

RESEARCH AND DEVELOPMENT PERFORMANCE MANAGEMENT AND MANAGERIAL TOOLS

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Abstract

Purpose: Economic competitiveness is becoming increasingly linked to rapid technological changes. New technologies are crucial for long term competitive advantages. R&D is a key strategic issue that must be aligned with the corporate strategy, therefore there have been considerable changes in the way that R&D has been managed over recent years and measuring R&D performance has become a key issue that has been extensively debated in innovation and R&D management literature. This paper provides current and up to date knowledge in the field of R&D management and strategic management accounting.

Design/methodology/approach: The purpose of the paper is to identify management tools used in R&D performance management in a selected sample of companies, and to compare them with the findings in the literature and identify the practical impact of the R&D outputs. Therefore, a questionnaire survey will be used to demonstrate this. SMEs members of Association of Research Organizations (AVO) were selected to answer research questions. Telephone interviews were provided by the agency STEM/MARKT. The data was then entered in electronic form into the program ENGRAFES 1.0 and statistically processed.

Findings: The survey shows that the selected sample of the Czech companies uses similar indicators comparable with indicators of foreign companies for managing the performance of research. The most problematic areas of R&D management are clearly indicated as the consistency of the long-term targets of R&D projects with the strategic and financial objectives of the company, and improperly set types of R&D management, poor organizational structure, and a division of competences.

Research/practical implications: R&D generates knowledge that is crucial for the long-term competitiveness of the companies. Thus, huge financial amounts are invested in R&D activities. The R&D performance management and managerial tools have become a challenge for both managers and the research community. The paper focuses on the management of R&D. This paper also responds to the challenges of strategic management accounting, and its minor impact on the practice and the lack of literature on the use of specific tools.

Originality/value: The added value of this paper is to extend the existing knowledge concerning the strategic management accounting tools used in the management of R&D performance in selected Czech companies, and how it compares with foreign samples.

Keywords: research and development, performance management, strategic management accounting

JEL Codes: O32, M10, M20

Introduction

The theory of business entities based on resources shows that a long-term competitive advantage depends on knowledge, ability to innovate and develop, utilize and restore basic resources (Bremser and Barsky, 2004). Businesses therefore need to pay close attention to the identification of new factors that are crucial for their development. Competitiveness is closely linked to new technologies and having knowledge that the competition does not possess. Knowledge is becoming more and more crucial, and the main production factor to economic growth and competitive advantage. Research and development (hereinafter R&D) are the main source of this knowledge (Kim et al., 2011). These facts, when put into practice, were confirmed by a number of companies (Pearson et al., 2000; Chiesa et al., 2009). One of the first intentions to investigate the management of R&D put Freeman (1969). Effective method of managing R&D both in the private and government sectors is of great interest to academic studies (Nixon and Burns, 2012).

Small and medium-size enterprises (hereinafter referred to as SMEs) are considered an important sector, which is the source of economic growth and wealth in society and for the creation of new jobs, especially in the "new" economic sectors dependent on new technologies (Coyte et al., 2012). Despite the importance of SMEs in economic growth of society, there is insufficient attention paid to them in the literature.

SMEs react and adapt more flexibly to new and changing market conditions. Thanks to a simpler management structure they are now "closer" to the customer. They put greater emphasis on the customer than on strategic planning (Coyte et al., 2012). Increased involvement in R&D activities leads to the fact that SMEs typically achieve higher productivity of R&D in comparison with large companies and deal with more complex tasks (Tierlinck and Spithoven, 2013). Tuomela (2005) says that R&D management systems used in large companies are not significantly widespread among SMEs, where R&D management

is carried out more on the basis of trial and error rather than on professional management (Gassmann et al., 2010). The specifics of SMEs concentrate on what management tools are used in knowledge management, and for the management of R&D performance (Coyte et al., 2012).

The paper links the current understanding of the field of R&D management and its aim is to identify the key challenges of R&D management and to identify the tools used in R&D performance management in a selected sample of SMEs in the Czech Republic.

1 Reference framework

Among the criticised aspects of existing approaches to R&D performance management belong a mainly short-term focus, and a preference for short-term goals at the expense of long-term goals (Pearson et al., 2000). Yawson and Sutherland (2010) highlight the lack of attention paid to measuring the performance of R&D within individual projects and the lack of tools for strategic decision making (with the aim of ensuring consistency between the objectives of R&D and strategy of the company) (Pearson et al., 2000; Bremser and Barsky, 2004).

