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To cite this article: B Kowal 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **214** 012093

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Key performance indicators in a multi-dimensional performance card in the energy sector

B Kowal^{1,*}

¹ AGH University of Science and Technology, Mickiewicza Av. 30, 30-059 Krakow, Poland

E-mail: bkowal@agh.edu.pl

Abstract: The present article focuses on key strategic objectives and their key performance indicators in the energy sector. Key Performance Indicators (KPI's) are indicators used in processes to measure the extent of completion of objectives within organizations. They focus on those key aspects of functioning of organizations that are of fundamental importance to the current and future success of organizations. By including KPI's in multi-dimensional performance cards, one can identify the priority objectives and gain a comprehensive view of a company. KPI's make it possible to clearly determine whether objectives are completed at all and what is the stage of their completion. Continuous monitoring of the extent of objective completion enables quick response to changing conditions in the environment and, consequently, helps companies survive in their markets, enables their growth, and gives them competitive advantage. The problems discussed in the article are very broad but immensely important to contemporary entities, including mining companies conducting their unique operations. Managers look for up-to-date management support tools that can support them in efficient and quick decision-making, effective information flow, and measurement of company performance. The article presents key performance indicators in multi-dimensional performance cards. For this purpose, research was performed to check the fraction of selection of specific options (sets of objectives) by respondents and an analysis of statistical dominance of key indicators of their completion. The results of the analysis were presented in the Balanced Scorecard (BSC) - one of the multi-dimensional performance cards.

1. Introduction

Nowadays, companies focus mostly on preparation of strategies that should ensure their survival in the market, their development, and their competitive advantage. Their determinant is the effectiveness of the operations of the companies, which combines the ability to adapt to changes in the environment (turbulent environment, continuous interactions, flexibility of response) and appropriate use of their resources (potential) in their efforts to complete objectives and tasks, both on the strategic level and the operational level [11, 14].

Many contemporary companies have problems with effective performance of their strategies [3, 4]. It turns out that in this area companies systematically use advice from external consultant and expect their support, mostly with regard to development of result measurement systems. This is also true of the energy sector. The industry continues to be highly interested in good practices in the area of



strategy implementation techniques and tools that support mining companies making their management more efficient and effective.

2. The role of performance measurement in companies

Companies that want to prepare competitive strategies and to implement them successfully continue to look for appropriate strategy implementation tools. Consequently, they use measurement systems to measure the effects of their actions. The role of such systems is to support the management process as well as the process of implementation of the company's strategy, which should include not only hard technical and economic factors (particularly financial measures) but also the requirements of the corporate social responsibility and sustainable development standards, as well as the employee relations and value management requirements [2, 5, 7, 8, 12, 16]. One possible solution is to use multi-dimensional performance cards that contain key areas of operations of the company, the key objectives that the company intends to achieve, and the key performance indicators related to those objectives. The KPI's constitute a management control tool as they help plan and prioritize actions, make decisions quickly, and respond to problems [6, 13]. Continuous monitoring of key performance indicators makes it possible to answer the question of whether the objectives are achievable at all and, if so, to what extent, which constitutes the basis for evaluation of the performance of contemporary companies. Also, for employees, KPI's are a source of feedback concerning their work (it is employees who contribute to achievement of assumed indicator levels).

3. The essence of multi-dimensional performance cards

Company managers must look at their companies from a broader perspective that goes beyond financial reports and results achieved in past periods. By doing so, they can evaluate and analyse their companies' business activities in each of the specified functional areas. The present turbulent environment has caused a continuous development of tools and concepts that support implementation of strategies. The tools for preparation and implementation of strategies, in the form of multi-dimensional performance cards, that are most often used by companies include: Balanced Scorecard, Business Management Window, Performance Prism, Performance Pyramid, Scandia Navigator, Tableau de Bord, etc.

The reason for their creation was the need to address the shortcomings (also referred to as dysfunctions) of the tools and systems used previously, especially as the latter did not take into account quick changes in the environment, inability to change the stakeholder groups, and the activity measurement areas (perspectives) [9]. All those concepts have a common element: the notion that a performance measurement system used by a company must be based on its strategy [15]. On the other hand, the key difference between those concepts is the unconventional procedures.

