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Optimizing of the Balanced Scorecard method for management of mining companies with the use of factor analysis

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The managers of information age companies cannot rely merely on data derived from past activities of the company and focus on improving existing processes. They need a frame for measuring values that result from strategic goals of the company, a tool, which is focusing on obtaining information about company's current success, as well as finding new driving forces to ensure the future competitiveness of the company. Strategic business performance measurement system the Balanced Scorecard (BSC) is a suitable tool for improving the competitiveness of industrial companies. During its implementation, however, there is a conflict of perception of the importance of individual goals and measurable characteristics in partial perspectives of the BSC and its actual enforcement of the various strategic objectives in companies. The aim of this article is to verify the accuracy of BSC settings in an environment of selected companies in the Moravian-Silesian region with the emphasis placed on mining companies with the help of multidimensional statistics – factor analysis. The research took place in 2015 in cooperation with managers from the Moravian-Silesian Region (MSR), and it was divided into two kinds of research – quantitative and qualitative.

Key words: *Strategic management, BSC method, industrial companies, mining companies, managers, competitiveness, factor analysis.*

Introduction

The business environment is known to be often and abruptly changed and constantly threatened by strong competition. If the company wishes to be successful, it should set specific aims at various decision-making levels together with means to accomplish them. The unique and well-put strategy is essential for companies operating at B2B markets especially since there are fewer customers, but they are bigger than customers on the consumer market. Based on the empiric research, Pawliczek et al. (2015) state that companies that use the thorough strategic planning and introduce innovations underwent the period of slow market growth after the last world's economic crises without any difficulties.

Balanced Scorecard (BSC), a strategic system for measuring the performance of companies, proved to be a suitable tool for managers, which besides financial indicators, also focuses on the areas the company operates within in relation to their internal as well as external customers and consequent innovations. The only problem while implementing BSC in practice seems to be the initial perception of the importance of each of the goal, factor or measurable parameter represent in partial perspectives of BSC for the company's managers and the consequent actual implementation of established strategic goals within the companies. For this very reason, the authors of this article have decided to verify the discrepancy mentioned above on the number of managers in a selected region. The research took place in the Moravian-Silesian region and therefore the authors chose to compare individual influences of industrial and mining companies, as those are for this region typical.

State of the problems

As a strategic tool, the Balanced Scorecard (BSC) is clearly determined by four basic perspectives aiming at measuring the success of a company (financial, customer, internal processes, training and development). However, it also provides enough space for individual differentiation of BSC for each of the company, according to specific conditions simulating the environment where the strategic decisions are made (Kaplan and Norton 1996). Consequently, it appears essential to evaluate the importance of individual perspectives while the

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industrial and mining companies try to achieve greater competitiveness. For instance, Kašík (2013) presented his modified Six-Box Model.

BSC method

The reason for implementing the BSC method was the criticism of the way companies have been managed up until now, i.e. with only financial aspect in view. The main impulse to create the new concept of business management was the fact that so far the performance was determined on the basis of outputs of inflexible business financial accounting. Evaluation based on the past data did not provide relevant information to achieve the desired success in an increasingly intense competitive environment (Vysušil 2004). BSC is often used in combination with other methods. Modak et al. (2017) focus on the development of an effective performance evaluation framework based on BSC and Fuzzy Analytic Hierarchy Process (FAHP) for the Indian coal mining organisation. BSC administers strategic elements of decision-making in assessing the performance of the firm whereas FAHP is applied to determine the relative importance of the criteria in regard to approving the organisational objectives. In the mining industry, the transport is one of the areas having considerable potential within the scope. Staš et al. (2015) design a conceptual framework for creating the Green Transport (GT) BSC models using an appropriate multi-criteria decision.making method with used Analytic Network Process (ANP).

The most common aim of the outcomes published about BSC is finding the answer to a question: which perspective of BSC and which partial factor plays the most important role when achieving greater competitiveness of the monitored companies. In the article published by Fouladgar et al. (2011), these authors dealt with setting and determination of priorities for strategies in Iranian mining industry. The questioning was carried out among the senior management of mining industry. According to BSC, the customer perspective had been selected as the most important perspective followed by financial perspective, internal processes and training and development. The research also showed that the strategy aiming at improving mining and production proved to be more significant than any other strategies.

