A Systems Approach to Measuring and Managing Company Performance

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Abstract — The key condition in today's tough competitive struggle is the ability to distinguish oneself from the competition. Naturally, an insufficient level of knowledge of modern management theory and deficiencies in systems thinking prevent managers from being able to set a company apart from its competitors. Nevertheless, it is possible to see competitiveness and competitive advantage as one of the decisive factors for a company's performance. A comprehensive information system is decisive for company management and other concerned parties in order to monitor company performance, evaluate and understand it and to reveal all factors affecting its development. Therefore, a systems approach for measuring and managing performance becomes an important condition for successful company management. This report deals with the problematic of the systems approach to measuring and managing performance at a specific manufacturing company. Findings acquired on the basis of an analysis conducted using internal company materials and a managed partially-structured interview are evaluated in the context of theoretical framework to apply the systems approach in the given area. Subsequently, this company's system is described and graphically depicted, and a recommendation is presented for potentially increasing the system's effectiveness.

Keywords — approach, management, performance, system.

I. INTRODUCTION

In today's tough competitive struggle, a competitive company must have potential that can be seen by the competition; otherwise, it is impossible to speak of competitiveness [1]. The decisive majority of company managers know quite well how, specifically, their company should be better in order to attain greater competitiveness for their products, company, or the field in which they are active. An insufficient level of knowledge of modern management theories and deficiencies in systems thinking prevent them from being able to set their company apart from the competition [2]. Another problematic area for companies is applying a systems approach in the field of measuring and managing performance. The requirements for a performance management system – not only in conception and methods of management but also in securing information and professional qualification for managers – are influenced by constant changes in business conditions, i.e., changes in the competitive situation or in technical and technological development; changes in values in the world of work or in the company; and, not least, change in attitude towards the environment, which is characterized by pressure to lower demands on resources. “The common denominator for the current fluctuating conditions of business processes is the decisive role of the customer, the dynamic of the innovation of processes and products and the growing measure of uncertainty for attaining success in the future.” For this reason, measuring and managing performance should be a company priority. [3]

II. THE SPECIFICS OF THE SYSTEMS APPROACH TO MEASURING AND MANAGING PERFORMANCE

According to [4] it is possible to consider the systems approach as a way of thinking, a way of resolving problems or a way of behaving where features are perceived comprehensively according to their internal and external relationships. [5] regard the systems approach to be a process of gradually exploring reality with its fundamental traits being:

• the purposeful simplification of the characteristics and relationships of the investigated features,

• their depiction in a newly created abstract object – system,

• preserving the comprehensiveness of the depiction of the processes and the characteristics and relationships of the observed features,

• functional relationships corresponding to the goals of observation are the only subject of the concern being researched,

• the rigorous application of the principle of causality in recognizing relationships between the analyzed abstract objects and their parts.

Bures [6] defines the systems approach similarly – as being founded on the concept that the phenomena we commonly encounter are part of a whole created from individual parts, which are mutually connected in various ways. He states that the given parts have their own place in the system determined by their relationships to other parts and have their own role and significance in the system as a whole. The system functions as a whole, i.e., if there is a change in one of its parts, this results in a change in other parts of the system.
Strizova [7] believes that the systems approach encompasses ways of heading towards fulfilling goals, is dependent on the organization's development within its surroundings and explores the effects of interactions. Additionally, she believes that primary attention is given to the harmony of its functions with the purpose of the whole and to the organization of the whole with its surroundings and that it integrates its structure with its function.

We can then see the application of the systems approach to performance in the definition of performance itself; for example, Pitra [8] defines business performance as “the result of the organized activities of specific people who have joined their strengths and resources to attain clearly defined goals.” He believes that business performance is not only an economic requirement but also a society-wide requirement and that employees, managers and owners who make decisions concerning its quality bear personal responsibility for its fulfillment. “Performance embraces all types of business activities that it is necessary to combine in order for the result to be a functional and prosperous company with a long-term prospect for existence.” [9]

Performance management then represents a methodical attempt by a company to improve its performance by means of its individual parts. It is possible to conceive of these parts as including the company's parts, people, processes, etc. [10] and [11] state that it is necessary to perceive performance management not only as a process but also as a system that is involved in an entire range of key areas within a company that are simultaneously critical factors for the success of the company overall (see Fig. 1).

Business performance is provided primarily by the individual performance of its employees.

The fundamental condition for performance management is its measurement. It is possible to define measuring business performance as an approach to evaluating performance in relationship to its goals, inclusive methodologies, scope and specific indicators that help businesses formulate and evaluate strategies, motivate and evaluate employees and communicate business performance to concerned parties [12], [13]. We can find elements of the systems approach even in this definition of performance measurement.

When applying the systems approach, it is essential to define the system being examined. It is possible to comprehend a system as Checkland [14] does – as a group of elements connected into a whole that embodies characteristics of the whole rather than characteristics of each individual element. Blanchard and Fabrycky [15] expand further on this statement; they consider a system to be a group of mutually interconnected components having specific characteristics and aiming collectively towards realizing a demarcated goal or fulfilling a certain purpose.

[16] understand the concept of a system to be any type of functionally defined set of elements (components, elements, parts, features) connected by mutual relationships in space and time. With the help of the mutual interconnection of individual elements, this system behaves differently with regards to its surroundings than another group of the same but not interconnected elements would behave. He also mentions the positive action of the synergetic effect between elements.

