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## INDICATORS' ADEQUACY ISSUES IN PERFORMANCE MEASUREMENT SYSTEMS

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**Abstract.** *The aim of this article is to analyse the problems of performance measurement systems in relation to the adequacy of indicators. The requirements for modern performance evaluation systems, their classification criteria, and the peculiarities of performance measurement in the public and private sectors are reviewed. One of the most popular performance measurement systems developed into a strategic management tool, the balanced scorecard, is considered, along with other systems. One of the main issues of performance measurement systems is that the set of indicators remains practically unchanged. Some indicators are changed only after changing the strategic goals, and this circumstance prevents the timely identification of emerging problems within adequacy of indicators. The article proposes to enrich performance measurement in process improvement systems, and suggests breaking down the measurement process into cycles by reviewing the set of indicators after each step of the cycle and, if necessary, adjusting them. This could make a significant contribution to ensuring the adequacy of indicators, one of the most important prerequisites for proper measurement, and would bring the performance measurement systems closer to the requirements of third generation systems.*

**Raktažodžiai:** *Veiklos matavimas, veiklos indikatoriai, subalansuotų rodiklių sistema, rodiklių adekvatumas, procesų tobulinimas.*

**Keywords:** *Performance measurement, performance indicators, balanced scorecard, indicators adequacy, process improvement.*

## Introduction

For decades, the importance and the impact of performance measurement on an organization's performance both in the private and public sectors has not been disputed. Performance measurement is spread across many management disciplines and here we find a huge variety of methods and criteria – what indicators to choose, how to link them with each other, for example. Simple sets of measurement indicators evolved into sophisticated performance measurement systems, measuring not only the results already achieved, or evaluating the current snapshot, but also enabling us to assess the readiness for future activities. There are successful examples of how advanced performance measurement systems, such as balanced scorecard (Kaplan and Norton 2000) have evolved into an effective strategic management tool.

However, historically, measurement systems used in different management areas are quite different and very rarely integrated with each other. Indicators are chosen according to different principles and requirements. The issue of adequacy with regard to the indicators of measurement systems is still insufficiently addressed by researchers. This is especially true for very weak links between measurement used on the one hand in quality management and process improvement, and on the other hand in performance appraisal. It is also necessary to mention the differences in performance measurement in the public and the private sectors, not only because of the different nature of these sectors, but also of the different traditions. Because of the complexity of the public sector organizations' mission, private sector organizations' performance evaluation can be regarded as an isolated case of performance evaluation in public sector organizations (Sudnickas 2008; Sudnickas 2016). On the other hand, the emergence of corporate social responsibility as a type of private business self-regulation has an impact on the organization's mission, making it more complex and thus bringing together public and private sector organizations in this respect. This, in turn, expands the circle of stakeholders and, at the same time, influences the performance indicators (Porter and Kramer 2006).

K. S. Cameron (1986) argues that it is not possible to reach a consensus on a definite set of performance criteria, and it is difficult to disagree with this claim, but it is possible to identify an area where the search for such indicators could take place: an organization's mission, vision, and strategy. This could be the basis for the conceptualization of an organization's effectiveness. In this sense, due to its multiple stakeholders, the public sector is more complex than the private sector. Different approaches are adopted to determine efficiency criteria in the process improvement systems (6 Sigma, TQM, etc.). In order to reflect system dynamics, indicators are chosen in each step of the improvement cycle as the organization's mission is relatively stable.

## Brief Overview of the Development of Performance Measurement Systems

G. Roos (2005) has formulated several conditions that in his opinion are necessary to measure performance successfully:

- **Completeness.** The indicators must reflect all the resources of the organization and describe the organization fully.
- **Distinctness.** This requirement avoids duplication. An indicator may be acceptable for measurement if no element of it is present in another measured indicator.
- **Independence.** The value of one indicator should not instantaneously change as the other indicators change.
- **Agreeability.** Digital indicators should be adequate for the empirical system to be measured, i.e. they must have the same completeness, distinctness, and independence.
- **Scaling.** Indicators must be measured using ratio scale. The scales of physical processes are clear enough, but the choice of the wrong scale in the social field can prevent the correct interpretation of the data.
- J. F. Henri (2006) has distinguished four different functions specific to performance measurement systems:
  - **Monitoring.** This is understood as classic feedback, and is the comparison of pre-set goals with outcomes, along with performance adjustment if needed.
  - **Focusing.** These are the signals that allow you to answer the question: what is the problem?
  - **Supporting strategic decision-making.** Measuring information, along with established cause-effect relationships between set goals and internal processes, allows one to choose the most appropriate solution alternative.
  - **Legitimizing.** Performance measuring systems can be used to legitimate actions or to justify decisions taken.

