

**Lubna Q. OWAIS**

*Faculty of Business and Economics, Károly Ihrig Doctoral School of Management and Business,  
University of Debrecen, Hungary*

# A BRIEF OVERVIEW OF PERFORMANCE MANAGEMENT SYSTEMS

*Review  
Article*

---

## **Keywords**

*Performance management;  
Performance measurement systems (PMSs);  
Balanced Scorecard (BSC);  
Cause-and-effect relationships;*

---

## **JEL Classification**

*M10, M40*

---

## **Abstract**

*Performance management is not a new topic; however, it has gained so much attention recently due to its need in the current competitive business environment. Performance management has been first used in the 1970s, and since then many definitions, frameworks, and concepts of performance management have been introduced, which led to great confusion in the performance management literature. Furthermore, many terms are used interchangeably with performance management, which made the confusion much worse. This article aims to provide a brief review of the evolution of performance management. Moreover, in the literature, it is obvious that even with the new comprehensive systems still the financial indicators are the most common and used indicators, therefore, an overview of some of the most common financial indicators and their importance is provided in this paper. Additionally, some empirical pieces of evidence about the cause-and-effect relationships, which are claimed to be fundamental for the success of the Balanced Scorecard (BSC), are provided. The findings are ambiguous as some support the existence of these relationships, whereas other findings deny their existence.*

## INTRODUCTION

The interest in performance management systems has increased a lot lately due to businesses realizing the importance of such systems in assuring their stability and prosperity in the current highly competitive environments. They need performance management because it helps them enhance their accountability and transparency, which are highly important to prove their efficiency and effectiveness for their users (Coste & Tiron-Tudor, 2015). The performance management system can be defined as “a continuous process of identifying, measuring, and developing the performance of individuals and teams and aligning performance with the strategic goals of the organization” (Aguinis, 2013). Unfortunately, the literature on performance management is very broad and confusing because there is not any “generally agreed-upon” definition of performance management (Andersen, Henriksen, & Aarseth, 2006). Many definitions of performance management are available in the literature, for example, each field has a different specific definition of performance management, furthermore, many terms are used with performance management. Performance management has evolved from being unidimensional, focusing only on the financial performance of the organizations into a more broad and comprehensive system. This system includes and focuses on other important aspects rather than focusing and relying on the financial aspect solely. The balanced scorecard (BSC) is one of the most famous modern strategic performance management tools, it helps organizations in setting their strategic goals and defining their action plans. Moreover, it aids in developing the performance measures and metrics that will help monitor the delivery of the strategic goals. “The BSC has represented one of the major innovations in the field of performance management techniques” (Lucianetti, Battista & Koufteros, 2019). It focuses on four different perspectives of organizations: financial, customer, internal processes, and learning and growth. These perspectives according to Kaplan and Norton, the founders of this system, are connected with each other through cause-and-effects relationships. Theoretically, it is claimed that these causal linkages between the different BSC perspectives are considered fundamental for its success, furthermore, the importance of the existence of these relationships is clearly mentioned in the literature. Nevertheless, there are not any provided precise guidelines by the developers of this system on how to establish such links, and according to some researchers, there is a confusion regarding both the interpretation and the implementation of

the cause-and-effects principle in both practice and academic research.

This article starts by providing several available definitions of performance management, and the second part is about the financial measures since the traditional performance management systems were focusing solely on the financial perspective. The following part is about the causal relationships between the different BSC perspectives, and finally the conclusion.

