enterprises.

2. Analysis

2.1 The BSC method

The Balanced Scorecard is a strategic management tool. The abbreviation BSC, which is used for this method, in Czech translation means the system of balanced performance indicators. Performance must be measured so that the management knows

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to what extent are the strategic goals fulfilled and whether the company is competitive. Since the beginning, the BSC was a very successful tool for implementing corporate strategies and gradually it has become the most important concept of strategic management [6]. The BSC method is universal and therefore applicable in all sorts of companies. Its model thus cannot be seen as a formula, but rather as a template. In the case of individual perspectives of the BSC, the authors themselves admit that the number of these perspectives and their structure may differ from business to business. Nevertheless, there are a lot of cases when while implementing the BSC in various companies only the basic structure is copied with its 4 major dimensions (financial, customer, internal processes and training and development). To make the whole system work, individual steps of the strategic management should be in an appropriate sequence, so the mission and vision of the company should be followed by objectives, out of which the strategy is then formed and implemented. To successfully implement the BSC, it is important to link the scale factors of performance in individual perspectives to the strategic goals and not only form them based on a demand focusing on fulfilling certain perspective of the BSC by some controlled indicators. The strategic goals should be based on a relevant strategy, as well [7].

2.2 Creation of the BSC

There are many ways and procedures while creating the BSC; the most frequently implemented are the traditional structures of the BSC, which are then used for criterion selection. In many cases highly sophisticated methods for measurement are used, which may be for many companies unavailable, overly complicated or require cooperation with another subject. For example, Yuksel and Dagdeviren [8] dealt with measuring and evaluating individual dimensions of the BSC of a production company in Turkey. The expert team included authors of the article and managers of different departments of the company. Performance indicators were set based on literature study and finally for their consolidation with the BSC structures, the fuzzy ANP technique was designed. Wu [9] developed a structured evaluation methodology putting the key performance indicators, into a strategic map according to the BSC for banks. The most important key performance indicators synthesized into the dimensions of the BSC were collected by literature review. Subsequently, a list of criteria was made and the DEMATEL method was used to determine causal relations. Wu, et al. [10] used the similar procedure three years before while evaluating the performance of banks. Firstly, they reviewed indices that could be used for evaluating performance of banks out of a literature and then they summarized them in accordance with the 4 dimensions of the BSC method. Furthermore, they used the method of fuzzy analytic hierarchy process to calculate the relative weights

of selected evaluation indices. To evaluate the performance of banks, they used three analytical tools of multi - criteria decision - making, namely the WSA, TOPSIS and VIKOR.

The authors of this article consider s the approach of Bentes, Carneiro, da Silva and Kimura [11], towards designing the BSC for a telecommunication branch in Brazil, as essential for their research procedure. For this research, managers of the company set three functional units that were from their point of view, the most important in connection to company's performance. The indicators were determined and selected by various people from the company, specifically employees of functional units, senior managers, supervisors, analysts and directors of financial operations. After conducting the focus groups and several brainstorming sessions, indicators were found and evaluated according to their significance. The individual participants did not set such a significance; it was a result of a discussion with a unified consensus.

3. Methods

3.1 The consistency analysis

To create a comprehensive scale out of a several questions (items) of a questionnaire set, such creation should be meaningful and consistent. There are many possibilities how to verify that, yet the most used one is the consistency analysis with the use of the Cronbach's alpha coefficient [12]. It is based on an assumption that all the items measuring one attribute shall have a positive and sufficiently high correlation between them. The Cronbach's alpha measures reliability as an internal consistency. It may be interpreted as an estimate of the lower confidence limit (reliability) for the summation variable Y, the components of which may not be parallel measurements. To measure the internal consistency of groups *as well as* items ($i = 1, 2, ..., k$), it is necessary to determine the sample variance σ_i^2 of individual k items that will be consequently compared to the variance σ_i^2 of the measured initial file, expressed as the sum of the individual items. The Cronbach's alpha can then be expressed by equation [13]:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_i^2}{\sigma_i^2}\right) \qquad (1)$$

where:
k is the estimated number of (free) parameters,
σ_i^2 is the variance component i for the given sample
σ_i^2 is the variance of the measured initial file.

The value of $\alpha = 0$ means extremely inconsistent group of values (entries are not correlated), while $\alpha = 1$ represents 100 % consistency, when all the items in the group are linearly dependent and express the same thing. The Cronbach's alpha

value should be optimally greater than 0.7 for each latent variable, sufficient amount appears to be a value of 0.5. Simultaneously, α > 0.9 represents an unnecessarily large amount of items.