Among the main objectives of the R&D performance management systems is the ability to respond flexibly to a rapidly changing environment (Tierlinck and Spithoven, 2013). Also, to ensure the transformation of the long-term objectives in the field of R&D into operational activities, set the system for evaluation and motivation of researchers, stimulate education and support processes of the learning (Chiesa et al., 2009). The correct adjustment of goals is the most significant activity to manage R&D performance, as the process of performance management is always considered as goal-oriented, in which the basic quality category is the significance of the performance information to the users. One of the most important issues of R&D performance management can be considered as the correct definition of goals to involve researchers, and the provision of operating management and learning processes (Chiesa et al., 2009). Management accounting offers a number of techniques which show the added value of a specific product or project in relation to the added value of the company. It also provides an option to clearly set the limits; in particular regarding the budgets and calculations (King et al., 2010).

The issue of indicators used for performance management of R&D has been researched by Bremser and Barsky (2004). The results indicated that the most commonly used indicators are following:

- R&D costs as a % of sales,
- Total R&D costs,
- Fluctuation of R&D employees,
- Total number of realised projects,
- Number of successful projects,
- Percentage of sales which are contributed to by new products,
- Total costs of successful projects,
- Number of filed/granted patents,
- Number of other measured R&D results,
- Average costs of new product development.

Based on the reference framework and in line with the main aim of the paper, the following questions were asked:

1. The first partial objective is to identify the key issues of R&D performance management in selected samples of SMEs in the Czech Republic. The research question was formulated as follows: *Which areas in R&D performance management are the most problematic?*
2. The second partial objective is to identify the management accounting tools used in R&D performance management in a selected sample of SMEs and to compare them with the tools used abroad. The following research questions were formulated: *Do the important indicators of R&D performance management used in praxis of foreign companies significantly differ from those used in selected samples of SMEs? Do SMEs use budgets and costs calculations in R&D performance management?*

2 Methodology

To achieve the above objectives and to answer the research questions, study of used research methods was realized. Al-Ashaab et al. (2010) used the quantitative research – a questionnaire survey – to obtain information about the company's experience with the use of specific managerial tools; Bhimani and Langsfield-Smith (2007) used this method to determine the financial and non-financial indicators for strategy implementation. To fulfil the objectives of

the paper and to answer the research questions a questionnaire survey has been made with carefully chosen questions. The research progressed in the steps commonly used for this type of research. In the first step the base survey population was selected. The only association in the Czech Republic that represents the R&D in the business sector is the Association of Research Organizations (AVO). SMEs that are members of AVO were therefore selected for quantitative research. Furthermore, the technique of information gathering was selected and a pilot study was performed in order to verify if the required information is achievable. Repeating the same or similar questions in the pilot study and within own research could distort the respondents' answers, therefore for the pilot study a group of companies associated within the Moravian-Silesian Energy Cluster and the Moravian-Silesian Timber Cluster was selected. The rate of questionnaire return within the pilot study was 38%. The pilot study confirmed that the questioning of a selected sample of SMEs can identify problems in the R&D performance management and confirmed the ability to acquire information on tools used within R&D performance management.

The final questionnaire included 14 closed questions (yes – no), 11 scale questions (rating scale), and five open questions. For the realization of the questionnaire survey the agency STEM/MARKT was used, questioning was conducted via telephone interviews. The interviewers were informed that the questionnaire survey is designed for top managers or R&D managers.

Of the 73 companies that were interviewed (out of which were 64 SMEs), that make up the membership of AVO, 39 companies were involved in survey (out of which 33 were SMEs). Only the SMEs data was analysed. Therefore the return rate was 52%. The results were processed using statistical methods.

3 Results

The respondents considered the most problematic areas mainly as the following: inappropriately set style of R&D management (inappropriate organisational structure and competences division) and way of evaluation of effectiveness of specific R&D projects. The respondents considered the least problematic setting of goals of R&D projects and R&D staffing. Detailed results are summarised in Table 1.

The survey showed that, for the evaluation of R&D performance, the respondents used the indicator *the number of successful projects*. The respondents also used these indicators: *the total R&D costs, the total number of realised projects, the percentage of sales which are*

contributed to by new products and the total costs of successful projects; those indicators are used by more than 93% of respondents.

Tab. 1: Problematic areas in R&D performance management

Area / Relative frequency of response	Yes	Rather yes	Rather no	No
Consistency of long-term R&D project goals with strategic and financial goals of the company	33,33%	12,12%	39,39%	15,15%
Setting management processes in order to ensure consistency of long-term and short-term R&D goals	6,06%	36,36%	39,39%	18,18%
Evaluation of effectiveness of specific R&D projects	18,18%	39,39%	27,27%	15,15%
R&D employees motivation to achieve project goals	3,03%	33,33%	33,33%	30,30%
Inability to learn from completed projects and thus repeat errors in the management of R&D	6,06%	31,25%	40,63%	21,88%
Insufficient R&D staffing	3,03%	27,27%	39,39%	30,30%
Unclear or unspecific goals of R&D projects	0,00%	21,21%	36,36%	42,42%
Inappropriately set style of R&D management, a poor organizational structure, division of competences	24,24%	30,30%	24,24%	21,21%

Source: Authors

More than 95% of the respondents continuously evaluate the usage of budgeted costs, and evaluate the revenues (benefits) of the projects. Almost 94% of the respondents develop a calculation of preliminary costs and revenues, and over 90% of the respondents also prepare the final calculation of costs and revenues after completion of the projects.