For effective management, it is necessary to realise that the individual BSC perspectives are interrelated. As Toušová et al. (2007) proclaim, the combination of financial and marketing approach in the area of increasing the share of energy resources in the Slovak market benefits the future users on the one hand and the increase in sales volume for the sellers on the other one. Šimková et al. (2016) add that mineral resources are an important and indispensable condition for the continuous development of the economy. For their efficient use, a strategic approach is needed, which must be reflected in responsible raw materials policy.

Competitiveness and innovation

The significance of innovations in the economy is growing. Innovations accelerate and improve design, development, production and use of new products, industrial processes and services. They play a crucial role in maintaining competitiveness both at national, European or world market. Current worldwide low commodity prices force the mining companies to reduce unit costs and increase productivity. For example, Elevli and Elevli (2010) deal in their article with the use of the overall equipment effectiveness (OEE) to measure the effectiveness of mining equipment. While Maruszewska et al. (2014) point out the importance of private vs state ownership of mining companies. Another important area often published and relevant to this article is introducing innovations in the industry. The basic question is whether or not to introduce innovations in companies that are part of the industrial mining of natural resources. The study of De Arteche et al. (2017) includes the application and validation of a balanced scorecard for measuring innovation and knowledge. The results show that Chile is the leader in the mining sector, Argentina is more developed in the life sciences sector, Colombia performs better in human resources, and Peru is professionalising the mining enterprises.

Klippel et al. (2008) claim that among factors ensuring the survival of companies, innovations are the most relevant one. To prove their claim, they presented in companies within the industrial mining of natural resources, how a new way of management – implementation of the integral use of lean manufacturing and mining engineering, may influence their competitiveness. Moreover, results obtained by the practical use of lean manufacturing in fluorite mining company in Brazil show that there is a potential for adopting this integration. By adopting this concept, the company has saved significantly. Management innovations are very important in the context of linking individual parts of the BSC. As Jurkasova et al. (2016) emphasise, it is essential to use the appropriate tools for the management of organisational changes in the trades such as mining industry. The main tool of the InLook system brings along many advantages in this field. This tool is promising for corporate management and employees, especially in manufacturing companies such as mining companies where rather highly qualified employees should work. Especially nowadays when the employers, as well as employees and also businesses, are thrown by never-ending changes and uncertainty.

Based on the secondary data analysis, Bartos (2007) examined whether is the mining industry conservative and dull or whether it is a sophisticated field and a high-tech industry. The results suggest that mining industry may be compared to any other sectors of the processing industry. However, when comparing to high-tech processing industry, which is on a much higher level, the difference was quite significant. Finally, it has been

discovered that investments into the basic research and development were in the mining industry, compared to other sectors, very low and they kept plummeting.

Methods

Further presented analysis methods of available theoretical resources are used for the needs of defining the key terms in the BSC area and bases of used analytical procedures. Selected methods of primary marketing research above all focus on obtaining feedback from managers of companies operating within the Moravian-Silesian region by means of personal interviews and questionnaires. For the analytic purposes of this article, the principles of factor analysis have been used.

Factor analysis

Factor analysis serves to reduce a large number of (manifest) variables into smaller clusters (latent variables) with minimum loss of information. Therefore it is possible to create perception maps while researching the knowledge of products or brands by consumers or simulate correlated track purchases, or least but not last it use it to get the most efficient data reduction of extensive customer databases, etc.

According to Hendl (2004), factor analysis focuses especially on these three following targets:

- Analysis of correlations of larger number of variables using their clustering, when the intra-clusters variables strongly correlate together, while variables from different clusters do not correlate with each other,
- Interpretation of clusters, or more precisely new factors based on the original variables, which are included in the specific factor,
- Summary of the variability of variables by using a small number of factors.

Variables used in factor analysis should have quantitative character. Marketing research often works with five (or seven) point Liker scales.

If factor analysis aims at reducing the number of information needed to describe particular phenomenon, it can be argued that a set of evaluation items X_i (i = 1, 2, ..., k) try to explain, respectively replace a smaller group of latent variables – factors F_j (j = 1, 2, ..., m), by which we can accurately describe the behaviour of the phenomenon *($j < i$).* Mathematically, the result of factor analysis can be described using systems k of linear equations:

$$\begin{aligned} X_1 &= a_{11}F_1 + a_{12}F_2 + \ldots + a_{1m}F_m + \varepsilon_1 \\ &\vdots \\ X_k &= a_{k1}F_1 + a_{k2}F_2 + \ldots + a_{km}F_m + \varepsilon_k \end{aligned} \qquad (1)$$

where:

X_i - measurable manifest variables,
a_{ij} - factor loadings,
F_j - latent variables,
ε_i - residual (unexplained) variable X_i.