3.2 The item analysis

The item analysis is used to evaluate individual items of the set of questions without regards to which the aggregated indicators they belong to. This way it is the most likely to find the most outstanding views within the set of questions. Additionally, you can determine whether each item of the set was suitably put one after another in the correct order and see whether the respondents do not fill the questionnaire automatically, but they take a minute to think about their answer, or more precisely, put down what is their true evaluation. While searching for the most outstanding opinions, the average score (arithmetic mean) may be determined for individual items. After that you can calculate the strength of the opinion for individual items as a standardized absolute distance NAD the average score from the average scale value x_{med}.

$$NAD_i = \frac{2 \cdot \left| \bar{x}_i - x_{med} \right|}{R} \qquad (2)$$

where:

R is the range of scale (difference between maximum and minimum values).

The standardized absolute distance takes values between 0 and 1, where the higher the value, the stronger the opinion. As a strong opinion may be considered an item for which the $NAD_i >$ 0.5 applies.

4. The primary qualitative research method

The research, which involved the authors of this article, took place in 2015. The primary research procedures were based on a combination of qualitative and quantitative research. The outputs of the qualitative research served as the inputs for the quantitative one. The quantitative research, performed among the managers from Moravian - Silesian Region (MSR) aimed at verifying the accuracy of the outputs of the qualitative research. The following part of the article focuses on the qualitative research method design.

4.1 Preparing the research

Starting points for the research conducted with managers of MSR were established by the explorative research, which used the unstructured interviews with experts and studying of available secondary sources (from the field of the BSC and statistical methods). A revision of the methodology of the BSC for achieving the higher competitiveness of Czech companies was defined as a research problem. The aim of the research was to verify the accuracy of the BSC setting in the conditions of Czech companies, in particular, selected companies operating within the MSR. To that end, in cooperation with selected experts, a research hypothesis was defined and had to be verified by using other research techniques:

Hypothesis: Experts with knowledge of local situation are more important for proper designing of the BSC than the published secondary sources of past experience.

The hypothesis was created as a critical approach to some of the published outputs from the scope of the BSC, when authors of the studies preferred reviews from literature while selecting the input set of factors for constructing the BSC and it was often conducted based on a specially developed systems analysis, instead of seeking the simplest procedures.

4.2 The research organization plan

The qualitative data was obtained from experts in the field of strategic management and from managers of selected companies via the focus groups. The outcome of the interviews in form of a questionnaire was used as the mean for quantitative research. The managers of companies in the MSR filled in the questionnaire by being personally interviewed. The sample size was limited to 100 respondents. Data analysis also compared results in selected groups of respondents with the emphasis on the following groups:

- Main activity (production),
- Sector / core business (industry),
- Scope of business (mining and metallurgy),
- Prevailing customers (B2B),
- Average number of employees - more than 250,
- Average gross annual sales / revenues of more than a billion CZK.

It was suggested that statistical data analysis was carried out using a combination of one and multivariate statistics methods (for example factor, cluster and correspondence analyses). This article further presents the results of consistency analysis.

4.3 The research implementation

The qualitative research data collection was conducted via the focus groups. Those focus groups were hosted several times and consisted of the authors of this article, 8 - 10 experts on strategic management and managers of selected companies of the MSR. The aim of this group was to examine the individual proposals arising during these group debates and discuss them more. Only after all of the participants agreed on the proposal, such could

Table 1 List of questions of the evaluation set of the quantitative questionnaire

	I. Financial perspective
F3	financial planning and budgeting
F4	analysis of financial indicators
F5	cost analysis
F6	risk analysis
F7	financing method
F8	management of current assets
	II. Customer perspective
C10	market analysis, opportunity search
C11	comprehensive offer
C12	customer segmentation
C13	characteristics of customers
C14	Customer Satisfaction Analysis
C15	building customer relationships
	III. Perspective of processes and innovations
I17	implementation of innovations
I18	process management
I19	process analysis
I20	optimization, redesign and reengineering of processes
I21	support of innovation by management of the company
I22	willingness to participate in innovation from the side of employees
	IV. Employee's perspective
E24	planning and prediction of places and work loads
E25	hiring and selection of employees
E26	management and evaluation of employees
E27	employees' carrier management
E28	employee's motivation
E29	safety and working conditions of employees