Performance indicators, or what we measure, can also be categorized into various groups: outcome measures and drivers; external and internal; objective and subjective.

R. Kaplan and D. P. Norton (1992) have proposed a balanced scorecard, a popular and widely used performance measurement system, where all indicators reflect four different perspectives. The customer, internal processes, and innovation and development perspectives are introduced alongside the traditional financial perspective. The introduction of four perspectives makes it possible to at least partially address the issue of the adequacy of indicators, in which case they are not directly related to a less defined mission of the organization, but are assigned to one of the more specific, clearly defined areas.

H. Rohm (2002) highlights the differences between public and private sector organizations, and proposes a consideration of the mission-driven nature of the public sector. He suggests expanding the customer perspective to include both the customer and stakeholder perspective. Rohm advocates adopting this broader meaning of perspective, changing the positions of financial and customer perspectives, and using the terms employees and organizational capacity for the final learning and growth perspective in order to stress the importance of the human system. Other researchers of the balanced

scorecard in the public sector (Griffiths 2003; Olve et al. 1999) propose to enter the fifth perspective of stakeholders alongside the customer perspective, renaming the internal process perspective as activity perspective. The main ideas of Norton and Kaplan remain unchanged – the organisation's strategy remains the cornerstone of the system, a balance between different perspectives that are linked by cause-effect relationships is ensured, and the organisation's past, present, and future is reflected. In addition to customer satisfaction, G. Bouckaert and S. Van Der Walle (2003) suggest measuring the level of their confidence which, in many cases, can serve as an indicator of effective management.

After the balanced scorecard, the performance prism appeared (Kennerly and Neely 2002), where the indicators combined five different perspectives:

1. Stakeholder satisfaction (who are our stakeholders, what are their desires and needs?).
2. Strategies (what strategies do we have to choose to meet the needs of the stakeholders?).
3. Processes (what are the essential processes, and how can they be improved?).
4. Capabilities (what capabilities do you need to successfully complete the processes?).
5. Stakeholder contribution (what contribution do we expect from stakeholders if we want to maintain these capabilities?).

As in case of the balanced scorecard, the problem of the adequacy of indicators in the performance prism within each perspective remains open.

Some researchers (Neely et al. 2003) attempted to systematize the development of research in the field of measurement by grouping performance measurement systems into several generations.

For the first generation, they attributed the aforementioned Norton and Kaplan balanced scorecard, A. Neely's performance prism, and Edwin and Marlone's Skandia navigator. In the systems of this generation, the traditional financial indicators were supplemented by non-financial ones, as well as by recommended procedures or criteria that helped to decide which non-financial indicators were the most suitable for inclusion in the performance measurement system. The second-generation performance measurement systems do not focus on any particular resource whose value is measured, but on the measurement of the transformation of this resource. The dynamic aspect would be a distinctive feature of the second-generation measurement systems compared to the first-generation systems. Such systems include the strategy maps of Norton and Kaplan (2000), Neely and his success and risk maps, as well as IC-Navigator, developed by Roos and his colleagues. Kanji's (2002) business excellence measurement system, which links the measurement criteria with critical success factors, could also be attributed to second-generation performance measurement systems.

According to Neely, for a performance measurement system to be called the third generation, it must satisfy three criteria:

1. Appropriateness and adequacy – the model must be realistic.
2. Information adequacy – correct information must be provided.
3. Practicality and organisational alignment – the outputs must be practical and action-oriented.

Most performance measurement studies are dedicated to the first and second-generation systems. However, there is a lack of research dealing with third-generation measurement systems challenges. Neely and his colleagues formulated requirements that should be met by third-generation measurement systems:

1. Models must reflect static and dynamic aspects of an organization's activities and at the same time must not become too complex to be used as a practical management tool.
2. Models should help gather accurate information, especially for less defined and tangible drivers that create added value in the organization.
3. Models must be practical and fully compatible with the processes in the organization to initiate actions to be taken.
4. Models should have the ability to trace how financial flows affect non-financial and less tangible organizational drivers.

There are high requirements for third-generation measurement systems, and the adequacy of metrics in these measurement systems is indicated as a goal, but a way to ensure this, or at least to evaluate the adequacy of the indicators, is not specified.