In addition to naming new factors, the next step may be the analysis of factor scores as by means of these unique values for each measured case, new factors (new variables) may be used in subsequent data modelling.

Factor analysis, strategic management and BSC

Because BSC is closely linked to strategic management, we would like to present studies, where factor analysis was used in the strategic context. Chaiprasit and Swierczek (2011) investigated factors influencing global performance and technological development from the perspective of management in Thai companies. By using factor analysis, they identified three dimensions – Global Activities, Strategic Direction of a Company and Strategic Management Competencies. To achieve better performance, the companies should accept global standards, choose potential international partners, use international projects and focus more on the level of globalisation of their operation.

The most common area of factor analysis used in connection with strategic management is the area of human resources. The perception and expectations of human resources experts towards the content of human capital measurement in conjunction with the company's strategy and performance impact have been previously covered by, for example, Gates and Langevin (2010). By means of analysis of main components – work efficiency and costs of knowledge (indicators of efficiency), they derived two factors (types of human capital

measurement). The results of factor analysis confirm that the more developed is the company in the field of measuring human capital development, the higher efficiency it achieves. Company's strategy shall not be created merely on the basis of internal stimulations, but it should also be applied with the knowledge of limitations deriving from company's external environment. In their study, Fraj-Andrés et al. (2009) targeted those factors influencing the choice of strategies in the environmental area within Spanish industrial companies. The results of factor analysis show that pivotal factors explaining why companies integrate environmental issues into their strategic planning process are competitive motivation and determination to lead.

Methodology of conducted research

The research, which involved the authors of this article, took place in 2015 in cooperation with managers from Moravian-Silesian Region (MSR) and it was divided into two kinds of research – quantitative and qualitative. The following pages of the article will contain detailed methodology and results of the quantitative research, which was based on the results obtained from the qualitative one.

Preparing the research

The explorative research was conducted at the beginning of the research process (Kozel et al. 2011). By combining unstructured interviews with experts and researching available secondary resources, above all published outcomes in the area of BSC, statistical methods as well as regarding the importance of innovation in the industry, the authors found a suitable basis for further described research of managers from MSR.

The research effort aimed to verify the accuracy of the BSC settings in terms of Czech companies that have been performed on a sample of businesses from MSR. It was, therefore, necessary to verify the research hypotheses that were determined based on the implementation of the unstructured interviews with experts and study of the available secondary sources, mostly outputs published within the area of research.

One of the hypotheses was devoted to a particular form of BSC. The second focused on the importance of innovation in the industry. Hypotheses were formed as an outcome of the interviews with experts in the field of strategic management and managers of selected companies, who claim, that in the large industrial companies, such as mining companies, innovations play a more significant role when it comes to competitiveness than many of the managers care to admit:

H_1: Instead of typical 4 dimensions the Czech industrial companies may use an alternative approach within the BSC.

H_2: Innovations have major impact on achieving greater competitiveness of industrial enterprises.

The whole research process was carried out in 2015. The quantitative research preparation stage included besides indicative analysis of research and testing the functionality of the questionnaire on the group of 10 managers, also a proposal for the methodology of collecting and analysing data. The questioning has been selected as the most suitable method of primary data collection, more precisely personal questioning with a paper questionnaire to allow respondents to clarify the questions, if necessary. The questioning was scheduled for the second quarter of the year when the research process methodology had already been defined and simultaneously trained university students were able to take the role of an interviewer upon them. Data were collected at respondents' place of work. Respondents for the quantitative research were managers of companies operating within the Moravian-Silesian region. The sample size was determined by the lower limit of 100 respondents. It was suggested that statistical data analysis should be carried out using a combination of methods of multivariate statistics. This article presents the results of factor analysis.

Implementing the research

Collection of data from a questionnaire survey was carried out among 200 companies operating in the territory of the MSR. Out of this number, the interviewers were rejected in 76 cases, and 111 complied with the required standards out of the remaining 124 questionnaires. To achieve proportional and comparable representation of various groups of respondents, it was set that in case of sorting variables with only two categories, both of them may acquire any relative frequency from 1/3 to 1/2 of the respondents. Variables with a higher number of categories only the upper limits for each category were set – maximum 50 % of respondents. Specifically, it was the following sorting variables and categories:

- Main activity (production, other),
- Sector/core business (industry, other),
- Scope of business (montanistic, other),
- Prevailing customers (B2B, others),
- Average number of employees (11-50; 51-100; 101-250; more than 250),
- Average gross annual sales / revenues in millions of CZK (11-100; 101-250; 251-1000; more than 1000).