Figure 1 The conceptual diagram of the three - level model

be approved for further research procedure. The first topic of discussion was whether or not to revise the current state of the BSC structure at all. Participants expressed their opinion that many of the companies have the BSC proposed only because it is a necessity. After they receive it, they either do not know how to use it or they are using it, but its true purpose, importance of its implementation and above all the content of the BSC in connection to strategic goals of a company, are not further communicated nor used, and thus the resulting benefit of the BSC for the company's competitive advantage is again disputable. Another extensive topic was the actual form of the BSC and its content. Participants of the discussion expressed their negative attitude towards automatic acceptance of previously published standards without the knowledge of local market specifics and a number of external and internal factors influencing the particular company. To verify their claims the focus groups participants created their own concept.
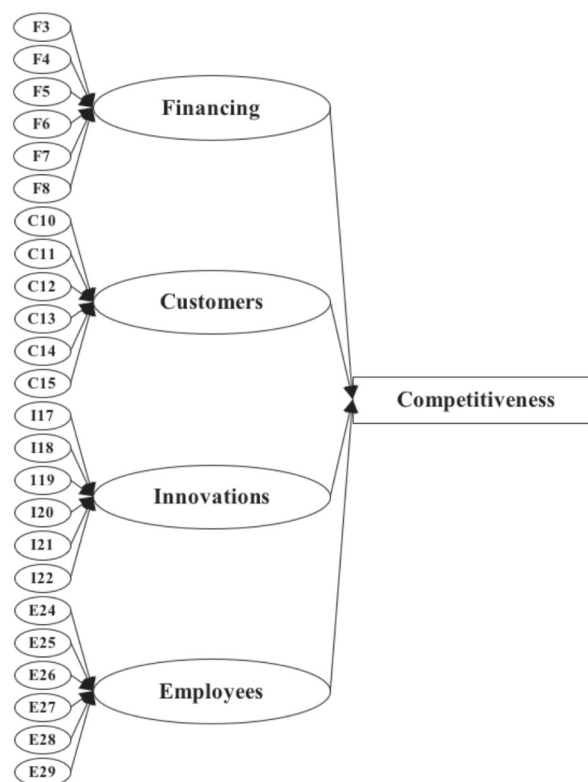
5. Results

5.1 Evaluation set

The expert group suggested 50 possible questions out of which 24 evaluating questions were selected. These questions were divided according to where they belong to one of the four basic perspectives/dimensions of the BSC, see Table 1.

During a subsequent questionnaire survey, the respondents evaluated this set of 24 questions on the scale of 0 (zero significance / importance) - 4 (great significance / importance). Altogether 200 companies operating in the MSR were approached. Out of questionnaires that met the conditions of accuracy and completeness 111 were selected as they fulfilled the criteria for maximum/minimum relative frequency of respondents in each category of sorting variables.

5.2 The three - level model

Based on the submitted set of evaluating questions, a three - level model has been created. This model explains competitiveness in four areas of the BSC, whereas each area consists of six evaluating questions (items), see Figure 1. The items use the

Table 2 Degree of consistency and average values for each area of the BSC

Summary indicator	Mean	Cronbach's α
Financing	2.934	0.649
Customers	3.047	0.746
Innovations	2.749	0.882
Employees	2.852	0.807

Likert - type rating scales. The values of the individual items then serve as a basis for the overall value of indicators.

5.3 Consistency of the current model

To measure the internal consistency of the group the Cronbach's α was used. In our three - level model we can measure the influence on each of the BSC area on company's competitiveness by means of 6 items on an integral evaluation scale 0 (no influence) to 4 (significant influence). As a summary indicator the average of 6 items is used, which is the way able to take the (quasi) continuous values from 0 to 4. Table 2 shows the degree of consistency and average values for the individual areas describing the company's competitiveness.

The limit value for the Cronbach's α is 0.5 and ideally it should be greater than 0.7 for each latent variable. It is therefore clear that the given items express all four areas very well. That means that the newly established aggregated variables may now be used in further analyses.

When comparing the results of the model consistency with the answers of the respondents to each question, a clear trend of levelling the importance of all four areas of the BSC can be seen. The obvious difference between evaluating the importance by using the set of evaluating questions (by their aggregated indicator) and stated influence on the competitiveness out of a direct question regarding it, is shown in Table 3, where the line maxima are marked in red and the column maxima in yellow.

While the column maxima of this table form, as expected, the main diagonal matrix (i.e. the same strategies match each other), the line maxima appears only in the second column. That means that the managers quite consistently claim that the greatest influence on competitiveness lay in customer oriented strategies, regardless of which strategy according to the questionnaire they appointed with the greatest importance. If we calculated the

Table 4 Item analysis of the question set

Items of the question set	Mean	NAD
C15 - building customer relationships	3.60	0.799
F3 - financial planning and budgeting	3.31	0.654
C10 - market analysis, opportunity search	3.30	0.650
C11 - comprehensive offer	3.17	0.584
F5 - cost analysis	3.12	0.561
E29 - safety and working conditions of employees	3.11	0.556
E28 - employee's motivation	3.07	0.533
E26 - management and evaluation of employees	3.04	0.519
C14 - Customer Satisfaction Analysis	3.03	0.514
F4 - analysis of financial indicators	3.02	0.509

consistency between the newly created aggregated variables that correspond to individual strategies, we would get the value of $\alpha = 0.848$, suggesting a high consistency of aggregated variables.