According to American consultants J.H. Lingle and W.A. Schiemann, the characteristics that set leaders in their industries from other companies, which are used in the strategy measurement and performance evaluation system, include [10]:

- use of performance measures that are comprehensible to all employees;
- combination of financial and non-financial measures in the performance measurement system;
- combination of strategic measurement with operational measures;
- appropriate communication and flow of information from the performance measurement system to all employees of the company.

Multi-dimensional performance cards have the above characteristics. They can certainly be described as tools for communication within companies that support the decision-making process. They make it possible to shorten the time until managers get important information and to select the most important data from various areas of activity of a company. They significantly facilitate monitoring and analysis of the level of key performance indicators, making appropriate decisions, and performing the actions necessary to complete the adopted objectives and implement the company's strategy [1]. "The management sees the need for development and management of an integrated result profile simultaneously" [11] and, therefore, all company performance measurements take into account both financial and non-financial indicators. Companies must decide which of the concepts and tools

are the most appropriate given the nature and capacities of their operations, and then must adapt them to their profiles and needs.

4. Research on determination of KPI's for two mining companies

The research was intended to demonstrate the possibility to use the Balanced Scorecard as the performance measurement tool in a mining company.

The research tool that was used was a survey questionnaire. The respondents were managers of two Polish bituminous coal mining companies who were asked to express their opinion about their companies' strategic objectives and the indicators of their completion (key performance indicators). The respondent groups who participated in a quantitative research were treated as representatives of the general population who have extensive theoretical and practical knowledge about the strategy, objectives, and key performance indicators of their mining companies.

The analyses that were performed consisted in checking the fraction of specific options that were selected by the respondents and analyzing the statistical dominance of their performance indicators. The fraction of specific options selected by the respondents was checked in order to determine how consistent were the responses given by the respondents in the survey. The consistency concerned the selection by the respondents of the same strategic objectives. The consistency of the answers in the survey was the higher, the more respondents evaluated the same objectives in the same way. The most important objectives in the research were the ones that received 4 (important objectives) and 5 (very important objectives) points.

A comparison of the most important strategic objectives that were awarded 4 and 5 points by the respondents and that were identified by them as ones that determined the future development of their mining companies is presented in Table 1.

Table 1. Strategic objectives from the stage of analysis of the fraction of specific options selected by respondents from two mining companies. Source: authors' own study.

	Points	Set of objectives	Name of objective
MC no. 1	4-5	1-3-1-6 3-3-1-6	1 - Maintaining liquidity 3 - Achieving a positive operating result 3 - Maintaining a stable position in the domestic bituminous coal market 1 - Improving work safety 6 - Ensuring a proper level of competence of managers
MC no. 2	4-5	3-3-1-1	3 - Achieving a positive operating result 3 - Maintaining a stable position in the domestic bituminous coal market 1 - Improving work safety 1 - Improving the competences of the engineering and technical staff

The research demonstrated that the managers were able to identify the strategic objectives in a consistent and cohesive manner. In the research concerning the fraction of specific options (set of objectives) selected:

- in the case of the first mining company (MC no. 1), out of the 90 respondents participating in the research, the consistency was 62.22% for the two sets of objectives (1-3-1-6 and 3-3-1-6), which were selected by the same number of respondents, i.e. 56;
- in the case of the second mining company (MC no. 2), the consistency was 57.73% - i.e. out of the 97 respondents participating in the research, 56 respondents gave 4 or 5 points to the set of objectives 3-3-1-1.

Afterwards, the key performance indicators were selected for the most important objectives selected by the respondents by way of an analysis of the statistical dominance according to the arithmetic mean. The values of the means were calculated for the empirical data - the points awarded by the respondents in the questionnaires to the indicators related to the objectives that were identified as ones that had to be completed as a priority.

As a result of the dominance analysis, two key indicators were obtained for each of the specific objectives whose arithmetic means were the highest. The selected indicators are shown in Table 2.

Table 2. The performance indicators that were awarded the highest number of points by the respondents from two mining companies. Source: authors' own study.