21% of respondents also used other tools within management of R&D projects, especially to evaluate employee productivity, the return of invested funds, and the benefits of each project (eg. reduced scrapping, reduced energy consumption, reduced environmental impacts, increased production capacity etc.)

Conclusion

The current level of global competition requires a comprehensive approach and a fast response; the management of R&D must respect the type of research activities, and must be closely linked to the company's strategy. The results of the survey confirm that the most problematic areas of R&D management are as follows: inappropriate organisational structure and competences division, unsatisfactory methods of evaluating the effectiveness of R&D projects, improper setting management processes that do not even enable to achieve consistency between long-term project goals and the strategic and financial goals of the

company. Even consistency between long-term and short-term goals of R&D activities is affected. The selected sample of SMEs uses tools of management accounting for R&D performance management, which are applied in the practice of foreign firms; most of respondents use costing and budgeting within R&D performance management.

These conclusions agree with the findings:

1. Bremser and Barsky (2004), who state, that the most significant problems faced by R&D performance management are achieving the consistency of R&D strategy with the business strategy of the company which is focused on the growth and consistency of long-term and short-term goals in the area of R&D,
2. Yawson and Sutherland (2010), who confirm, that there are only a few companies which can transform strategic goals into operational goals and evaluate their contribution to the added value and performance growth,
3. Sohn et al. (2007), who consider one of the most significant problems of R&D projects management as being the suitable system of internal processes management.

The main limitation of realised research is the chosen method. The questionnaire survey was carried out in a selected sample of SMEs, the conclusions therefore can't be generalised. The findings and examples of good practice can be taken as a guide to a variety of businesses. They can be applied in a variety of companies operating in different conditions. During further research, a space appears for the realization of the survey in a range that allows for statistical generalisations or space to implement the survey to another group of SMEs (eg. beneficiaries of subsidies under the programs of Technology Agency of the Czech Republic), and to compare findings.

References

- Al-Ashaab, A., Flores, M., Doultsinou, A., & Magyar, A. (2010). Balanced scorecard for measuring the impact of industry-university collaboration. *Production Planning & Control*, 22, 554-570.
- Bhimani, A., & Langsfield-Smith, K. (2007). Structure, formality and the importance of financial and non-financial information in strategy development and implementation. *Management Accounting Research*, 18, 3-31.
- Bremser, G. W., & Barsky, N. P. (2004). Utilizing the balanced scorecard for R&D performance measurement. *R&D Management*, 34(3), 231-238.

- Chiesa, V., Frattini, F., Lazzarotti, V., & Manzini, R. (2009). Performance measurement in R&D: exploring the interplay between measurement objectives, dimensions of performance and contextual factors. *R&D Management*, 39(5), 488-519.
- Coyte, R., Ricceri, F., & Guthrie, J. (2012). The management of knowledge resources in SMEs: an Australian case study. *Journal of knowledge management*, 15(5), 789-807.
- Freeman, C. (1969). *Measurement of Output of Research and Experimental Development. Statistical Reports and Studies*. Paris: UNESCO.
- Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The future of open innovation. *R&D Management*, 40, 213-221.
- Kim, S.K., Lee, B.G., Park, B. S., & Oh, K. S. (2011). The effect of R&D, technology commercialization capabilities and innovation performance. *Technological and Economic Development of Economy*, 17(4), 563-578.
- King, R, Clarkson, P.M., & Wallace, S. (2010). Budgeting practices and performance in small healthcare businesses. *Management Accounting Research*, 21, 40-55.
- Nixon, B., & Burns, J. (2012). The paradox of strategic management accounting. *Management Accounting Research*, 23(4), 229-244.
- Pearson, A. W., Nixon, W. A., & Kerssens-van Drongelen, I. C. (2000). R&D as a business – what are the implications for performance measurement. *R&D Management*, 30(4), 355-366.
- Sohn, S., Joob, G. J., & Han, H. K. (2007). Structural equation model for the evaluation of national funding on R&D project of SMEs in consideration with MBNQA criteria. *Evaluation and Program Planning*, 30, 10-20.
- Tierlinck, P., & Spithoven, A. (2013). Formal R&D management and strategic decision making in small firms in knowledge-intensive business services. *R&D Management*, 43(1), 37-51.
- Tuomela, T. S. (2005). The interplay of different levers of control: A case study of introducing a new performance measurement system. *Management Accounting Research*, 16, 293-320.
- Yawson, R. M., & Sutherland, A. J. (2010). *Institutionalising Performance Management in R&D Organisations: Key Concepts and Aspects*. [ONLINE] Available at <http://mpira.ub.uni-muenchen.de/33180/>. [Accessed 22 January 17].

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