## AN INTRODUCTION TO THE PERFORMANCE MANAGEMENT AND PERFORMANCE MEASUREMENT SYSTEMS (PMSs)

Performance management was used initially as a term in the 1970s, then it became a known and familiar procedure in the late 1980s (Armstrong & Baron, 1998). The literature on performance management is very broad and confusing and according to Andersen et al. (2006), the reason is that there is not any “generally agreed-upon” definition of performance management. Therefore, multifarious definitions of performance management are available in the literature, starting from the late 1980s until this moment. Armstrong (2009) defined performance management as “a systematic process for improving organizational performance by developing the performance of individuals and teams. It is a mean of getting better results by understanding and managing performance within an agreed framework of planned goals, standards, and competency requirements”. Parthiban and Goh (2011) on the other hand, defined performance management in relevance to performance measurement. They mentioned that performance management precedes and follows performance measurement, moreover, there are two stages required for the effective conduction of performance management: performance measurement and performance improvement. Ates, Garengo, Cocca and Bititci (2013) in their article searched for the available performance management definitions in literature, the definitions found reveal how complex this area is and how many different perspectives regarding this concept are available. For instance, if the author has a human-resource background, the performance management will be about managing people to increase the achievement of job-related success. As well as working on activities that are in connection with improving, motivating, rewarding, training, and developing skills. On the other hand, the operation-management field definition is related to highlighting that performance measurement is a very crucial part of the performance management process, including all the procedures that are connected to developing

performance measures, key performance indicators (KPIs), as well as reporting. When the literature is relevant to the strategy field, performance management is considered as a process assisting organizations developing, applying, and modifying their goals, and converting them into actions. Finally, quality-focused field definition revolves around the improvement of both the processes and the performance.

Performance management and performance measurements are two terms that are found in literature either together or used interchangeably as two terms leading to one meaning. Other researchers use the term performance management systems to refer to combined systems that include both performance measurement and performance management. There is a lack of clear conceptual definitions of these two terms nevertheless, one of the most logical and widely used interpretations of these two terms is the one delivered by Bititci, Carrie and McDevitt (1997). They suggested that performance management is a closed loop control system that is about the deployment of both policies and strategies, in addition to gathering feedbacks from different levels to manage the organizations' performance. Whereas the PMS is "the information system which is at the heart of the performance management process and it is of critical importance to the effective and efficient functioning of the performance management system". Bourne, Mills, Wilcox, Neely and Platts (2000) suggested three phases for the implementation of PMSs: (1) the designing of the performance measures to be aligned with the organization's strategy, (2) the implementation of these measures by conducting adequate systems and processes to collect the data, (3) the usage of measures to assess the success of the strategy implementation and to utilize the information and feedback from these measures to check the validity of the strategy.

Another familiar term in the performance management literature is "Performance Measurement and Management Systems" (PMMSs, and in some references PMSs). These systems are defined as balanced and dynamic systems which enable the support for the decision-making processes by gathering, elaborating, and analyzing information (Neely, Adams & Kennerley, 2002). A simpler definition: processes which assist organizations setting goals and tracking the progress over a period of time (Okwir, Nudurupati, Ginieis & Angelis, 2018). PMMS consists of spreadsheets, performance indicators, and performance reports which provide support to managers to improve the decision-making process by using the provided information (Chenhall, Hall & Smith, 2017). The interest in PMMSs has increased greatly in the previous years; this is mainly due to companies comprehending the

importance of monitoring and understanding firms' performance to compete in the continuously changing environments. These systems enhance both the capabilities and the performance of organizations (Koufteros, Verghese & Lucianetti, 2014). The PMMSs are currently receiving adequate attention from researchers, yet, various PMMSs are neither dynamic nor flexible to variations within the internal and external organizations' environment. In other words, some organizations are functioning in dynamic markets addressing static PMMSs and working on dynamic strategies, resulting in complexity and inefficient allocation of resources. Hourneaux Jr, Carneiro-da-Cunha and Corrêa (2017) study shows that PMMSs are found to be used as a monitoring tool for different reasons and that the effective use of these systems provides support for managing corporate performance. A problem may limit the effectiveness of these systems for organizational strategic management, which is the traditional management style while using the PMMSs. This problem could prevent the systems from delivering the support and management technology that they are designed to implement. This problem can be avoided by training managers to deeply understand the PMMSs. This will result in an increase in their managerial efforts toward improving strategic decision making, which will eventually improve the productivity and increase the profits of the organizations.