Objective MC no. 1	Objective MC no. 2	Indicator no.	Indicator content
1		2	current financial liquidity ratio
		1	quick liquidity ratio
3	3	1	degree of completion of the planned operating profit
		3	degree of completion of the planned operating expenses
3	3	3	share of the MC in the domestic coal market
		2	share of the MC in the domestic market for other customers
1	1	2	injury indicator
		1	accident indicator
1	1	4	effectiveness of training
		3	number of employees trained
6		2	number of managers trained
		1	yearly staff training expense level

5. Proposed multi-dimensional performance card using the example of the BSC

As mentioned above, an example of a multi-dimensional performance card is the Balanced Scorecard (BSC). The BSC presents the performance of an organization (in the four traditional areas of activity: financial, customer, internal processes, learning, and development) in a balanced and comprehensive (multidimensional) manner by relating and combining:

- long-term objectives with operational objectives of the organization;
- financial indicators with non-financial indicators that constitute the sources of competitive advantage of contemporary entities;
- retrospective indicators with prospective indicators;
- internal and external evaluation of performance.

The research made it possible to prepare a proposed multi-dimensional performance card in the form of a Balanced Scorecard. The proposal does not present the structure of the entire BSC tool and is limited to priority objectives selected by the two mining companies participating in the survey in relation to awarded scores 4 and 5. Table 3 shows the results of the proposal, whose objectives and their associated indicators are compiled in the four traditional Balanced Scorecard areas.

Table 3. The proposed reduced form of a multi-dimensional performance card. Source: authors' own study.

BSC area	Objective MC no. 1	Objective MC no. 2	Key performance indicators
Financial	Maintaining liquidity		current financial liquidity ratio
			quick liquidity ratio
	Achieving a positive operating result		degree of completion of the planned operating profit
			degree of completion of the planned operating expenses
Customer	Maintaining a stable position in the domestic bituminous coal market		share of the MC in the domestic coal market
			share of the MC in the domestic market for other customers
Internal processes	Improving work safety		injury indicator
			accident indicator
Learning and development		Improving the competences of the engineering and technical staff	effectiveness of training
			number of employees trained
	Ensuring a proper level of competence of managers		number of managers trained
			yearly staff training expense level

Such a proposed compilation of the results of a company appears to be complete, as it includes the most important areas of activities and the key performance indicators, and comprehensible to other employees. The BSC presented herein is only a section because a tool of this type should comprise many more objectives and their associated key performance indicators. Their number depends on individual needs of the entities that use performance measurement tools. In the energy sector, this tool must be adapted to the unique operations of mining companies. Currently, the card becomes a tool for many companies to support the management process and provides a cohesive approach to multi-aspect observation of companies on the strategic level and, consequently, constitutes a good tool for measuring the performance of mining companies.

6. Conclusion

Due to the ongoing restructuring processes, the mining industry must adapt to the requirements and conditions of the free market economy. This forces the companies in this industry and, more specifically, their managers, to adapt the management tools that they use for effective implementation of their strategies. Therefore, mining company managers should put strong emphasis on the effectiveness of the management process, which is based on the ability to identify the appropriate strategic objectives and on their consistent completion by achieving the levels of key performance indicators set for those objectives.

The tools whose structure covers all the activities of companies are multi-dimensional performance cards. The elements that determine their integrity and their multi-aspect nature are: compilation of results in different aspects (areas) of activities and presentation of achievements of companies related to achievement of the assumed level of the indicators and completion of the set objectives in the relevant perspectives. Thanks to their structure, multi-directional performance cards are tools that enable managers to comprehensively manage contemporary companies, including bituminous coal mining companies.

The research demonstrated that managers know the most important strategic objectives and their associated performance indicators, as shown by the results of the check of the fraction of specific options selected by the respondents (consistency of the responses where the objectives were awarded the same number of points: 4 and 5) and of the analysis of the statistical dominance of their associated

performance indicators (consistency in the selection of the key performance indicators). The KPI support the achievement of companies' operational and strategic objectives. By including them in multi-dimensional performance cards, one can identify the priority objectives and gain a comprehensive view of the level of their completion.

Every company, including mining companies, should set its priority objectives that constitute a record of the strategic aims resulting from its strategy. Full completion of such objectives enables efficient implementation of the adopted strategy.

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