5.4 The item analysis

If we have more than 50 measured values for each item, we can perform the item analysis for the set of evaluation questions. For the five - value scale with variations of 0 - 4 (zero significance / importance) - 4 (great significance / importance) that was used for the set of 24 evaluation questions, this parameter can be calculated as:

$$NAD_i = \frac{\left| \bar{x}_i - 2 \right|}{2} \qquad (3)$$

Out of the 24 items of the question set, a strong opinion ($NAD_i > 0.5$) is expressed by 10 items, which is app. 42 %, see Table 4. All the set items have a sample mean higher than 2, which means that they represent a positive attitude. Therefore, the managers consider all the items as important and at the same time the order of their responses do not comply with the order of the items in the set of questions, which means that the questions were set correctly.

When carrying out the item analysis of the question set according to selected classifications the largest finding item I17 - implementation of innovations (average evaluation 2.99) was found. It is a factor that together with item I18 - process management - most frequently achieved the biggest differences

Table 3 Relation between the aggregated indicators and stated influence on the competitiveness (in %)

Greatest importance	Stated influence on competitiveness			
	Financing	Customers	Innovations	Employees
Financing	30.58	33.08	19.42	16.92
Customers	23.50	40.17	19.67	16.67
Innovations	24.55	32.73	25.00	17.73
Employees	26.40	34.60	18.40	20.60

in the evaluation of selected groups. Both of these items reached the positions in the top ten according to the measured values for groups of companies, which according to the methodology of the research were crucial for the following:

- Production companies,
- Industrial companies,
- Mining and metallurgy,
- Prevailing B2B customers,
- With more than 100 employees.
- With a turnover of over one billion crowns.

This list agrees with the experts, who during the preparation of the questionnaire considered innovation to be important for achieving competitiveness, especially in large industrial enterprises. In the subsequent statistical analysis of data (mainly exploratory and confirmatory factor analysis and hierarchical cluster analysis) it was confirmed that out of the suggested set of questions, based on the of respondents' answers, a five - factor model may be created. This model would be identical with the usual four perspectives of the BSC.

6. Discussion

The hypothesis of the expert group, expressing a certain level of criticism towards automatic implementation of already existing standards while creating the BSC, as well as unnecessary use of overly sophisticated systems and procedures instead of searching for simpler and functional solution for creating the BSC, was verified by several research procedures and the respondents of the qualitative research (managers of MSR companies) had confirmed it. It may be presumed that for creating the BSC in practice, the best solution would be combining a group of experts from external (experts, academics) environment together with people working in the internal environment of enterprises and companies (owners, management) to create a suitable structure of the BSC. They may use both, their experience with implementing this method in other companies, as well as knowledge of their current surroundings (external participants), and strategic plans that they wish to implement in their company, along with a thorough knowledge of the internal environment of the company (internal participants), which should ensure that the result will comply with the needs of a specific company.

An important factor that influenced other research technique in this work was the decision of the existing members of the expert group that all the outputs of their actions shall be agreed upon by all of the focus groups participants otherwise the result will not be valid. Putting this condition to practice means finding a common approach towards the BSC implementation in the company that would be agreed upon by all the BSC creators. In this way, the BSC should be linked to the strategies and strategic objectives of the firm and consistent communication of the BSC as a tool for management and evaluation of other employees in the company should be ensured (whether while implementing the BSC or during its use within the company). At the same time it has been proven that the respondents of the quantitative research correctly interpreted (understood) given questions and were able to answer them accurately.

7. Conclusion

The Balanced Scorecard method as a useful tool for improving the competitiveness of industrial enterprises became the research content of the authors of this article, who have decided to verify the configuration of the BSC in conditions of selected companies operating within the Moravian - Silesian region. They obtained their feedback, suggestions and help on the matter from managers working in the MSR. The aim was to find out whether the BSC structure might be simplified without losing the information value of the method as a whole or in some of its parts. Secondly they aimed to discover whether in case of industrial companies (especially in the field of mining and metallurgy) the priorities are different in comparison to other companies.

The research method confirmed that the combination of quantitative and qualitative research is suitable for creation and implementation of the BSC. While using the simple procedures when creating the BSC, the results of both researches allow getting feedback from large number of respondents that will have an easier job providing their feedback than in the case of other, overly sophisticated procedures.

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