### AN INSIGHT INTO THE FINANCIAL MEASURES

Performance measures are the metrics used to quantify both the efficiency and effectiveness of actions (Neely, Gregory & Platts, 1995), which are the main tools in any performance management (Roubtsova & Michell, 2014). An effective performance gauging system requires that the developed indicators be relevant to the organization's field of work and can be easily calculated, analyzed, and evaluated. To ensure an overall performance evaluation "performance measures must be related to a diverse set of performance measures, including financial performance, customer relations, internal business process, and learning and growth" (Kaplan & Norton, 1996). Performance measures data can be collected from plentiful different sources, taking into consideration that these data certainly provide the optimal answers for many business questions. Understanding the performance measures is a vital part of successful PMSs, the inadequate understanding of performance measures is the reason why most monitoring and reporting of measures have failed (Parmenter, 2015; Van Camp & Braet, 2016). Parmenter (2015) argued that most

of the performance measures are classified as KPIs, but in fact there are four different types of performance measures, and to understand and distinguish them is a very important matter. These four types are:

- Result indicators (RIs): the indicators which provide a summary of the activity of more than one team; they give an overview of how efficiently teams are working together. Parmenter (2015) believes that all financial indicators are result indicators.
- Key Result Indicators (KRIs): the indicators that provide the board with a clear picture of how the organization is performing, whether it is moving in the right direction and speed or not.
- Performance Indicators (PIs): the indicators that provide the management with the information about the teams (what they are delivering) since these indicators can be traced back to a team.
- Key Performance Indicators (KPIs): the indicators which focus on the most critical aspects of organizational performance regarding their current and future success.

Vachnadze (2016) mentioned that despite the intensified attention towards the performance measures, a certain misunderstanding has been noted which consequently leads to a failure in the practical cases of performance measurements. He further explained that organizations are working with the wrong measures and some of them are incorrectly labeled as KPIs.

It has been noted that when businesses do not measure any indicators, they cannot improve their performance therefore, using a wide range of performance measurement indicators is immensely essential. The results of these measures and indicators are then used by the management to take corrective actions and concrete decisions, as well as providing an indication about the current situation of the firm (Rajnoha, Lesnikova & Korauš, 2016). It was mentioned earlier that there were two phases of performance management, the first phase was mainly focused on financial indicators solely (return on investment (ROI), profit, and productivity). In the 1980s, the second phase started due to the variations in the world market which led to firms losing their position to the competitors who introduced better quality, more variant, and more affordable products to the market. In order to gain back their positions, they had to start implementing new technologies and philosophies which highlighted that traditional measurement systems have multiple limitations, leading to a rise in the necessity of developing new systems to ensure success. These traditional systems' shortcomings led to the business performance measurement revolution, shifting from considering the financial measures as the foundation of the measurement systems to being considered as one part among a wider number of

measures (Eccles, 1991). However, recent studies provide a proof that most of the firms are still depending mainly on the financial indicators. For example, Abdallah and Alnamri (2015) when they investigated 180 Saudi manufacturing subsidies, they concluded that the most commonly used measures by the majority of these Saudi subsidies are financial measures. This is due to the fact that they are popular, familiar, and are the most well-known in the business practice. Additionally, these measures are well-understood, applied, and quantified easily. Zizlavsky (2016) highlighted in his paper that financial indicators are an essential part of PMSs and that they are crucial for evaluating business performance. As only these measures are able to provide managers with information about the capability of the firm to create value. According to his study results, he also found that the financial indicators are still the mainly used indicators by most managers in Czech economics between 2013-2015 to evaluate performance and its components, and the most used indicators are EBITDA, revenues, and budget. Another study by Cakir, Bezbradica and Helfert (2019) found that 55% of the retail research focus is on financial measures, whereas the focus on the non-financial measures is 45%. Nevertheless, the gap has been shrinking with time; due to the significant increase in the interest in the non-financial measures.

The financial perspective is mainly used to measure and evaluate the performance since its results reflect indicators to the companies to reach their goals. The financial perspective aims to reduce the costs, achieve the desired growth, it also concentrates on the amount of profit achieved due to the cost reduction and the increased level of sales. This perspective further aims to improve the image of the company from the point of view of the investors. This perspective indicators provide a clear image of the company's financial performance. Studies show that the financial indicators used to measure performance have a great impact on the overall organizational performance. For example, the correlation analysis of the data in Bhatti, Awan and Razaq (2014) shows that the Overall Performance Index (OPI) is significantly and positively correlated with the financial indicators. Furthermore, measuring performance in terms of the financial indicators affects the overall performance of the organizations positively at 0.01 significant level. However, Bajnai and Popovics (2020) noted that the firms' ability to improve some aspects such as customer and internal processes is affected when the focus is only on the financial performance of firms.