### **Criticism of the Existing Performance Measurement Systems**

The balanced scorecard, despite its popularity as a universal performance measurement system, has also received critical attention, attracting doubts about its effectiveness. Most of the critical remarks were related to the assurance of the adequacy of the indicators – in particular, to the problems of the reflection of process dynamics. K. E. Davis (2018) claims that “The costs of producing disaggregated measures may be as high as, or higher than, the costs of producing more highly aggregated measures, and the demand for the more precise measures is typically more limited”. Authors such as A. Ng, H. Wong, and R. Wong (2014) take a critical look at the possibility for the successful application of the balanced scorecard in different organizations. Among the potential weaknesses, they point to a lack of adequacy in linking specific performance indicators to the final results. Such linking could be enhanced by using a dynamic system model. H. A. Akkermans and K. E. van Oorschot (2005) note that the linking of indicators can be hierarchical and horizontal. With regard to the horizontal linking of indicators, it is claimed that balanced scorecard fails to identify performance evaluation as a two-way process, as it is mainly oriented towards top-down performance measurement. There is also a lack of linkage between top-level strategic indicators and operational-level indicators, and a lack of integration between top-level strategic outcomes and performance-level measures. According to A. Neely, one of the shortcomings of the balanced scorecard is its inability to answer important questions for managers, such as: what do their competitors do?

Joining the balanced scorecard critics, C. Bianchia and G. Battista Montemaggiore (2008), claim that the BSC method is incapable of answering such questions as how strategic asset accumulation and depletion processes triggered by the use of different policy levers affect performance drivers; how performance drivers affect outcome indicators; and how outcomes will affect strategic asset accumulation and depletion processes.

According to the BSC authors Norton and Kaplan, dynamic methods could help in developing a more comprehensive model that links both strategic and operational goals in more complex imaging. Both magnitude and time delay estimates should be included in the causal linkages of the detailed system's dynamics model (Kaplan and Norton 1996a, 67). An example of such a quantitative link could be the percentage improvement in the lagging indicator that would be expected after a certain percentage improvement in the leading indicator (Kaplan 2009).

K. A. Humphreys, M. S. Gary and K. T. Trotman (2016) examined the effects of causal linkages between strategic objectives and time delay information in a strategy map on long-term profit performance. The authors noticed that organizations often implement a balanced scorecard without first developing a strategy map or other causal model. They also noted that organizations generally do not validate the links in their strategy map, and that estimating time delays in a strategy map can be very complicated in complex organizational settings.

According to N. Yahanpath and S. Islam (2016), the BSC itself has certain limitations and has therefore been criticized by some researchers. One of the major drawbacks of the BSC is that it covers only four organizational perspectives – financial, customer, internal business process, learning and growth. These four perspectives could have been considered sufficient in the 1990s, when the system was created and the business world was less complex and challenging, and companies did not face such tough competition that has increased as a result of globalization. For this reason, today's businesses need to consider not only the four perspectives mentioned by the BSC, but also other perspectives important for sustainability. Other drawbacks noted by these researchers are that insufficient emphasis is placed on the contribution of an organization's staff, suppliers, and community in defining the environment in which it operates, and that there is a lack of performance measurement tools with which to assess stakeholder input.

Based on a multi-case study made up of four cases from the Pacific region, A. Anjomshoae, A. Hassan, N. Kunz, K. Y. Wong and S. de Leeuw (2017), noticed that traditional BSCs suffer shortcomings such as a one-way approach to cause and effect relationship between indicators, the lack of a clear time span between leading and lagging indicators, limited support for a strict mechanism for validation and scenario analysis of KPIs' relationships, and limited support for parameter choices. Most researchers (Anjomshoae et al. 2017) agree that one of the possible ways to overcome these shortcomings could be the integration of dynamic attributes into the BSC, which would help to create a "dynamic" balanced scorecard. The concepts of system dynamics (causal loop diagrams, time delays, and stock and flow models) could enrich the existing BSC.

A BSC based on system dynamics helps to involve more stakeholders and their competitors in the BSC design process. In addition, the principles of system dynamics help to better link strategic decisions to the operational level, allowing managers to see the impact of the chosen policy at the operational level. This enables the BSC to translate strategies into operational conditions, which in turn enables better coordination of processes, competencies, and the performance of structural units.

Criticism of BSC is most often focused on the lack of the relevance of links between different BSC perspectives and between indicators from the same perspective that are cascaded into to lower-level perspective. However, the extent to which the indicators chosen in each perspective adequately reflects the effectiveness of the organization remains a problem.