To ensure the accuracy of factor analysis, the following procedures were used: factor analysis use suitability for the given set of questionnaire items was assessed using the Kaiser-Meyer-Olkin degree of adequacy choice – KMO (Malhotra and Birks 2006) and using Bartlett's test of sphericity.

The number of new factors was first determined using the so-called Kaiser criteria that will allow only those factors to enter the model, whose own value (eigenvalue) representing the variability of the variable system explained by this factor, is higher than 1. Then, the scree plot has been used (Meloun et al. 2005).

The most widely used method of Principal component analysis was used for factor extraction. For the reasons of more suitable interpretation, the so-called rotation solution was consequently used ensuring more balanced assignment of the original variables to individual factors. Varimax rotation method was used to minimise the number of factors with high loading, and therefore the whole interpretation was much easier (Pecáková 2008). New factors were consequently named and then entered in further analyses as new variables in the form of factor scores.

Results

The questionnaire, which was formed during the qualitative research, used all twenty-four-evaluation items for the factor analysis. One of the aims of this analysis was to find out whether the four strategies (of the BSC area) appropriately and sufficiently describe the main objective, i.e. determining the competitiveness of the company. Those twenty-four questions were split into four groups (dimensions, indicators) based on the common BSC structure:

- **F**inancial
- **C**ustomer
- **I**nnovation
- **E**mployees

Model with six factors

Besides qualitative requirements to carry out factor analysis, also the suitability was used for the given set of items consequently verified quantitatively – by means of Kaiser-Meyer-Olkin test of sampling adequacy (KMO > 0.5) and Bartlett's test of sphericity (sphericity < 0.05). In both cases, the results came out positive, see Table 1.

Tab. 1. Results of the KMO and Bartlett's Test.

Metrics		**Values**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.856
Bartlett's Test of Sphericity	Approx. Chi-Square	1355.450
	df	276
	Sig.	0.000

The number of factors was set in accordance with Kaiser's criteria. Additionally, six proposed potential factors explained two-thirds of the total variance, which is considering that those are real data and good value, see Table 2.

Tab. 2. The total variance explained – Model with six factors.

	Total Variance Explained		
Component	**Total**	[%] **of Variance**	**Cumulative** [%]
1	8.490	35.376	35.376
2	1.978	8.243	43.619
3	1.675	6.980	50.599
4	1.490	6.208	56.807
5	1.289	5.371	62.178
6	**1.068**	**4.450**	**66.627**
7	0.989	4.121	70.749

With the use of extraction method – method of principal component analysis and consequent rotation of factors by means of the Varimax method, a table or a matrix of factor loadings was created. The table of factor loadings should comply with the following criteria:

- Each entry (row) includes at least one empty space (a value close to 0),
- Each factor (column) contains at least as many empty boxes as factors,
- For each pair of factors, there are at least as many items that are related to one factor (i.e. just one box is empty), as there are factors.

In the proposed model with six factors, the third condition for an easy structure of factor loading matrix was not met in three pairs of factors. On the top of that, some items remained without any strong connection towards

any of the factors. Therefore the structure of factor loading is not optimal. That is why the next step worked with a solution of a lower number of factors.

Model with five factors

As can be seen in Table 3, the model with five factors, which was generated using factor analysis, can roughly explain approximately the same percentage of variability of the original evaluation set (62.2 %), which is in the real world fairly high value. Once again the method of principal component analysis and rotation Varimax method was used.

Tab. 3. The total variance explained – Model with five factors.