## THE CAUSAL RELATIONSHIPS BETWEEN THE DIFFERENT PERSPECTIVES OF THE BSC

Traditional measurement systems were criticized for focusing solely on short-term metrics, and for being weakly linked to the organizational strategies (Neely et al., 1995), therefore, the BSC was developed by Kaplan and Norton to overcome these problems. The BSC is a strategic performance management tool that was developed to help decision-makers in understanding and obtaining the strategic objectives, by translating missions and strategies into objectives and measures. The strategy was defined by them as “a set of hypotheses about cause and effect” (Kaplan & Norton, 1996). The BSC was built on a careful selection and implementation of four perspectives: financial, customer, internal-business-process, and learning and growth. “These BSC four perspectives authorize kind of balance between short term and long-term objectives, the demanded outcomes and the performance supporter of those outcomes, and between hard objectives measures and more subjective measures” (Kaplan & Norton, 1996). Both financial and non-financial measures have a great and strong link between them, it is in the cause-effect-relationship between both the financial and non-financial drivers. Kaplan and Norton (1996) highlighted that the existence of the cause-and-effect relationships between the four different BSC perspectives is fundamental, “every measure selected for a BSC should be an element of a chain of cause-and-effect relationships”. According to Aidemark (2001), the success of the BSC is mainly based on the assumption that all the four perspectives of the BSC have cause-and-effect relationships. Moreover, the customer, internal processes, and learning and growth perspectives are vital to the financial perspective, and that these perspectives’ efforts must be directed toward the financial perspective. The financial measures are usually known as the lagging indicators since they reflect the impact of decisions previously made. On the other hand, the non-financial indicators are usually defined as leading indicators, and any change in them should affect the financial performance. Kober and Northcott (2020) emphasized that it is surprising how there is very limited research regarding the cause-and-effect relationships, even though they are fundamental for the BSC. The limited previous research found ambiguous results about the existence of these relationships, however, they found that the future financial performance is affected by the performance of the non-financial measures. The limited research was their main motive to conduct a research to study if the causality relationships really exist within the BSC of the New Zealand public sector. Their findings show that “statistical

cause-and-effect relationships can and do exist within a BSC” (Kober & Northcott, 2020). The existence of the cause-and-effect relationships between the four BSC perspectives was statistically proven in Krishnan, Ravindran and Joshi (2014) study on Malaysian manufacturing companies. Each lower perspective was found to have an effect on the next perspective. Dong and Wong-On-Wing (2020) found that investors’ decisions and judgments are affected by the interaction between causal linkages and financial performance, however, this effect exists only when the firm’s financial performance is favorable. The measures of the customer perspective specifically were found to improve the investment decisions of the investors and the prediction of the accounting metrics (Ittner & Larcker, 1998). Ittner and Larcker (2003) found that firms which adopted non-financial measures and connected them to the outcomes of the financial measures by cause-and-effect relationships, achieved a significantly higher return on equity (ROE) and return on assets (ROA) over a five-year period compared to the other firms. Khan, Halabi and Masud (2010) study on the leading manufacturing and service companies in Bangladesh found that there is a positive correlation between the BSC perspectives and that this correlation is statistically significant. The study also provides empirical evidence that firms which increased their efforts toward the improvement of the learning and growth perspective, achieved better ROE and ROA. Bento, Bento and White (2013) found that the financial perspective is positively and directly affected by the perspectives: learning and growth, internal business, and customer, hence, providing empirical evidence that the BSC is a complex model. Complex means that the relationships between the BSC perspectives are not hierarchical as mentioned by previous studies which stated that every lower perspective affects only the next perspective. Therefore, their study amplifies the importance of investing not solely in the customer perspective, but also in both learning and growth and internal processes perspectives. De Geuser, Mooraj and Oyon (2009), who tested the casual linking, concluded that adopting the BSC improves performance. Valmohammadi and Sofiyabadi (2015) study on Iranian automotive manufacturers proves that the customer perspective has an important role in both supporting and attaining organizations’ vision. Therefore, the organizations’ financial objectives will be fulfilled through customer satisfaction. Researchers in literature discussed various benefits of the causal relationships between the performance measures and the outcome. These benefits include improving the decision-making, the ability of prediction, learning, and communication. However, the concept of causal effects is hard in practice; it is hard to be learnt, understood, and developed by the

responsible of the operations in firms (Tayler, 2010). He further clarified that it might be because of what is called the “motivated reasoning”, which is the bias of the managers’ interpretation of information based on their preferences.