In traditional performance measurement or strategic management systems, the set of indicators is more or less stable, and changes only as strategic goals change, so the inadequacy of the indicator can only be noticed after a long period of time when, for example, significant positive change in leading indicators has no effect on lagging indicators. This problem is solved differently in quality and processes improvement systems. In these cases, unlike traditional performance measurement systems, the choice of measurement indicators is cyclical. Leading indicators are reviewed during each cycle according to a specific DMAIC (Define, Measure, Analyse, Control) methodology (Williams et al. 2000; Pyzdek 2003; Brassard 1988):

1. Define – the main purpose of this phase is to set goals for improvement and determine existing boundaries. The most commonly used tools in this phase are: SIPOC (Suppliers, Inputs, Process, Outputs, Customers) – a high-level process map, which determines organization's process suppliers, inputs, process structure, outputs and customers; Voice of the Customer, which describes stakeholders' needs and service or product perception; CTQ (Critical To Quality) tree, which helps to quantify customers' requirements; Affinity Diagrams, which are used to group the stakeholders' needs into the related groups and the categorization of needs into three categories (must be, more is better and delighters); and the Kano model of the relationship between customer satisfaction and quality.
2. Measure – during this phase, all information about all the parameters of the ongoing processes is collected. The narrowest process sites are identified, so that we can define a set of leading indicators for lagging indicators set in the phase defined.
3. Analyse – identify the root causes of the problem based on the data collected at the measurement stage. The result of this stage is a proven and confirmed hypothesis about the cause of the problem.
4. Improve – solutions are tested and implemented to eliminate the impact of the identified root causes.
5. Control – the goal of this phase is to evaluate the solutions and maintain the gains by standardization of the improved process.

After completing all five phases of one cycle, definite changes appear in the process we have improved. The lagging indicators defined in the define phase remain the same, but the set of leading indicators may change depending on the measurement results obtained in the next cycle during the measurement phase. The whole cycle is repeated again. Such dynamic revisions of leading indicators can more effectively reflect the dynamics of any process and could be used in integrated performance measurement/process improvement systems. When measuring complex, multi-parameter and ever-changing systems, especially public sector organizations, focusing function is no less important than monitoring function. The voice of the customer techniques could serve as handy tools to

select lagging indicators, for example customer and stakeholder perspective indicators. Due to a wider range of stakeholders, this would be more important and useful for public sector organizations.

## Conclusions

In the existing performance measurement systems, monitoring and legitimating are the most implemented of all four performance measurement functions outlined by Henri. Recently the strategic decision-making function has grown rapidly, especially in the case of the balanced scorecard systems. The focusing function is not typical of current performance measurement systems. Process improvement systems, which are also based on measurement, are more effective in focusing, monitoring and legitimating functions, while the strategic decision-making function is weaker.

The balanced scorecard system faces serious difficulties with the challenge of reflecting the dynamic aspects of the measured object. Although all indicators are spread over four perspectives, which are interrelated with cause/effect relationships (i.e. we have the leading as well as lagging indicator), the set of the leading indicators is stable and thus can hardly better reflect deeper changes in the observed reality.

Performance measurement systems would be much closer to the third-generation performance measurement systems defined by Neely as, using the Six Sigma DMAIC methodology, the set of the leading indicators would be systematically reviewed after each cycle. This would greatly enhance the focusing function of performance measurement systems.

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## Rodiklių adekvatumo problemos veiklos vertinimo sistemose

Anotacija

Straipsnio tikslas – išanalizuoti matavimo sistemų problemas, susijusias su rodiklių adekvatumu. Apžvelgiami reikalavimai, keliami šiuolaikinėms veiklos vertinimo sistemoms, jų klasifikavimo kriterijai, veiklos matavimo ypatumai viešajame ir privačiame sektoriuose. Kaip pavyzdys, drauge su kitomis sistemomis, nagrinėjama viena populiariausių veiklos matavimo sistemų, peraugusių į strateginio valdymo priemonę – subalansuotų rodiklių sistema. Pateikiamas skirtingų autorių kritinis požiūris į matavimo sistemų galimybes atvaizduoti procesų dinamiką. Viena pagrindinių veiklos matavimo sistemų problemų – tai, kad rodiklių rinkinys yra praktiškai nekintantis, vieni rodikliai keičiami kitais tik pasikeitus strateginiams tikslams, ir ši aplinkybė trukdo laiku identifikuoti išskylančias rodiklių adekvatumo problemas. Straipsnyje siūloma praturtinti veiklos matavimą patirtimi, sukaupta kokybės valdymo ir procesų tobulinimo sistemose, ir matavimo procesą skaidyti į ciklus, rodiklių rinkinį peržiūrint po kiekvieno ciklo žingsnio ir, esant reikalui, jį koreguoti. Tai žymia dalimi padėtų užtikrinti rodiklių adekvatumą – vieną svarbiausių prielaidų tinkamam matavimui pasiekti – bei leistų priartinti tradicines veiklos matavimo sistemas prie trečiosios kartos sistemoms keliamų reikalavimų.

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