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	**Total**	[%] **of Variance**	**Cumulative** [%]	**Total**	[%] **of Variance**	**Cumulative** [%]
1	8.490	35.376	35.376	3.971	16.547	16.547
2	1.978	8.243	43.619	3.300	13.749	30.296
3	1.675	6.980	50.599	2.722	11.342	41.638
4	1.490	6.208	56.807	2.605	10.856	52.494
5	**1.289**	**5.371**	**62.178**	**2.324**	**9.684**	**62.178**

Distribution of explained variability was reduced from the original rotation ratio of 6.6:1 (8.490:1.289) at a relatively favourable ratio of 1.7:1 (3.971:2.324). We can, therefore, expect an even distribution of the components between the set of items among the factors. In this case, the matrix of factor loadings for the five-factor model complied with all the conditions of simple structure. Considering a large number of numeric values (correlation coefficients) in the factor loadings matrix, values of correlation coefficients less than 0.5 were removed. To improve clarity, the original items of evaluation set are in the table assigned to the factor of the highest correlation and ranked according to decreasing values of correlation coefficients.

Tab. 4. The rotated matrix of factor loadings – model with five factors.

Original variables / New factors	1 INN	2 EMP	3 CUS	4 FIN	5 MAN
I18 – process management	**0.812**				
I19 – process analysis	0.790				
I20 – optimisation, redesign and re-engineering of processes	0.770				
I17 – implementation of innovations	0.723				
I21 – support of innovation by management of the company	0.663				
E26 – management and evaluation of employees		**0.765**			
E25 – hiring and selection of employees		0.690			
I22 – willingness to participate in innovation form the side of employees		0.610			
E28 – employee's motivation		0.519			
E27 – employees' career management					
E24 – planning and prediction of places and workloads					
C10 – market analysis, opportunity search			**0.748**		
C12 – customer segmentation			0.665		
C11 – comprehensive offer			0.615		
C13 – characteristics of customers			0.590		
F6 – risk analysis					
F5 – cost analysis				**0.741**	
F4 – analysis of financial indicators				0.698	
F3 – financial planning and budgeting				0.647	
E29 – safety and working conditions of employees				0.521	
C15 – building customer relationships					**0.709**
F8 – management of current assets					0.629
F7 – financing method					0.585
C14 – Customer Satisfaction Analysis					0.504

An item that has the highest correlation (factor loading) with the given factor is so-called characteristic item/component (determines the nature of the given factor), for better clarity the item in the table is in bold writing. In case it is problematic to find a suitable interpretation or a name for a new factor, it can be named based on this characteristic item. In this specific case, we aim to find names for new factors, so the names are as close as possible to the original names of the BSC dimensions of the evaluation set. It is obvious that in four out of five cases, the effort to find names of new factors based on the original model of evaluation set was successful (Innovation, Employees, Customers, Financing x Management). Nevertheless, that does not mean these indicators are identical because there was a penetration of certain items from other areas to the new factors.

Descriptive analysis of factor scores

The final stage of factor analysis was to determine the factor scores, which serve as a characteristic of examined units. The higher the value of the factor scores for a specific company is (or group of companies selected according to a sorting character), the stronger the factor of influence in the company. Using the mean value, it can be identified that some factors are more or less relevant to specific companies or groups of

companies according to required sorting characters. As statistically significant are considered those average (standardised) values of factor scores which are higher than the critical value:

$$F_{krit} = \frac{2}{\sqrt{n}} \tag{2}$$

In the case of this research, the number n = 111 respondents, which corresponds to the critical value $F_{krit} > 0.19$. All values higher in absolute value were seen as important for the interpretation. Table 5 presents selected groups of companies, for which is the new factor – Innovation, based on the factor score analysis more important than for other companies.

Tab. 5. Values of factor scores of a new factor Innovation for companies according to selected criteria.

Respondent groups	F1 – Innovation
Gross annual turnover – more than a billion CZK	0.6077822
Number of employees – more than 250	0.4853056
Sphere of business – montanistic	0.3472154
Main scope of business – production	0.2670671
Branch – industry	0.2669489
Main customers B2B	0.2391391

Discussion

By conducting the primary research and based on sophisticated statistic procedures, it has been found that the examined hypothesis cannot be rejected and, therefore, the authors tend to claim that the research hypothesis can be regarded as proven and acceptable at the same time.

New factors

F_1 (made up of items I17 to I21) – this factor includes five of the six items of the original indicator called **Innovation.** It can be stated that the original field of innovations in the evaluation set was set correctly and the evaluation of respondents shows the similar way of evaluating individual items.

F_2 (items E25, E26, E28 and I22) – this factor is a combination of three items of the original indicator Employees but one item of the Innovation indicator, however, also applies to employees. All items of this factor, therefore, have a common denominator – **Employees**. Once again, the correlation of the related items was proved, and at the same time, an important fact has been presented here in relation to BSC. Namely that the partial evaluation within one area of BSC has a content overlap in others (item or criterion included in one area – perspective – of BSC may be thematically related to another area).