Malmi (2001) found that the early adopters of the BSC in the Finish companies did not really understand the concept of linking the different measures based on causal relationships. Moreover, only 50% of the companies included in the study by Speckbacher, Bischof and Pfeiffer (2003) could connect the measures with cause-and-effect relationships. According to Anjomshoe, Hassan, Kunz, Wong and de Leeuw (2017), they argued that in the field of the humanitarian supply chain, the existing PMSs and frameworks all lack the cause-and-effect relationships between the different measures. Furthermore, the Italian bank that was studied by Francioli and Cinquini (2014) was proven to have an effective BSC, although they were not using any formalized or strong cause-and-effect strategy map in the bank. Moreover, they did not find in their study any basis to conclude that the existence of the causal linkages between performance measures is vital for the BSC to be effective as a communication tool. Therefore, providing a case of a successful BSC implementation without the existence of valid strong causal linkages.

Nørreklit, Nørreklit, Mitchell and Bjørnenak (2012) stated that the cause-and-effect relationships in the BSC lack evidence, in fact, they show some characteristics of a myth speech genre. Malina, Nørreklit and Selto (2007) believe that “one should not reject the validity of PMSs simply because statistical evidence of cause-and-effect is lacking”. Kasperskaya and Tayles (2008) found that what may be the reason behind limiting the validity of the causal models is the complex, dynamic, and uncertain environments. Furthermore, managers’ failure to trace the correct causality linkages due to judgmental biases could also be one of the reasons. It was also found that if causal models could mobilize managerial actions, they can guide the organizations even if they lack the validity.

## CONCLUSIONS

Many definitions and approaches of performance management are found in the literature. What is of the most importance is the need to implement and use these systems in the current competitive environments and the rapidly increasing business fields. These systems are believed to have a great impact on organizations since they improve organizational capabilities, productivity and performance. However, many of these systems eventually fail to deliver what they were implemented for mainly due to the lack of

understanding of the most important components of these systems. Therefore, one of the essential parts for developing any performance management system to achieve the desired goals is to fully understand their components.

The traditional PMSs shortcomings were tackled by modifying the systems to integrate multiple perspectives with the traditional financial perspective, and these modern systems proved that they have great impacts on improving the organization’s performance. The assumption of the existence of cause-and-effect relationships between the different BSC perspectives was discussed in this article. The results of the discussed studies regarding this topic are ambiguous; these relationships existed in some cases and in other cases they did not. The existence of these relationships is perceived to be fundamental for the success of these systems, however, some studies reveal that this principle is quite confusing and complicated in practice. Furthermore, some researchers found that even with the lack of validity of the existence of these relationships, the validity of the PMSs cannot be neglected. Other researchers found that these relationships do exist in practice and have a great impact on the performance of the organizations.

There is a shortage of available studies which discuss and check the validity and existence of the cause-and-effect relationships between the different perspectives and researchers call for further empirical studies regarding this topic.

## REFERENCES

- [1] Abdallah, W. M., & Alnamri, M. (2015). Non-financial performance measures and the BSC of multinational companies with multi-cultural environment. *Cross Cultural Management*.
- [2] Aguinis, H. (2013). *Performance management* (3rd ed.). Boston, MA: Pearson.
- [3] Aidemark, L. G. (2001). The meaning of balanced scorecards in the health care organisation. *Financial accountability & management*, 17(1), 23-40.
- [4] Andersen, B., Henriksen, B., & Aarseth, W. (2006). Holistic performance management: an integrated framework. *International Journal of Productivity and Performance Management*.
- [5] Anjomshoe, A., Hassan, A., Kunz, N., Wong, K. Y., & de Leeuw, S. (2017). Toward a dynamic balanced scorecard model for humanitarian relief organizations’ performance management. *Journal of Humanitarian Logistics and Supply Chain Management*.
- [6] Armstrong, M. (2009). *Armstrong’s handbook of performance management: An evidence-based guide to delivering high performance*. Kogan Page Publishers.