F_3 (items C10 to C13) – this factor includes four items of the original indicator **Customers.** As in the case of F_1, it may be stated that most of the items in the original area of customers were done in the original evaluation set, so the respondents were allowed similar evaluation significance.

F_4 (items F3 to F5 and E29) – this factor originated by splitting off three items from the original **Financing** indicator that was linked to the item E29 of the original indicator Employees. Similarly to F_2 case, joining of the item from another BSC area may be justified by the fact that when evaluating the item E29 (safety and working conditions of employees) respondents subconsciously stressed the negative impacts that may arise from non-compliance with safety and working conditions for achieving primarily financial goals that are part of the indicator of financial perspective of BSC.

F_5 (items C14, C15, F7 and F8) – this factor includes remaining two items of the original Financing indicator and two items of the Customers indicator. At a first glimpse, this factor may seem very heterogeneous. As the factors named Employees and Financing already exist the rule regarding the use of characteristic item was used to interpret the factor. In this case, the characteristic item is C15 – customer relationship management.

Considering that the F_5 factor also includes item C14 – customer satisfaction analysis as one of the main measures of general customer perspective of BSC, it was necessary to find fundamental differences between factors F_3 and F_5. When using the optical method, it was stated that the F_3 factor is composed of original items that focus on pro-customer activities preceding the actual sales of products and therefore this factor could alternatively be named Customer's offer. Under this assumption, a suitable name for F_5 seems to be customer relationship management, i.e. shortened to **Management.**

The relationship between the indicators used in the original model and the new factors is shown in the following table.

Tab. 6. Penetration of original model with new factors.

Factors/Indicators	Financing	Customers	Innovation	Employees
F_1 – Innovation			*****	
F_2 – Employees			*	***
F_3 – Customers		****		

F_4 – Financing	***		*
F_5 – Management	**	**	

Factor scores

It was found that the introduction and use of innovation is the most important factor for achieving competitiveness especially in these groups of companies and enterprises:

- With more than 250 employees,
- With turnover over one billion CZK,
- In montanistic field,
- Production companies,
- Industrial companies
- With prevailing B2B customers.

The companies mentioned above are a typical sample of the original main industrial branch in the MSR (mining and metallurgy). As it was found in the previously analysed development of industry in the Czech Republic, development of these industries within the MSR shows similarities, but it also shows that where innovations were implemented, this development seems to be much more positive compared to the rest of the Czech Republic. Whereas the miners of OKD used the high market prices of commodities and the profits went purely to the owners, after the drop in commodity prices, the company had to end its operation. In case of metallurgical industry in the region, there is a consequent implementation of innovations thanks to which in the recent years only one significant representative of this sector in the region finished its operation, namely steelworks Vitkovice Steel.

Conclusion

Balanced Scorecard represents a suitable tool for increasing competitiveness of industrial companies. It allows measuring the performance of companies in a more complex manner. To ensure system functionality, it is necessary to check compatibility of its individual parts. The authors of this article had therefore decided to verify the settings of the BSC in conditions of selected companies and enterprises from the Moravian-Silesian region by using the multivariate statistics, in particular, the factor analysis. Managers form the MSR provided the feedback. The aim was to find out how many and which dimensions (perspectives, parts) should the BSC include and whether some of it is of a greater importance for the industrial, or particularly mining companies.

The used research process has confirmed that combining the qualitative and quantitative research was the correct choice and that the input variables (the questionnaire) and the output variables (the new factors) proved to be useful for the intentions of the author team. Also, the use of factor analysis verified expected conclusions as during their research authors also used other statistical procedures, and the results of factor analysis proved to be the most suitable. Recommendations arising from performed factor analysis may be defined as follows:

- The number of traditional areas of BSC (and their contents) is not universal and depends on the needs of a specific company,
- Particular for large mining and other industrial enterprises in the Czech Republic the BSC indicated the area of use of innovations to increase competitiveness as crucial.

At the same time, it may be presumed that the requirement for a minimum number of respondents in each group of respondents, as it was defined in the methodological part of this article, caused relatively ideal responses in each of the group for the analytical needs of this article. Therefore, if possible (in case of large mining and industrial companies it should not be a problem) partial recommendation arising from this research is the requirement for proportional representation of individual respondents of the questioning when creating the BSC in a specific company.

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