- [7] Armstrong, M., & Baron, A. (1998). *Performance management: The new realities*. State Mutual Book & Periodical Service.
- [8] Ates, A., Garengo, P., Cocca, P., & Bititci, U. (2013). The development of SME managerial practice for effective performance management. *Journal of small business and enterprise development*.
- [9] Bajnai, P., & Popovics, P. (2020). Practical application of the balanced scorecard model, a balanced strategic indicator system. *SEA: Practical Application of Science*, 8(3).
- [10] Bento, A., Bento, R., & White, L. F. (2013). Validating cause-and-effect relationships in the balanced scorecard. *Academy of Accounting and Financial Studies Journal*, 17(3), 45.
- [11] Bhatti, M. I., Awan, H. M., & Razaq, Z. (2014). The key performance indicators (KPIs) and their impact on overall organizational performance. *Quality & Quantity*, 48(6), 3127-3143.
- [12] Bititci, U. S., Carrie, A. S., & McDevitt, L. (1997). Integrated performance measurement systems: an audit and development guide. *The TQM magazine*.
- [13] Bourne, M., Mills, J., Wilcox, M., Neely, A., & Platts, K. (2000). Designing, implementing and updating performance measurement systems. *International journal of operations & production management*.
- [14] Cakir, G., Bezbradica, M., & Helfert, M. (2019). The Shift from Financial to Non-financial Measures During Transition into Digital Retail – A Systematic Literature Review. In: Abramowicz W., Corchuelo R. (eds) *Business Information Systems*. BIS 2019. Lecture Notes in Business Information Processing, vol 353. Springer, Cham. [https://doi.org/10.1007/978-3-030-20485-3\\_15](https://doi.org/10.1007/978-3-030-20485-3_15)
- [15] Chenhall, R. H., Hall, M., & Smith, D. (2017). The expressive role of performance measurement systems: A field study of a mental health development project. *Accounting, Organizations and Society*, 63, 60-75.
- [16] Coste, A. I., & Tiron-Tudor, A. (2015). Performance measurement in higher education: literature review. *SEA: Practical Application of Science*, 3(2).
- [17] De Geuser, F., Mooraj, S., & Oyon, D. (2009). Does the balanced scorecard add value? Empirical evidence on its effect on performance. *European Accounting Review*, 18(1), 93-122.
- [18] Dong, L., & Wong-On-Wing, B. (2020). Does causally linking nonfinancial measures influence investors' use of management's disclosures of nonfinancial information?. *Accounting & Finance*.
- [19] Eccles, R. G. (1991). The performance measurement manifesto. *Harvard business review*, 69(1), 131-137.
- [20] Francioli, F., & Cinquini, L. (2014). Exploring the blurred nature of strategic linkages across the BSC. *Journal of Accounting & Organizational Change*, 10(4), 486.
- [21] Hourneaux Jr, F., Carneiro-da-Cunha, J.A. and Corrêa, H.L. (2017). Performance measurement and management systems: Different usages in Brazilian manufacturing companies. *Managerial Auditing Journal*, 32(2), 148-166. <https://doi.org/10.1108/MAJ-11-2015-1277>
- [22] Ittner, C. D., & Larcker, D. F. (1998). Are nonfinancial measures leading indicators of financial performance? An analysis of customer satisfaction. *Journal of accounting research*, 36, 1-35.
- [23] Ittner, C. D., & Larcker, D. F. (2003). Coming up short on nonfinancial performance measurement. *Harvard business review*, 81(11), 88-95.
- [24] Kaplan, R. S., & Norton, D. P. (1996). *The balanced scorecard: translating strategy into action*. Harvard Business Press.
- [25] Kasperskaya, Y., & Tayles, M. (2008). Causal performance measurement models: myth or reality. In *ANNUAL CONGRESS OF THE EAA* (Vol. 31, pp. 23-25).
- [26] Khan, H. U. Z., Halabi, A. K., & Masud, M. Z. (2010). Empirical study of the underlying theoretical hypotheses in the balanced scorecard (bsc) model: Further evidence from Bangladesh. *Asia-Pacific Management Accounting Journal*, 5(2), 45-73.
- [27] Kober, R., & Northcott, D. (2020). Testing cause-and-effect relationships within a balanced scorecard. *Accounting & Finance*.
- [28] Koufteros, X., Verghese, A. J., & Lucianetti, L. (2014). The effect of performance measurement systems on firm performance: A cross-sectional and a longitudinal study. *Journal of operations Management*, 32(6), 313-336.
- [29] Krishnan, A., Ravindran, R., & Joshi, P. L. (2014). Performance measurement link between the balanced scorecard dimensions: an empirical study of the manufacturing sector in Malaysia. *Afro-Asian Journal of Finance and Accounting*, 4(4), 426-442.
- [30] Lucianetti, L., Battista, V., & Koufteros, X. (2019). Comprehensive performance measurement systems design and organizational effectiveness. *International Journal of Operations & Production Management*.
- [31] Malina, M. A., Nørreklit, H. S., & Selto, F. H. (2007). Relations among measures, climate of control, and performance measurement

- models. *Contemporary Accounting Research*, 24(3), 935-982.
- [32] Malmi, T. (2001). Balanced scorecards in Finnish companies: A research note. *Management accounting research*, 12(2), 207-220.
- [33] Neely, A. D., Adams, C., & Kennerley, M. (2002). *The performance prism: The scorecard for measuring and managing business success*. London: Prentice Hall Financial Times.
- [34] Neely, A., Gregory, M., & Platts, K. (1995). Performance measurement system design: a literature review and research agenda. *International journal of operations & production management*, 15(4), 80-116.
- [35] Nørreklit, H., Nørreklit, L., Mitchell, F., & Bjørnenak, T. (2012). The rise of the balanced scorecard! Relevance regained? *Journal of Accounting & Organizational Change*, 8(4), 490-510. <https://doi.org/10.1108/18325911211273491>
- [36] Okwir, S., Nudurupati, S. S., Ginieis, M., & Angelis, J. (2018). Performance measurement and management systems: a perspective from complexity theory. *International Journal of Management Reviews*, 20(3), 731-754.
- [37] Parmenter, D. (2015). *Key performance indicators: developing, implementing, and using winning KPIs*. John Wiley & Sons.
- [38] Parthiban, P., & Goh, M. (2011). An integrated model for performance management of manufacturing units. *Benchmarking: An International Journal*.
- [39] Rajnoha, R., Lesnikova, P., & Korauš, A. (2016). From financial measures to strategic performance measurement system and corporate sustainability: empirical evidence from Slovakia. *Economics and Sociology*.
- [40] Roubtsova, E., & Michell, V. (2014). KPIs and Their Properties Defined with the EXTREME Method. In *International Symposium on Business Modeling and Software Design* (pp. 128-149). Springer, Cham.
- [41] Speckbacher, G., Bischof, J., & Pfeiffer, T. (2003). A descriptive analysis on the implementation of balanced scorecards in German-speaking countries. *Management accounting research*, 14(4), 361-388.
- [42] Tayler, W. B. (2010). The balanced scorecard as a strategy-evaluation tool: The effects of implementation involvement and a causal-chain focus. *The Accounting Review*, 85(3), 1095-1117.
- [43] Vachnadze, R. (2016). Prioritization of performance measures using analytic hierarchy process. *International Journal of the Analytic Hierarchy Process*, 8(3), 490-501.
- [44] Valmohammadi, C., & Sofiyabadi, J. (2015). Modeling cause and effect relationships of strategy map using fuzzy DEMATEL and fourth generation of balanced scorecard. *Benchmarking: An International Journal*.
- [45] Van Camp, J., & Braet, J. (2016). Taxonomizing performance measurement systems' failures. *International journal of productivity and performance management*.
- [46] Zizlavsky, O. (2016). The Use of Financial and Nonfinancial Measures within Innovation Management Control: Experience and Research. *Economics and Sociology*, 9(4), 41-65.