[5] talk about a system as an abstract object that is purposefully defined by a “conceptor” (a person who wants to understand, create or change a specific object or solve a problem) and which embodies specific functional characteristics as a whole, with the basic functional characteristic being the behavior of the system or the dependence of system outputs on system inputs. A system input is understood to be a depiction of a subject that acts on the original object of the “conceptor's” interest. It is then possible to express the set of these inputs with the help of variables by which the system is influenced. The system output is understood to be a depiction of the reaction of the original object to a specific stimulus. The set of these system outputs is expressed with variables by which the system influences other objects in its surroundings. Thus, most authors define systems differently; [15] for example, tried to unify these opinions and established 9 common criteria for defining a system.

The nature of the elements included in a system is varied; therefore, we differentiate systems, e. g., into technical, biological, economic, social and formal; these are homogenous types of systems. The combination of these results in the creation of heterogeneous or mixed systems; organizations or businesses can be considered heterogeneous systems [17]. The set of ties between elements of a system creates its structure. The system can be seen as structured, enabling optimization of internal system activities and the analysis of individual elements, and unstructured, in which only the behavior of the system as a whole is observed [5]. It is not possible to regard the system only in a static way – either from the perspective of its structure or from the perspective of its behavior and changes of state in dependence with the system's surroundings.

The following principles are applied in the systems...
approach [16, 18]:
• the principle of abstraction (overlooking non-essential features),
• the principle of proceeding from simple system characteristics to more complex features of behavior and to creating a more in-depth system structure,
• the principle of systematically investigating systems,
• the principle of team work (specialists from various fields),
• the principle of the process of investigating from top to bottom (from the highest level of structure down to the details of the system's structure),
• the principle of dividing systems (breaking down into simpler elements).

These mutually interconnected principles are characteristic for seeing reality with the help of the systems approach. Prorok [19] lists other principles which describe specific processes that take place in a given reality – not only processes of structure but also of hierarchy, feedback and the mutual dependence of a system on its surroundings.

On the basis of the relationship of a system to its surroundings, it is possible to divide systems into three basic types [5, 17, 18]:
• a closed system – it does not react to stimulus from its surroundings,
• a partially open system/relatively closed system – it reacts to stimulus but only specific elements,
• an open system – it reacts to stimulus from its surroundings.

For creating a system for performance measurement and management, it is important to apply a systems approach that is able to give these systems' form a clear structure as well as flexibility. It is possible to divide the implications of applying the systems approach to measuring business performance into two broad categories [20]:
• implications for process,
• implications for results.

The following table shows how it is possible to use the systems approach when designing a system for measuring performance (see Table I). [11]

<table>
<thead>
<tr>
<th>Features of the Systems Approach</th>
<th>Implications</th>
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<tbody>
<tr>
<td>The Top-Down Approach</td>
<td>Build on what the business is already using and the rules governing it. Focus on seeing the whole as well as its parts.</td>
</tr>
<tr>
<td>Life Cycle Orientation</td>
<td>Focus on the transition from concept to realization – on development from the beginning of the process. Take into consideration all relevant aspects of the organization's performance.</td>
</tr>
<tr>
<td>The Initial Definition of System Requirements</td>
<td>Conduct an analysis of needs and deficiencies at the beginning of the process. Establish the scope of the system of measurement, and make sure the requirements are realistic.</td>
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<tr>
<td>The Interdisciplinary Approach</td>
<td>The systems concept cannot be a task for the company's management only. It is necessary to cooperate with primary internal and external stakeholders.</td>
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A well designed system for measuring performance is explicitly accompanied by a set evolutionary cycle with these triggers [21]:
• Process – the existence of a process, its review and modification and the implementation of measures.
• People – the availability of the required skills, their utilization, to reflect on the business requirements, employees, fulfilling requirements, implementing measures.
• Systems – the availability of flexible systems that enable the collection, analysis and proof of pertinent data.
• Culture – the existence of a culture that ensures that measuring performance with pertinent and appropriate tools will not be perceived negatively.

III. METHODOLOGY

The goal of this research is to describe a systems approach to measuring and managing the performance of a specific manufacturing company and, on the basis of facts resulting from the analysis of the company's internal material and a managed interview that was conducted, to establish a set of recommendations for increasing the effectiveness of the system of performance measurement and management in use.

The internal materials of selected manufacturing company were analyzed. This company falls within the group 12.00 according to the classification of economic activities (NACE CZ) [22]. According to Commission Regulation (EC) No. 800/2008 [23] the manufacturing company can be characterized as large companies (over 250 employees, over 50 million Euro). It is a Czech joint-stock subsidiary, which is a part of a large foreign holding company/group.

Furthermore, the semi-structured interview was conducted with managers on the middle level management, based on the methodology and rules presented by [24].

IV. THE FEATURES OF THE SYSTEMS APPROACH TO PERFORMANCE AT A SPECIFIC COMPANY

In the context of theoretical background on the systems
approach to measuring and managing business performance, this approach was subsequently identified in the manufacturing company that was studied.

The system for managing performance at the manufacturing company that was studied is founded on the company’s four basic principles:

- Optimize all company activities with the goal of achieving added value.
- Identify problems and seek to resolve them.
- Learn and continually improve all company activities.
- Innovate and streamline all company activities. [25]

It is possible to describe the system of performance management from the studied manufacturing company on the basis of the nine criteria for defining a system established by Checkland [14] including the use of these criteria for creating structures and the content of the system for measuring and managing performance in the following way [20]:

1) The system has a long-term mission resulting from the strategy and established measurable goals that is set three years in advance.

2) It is able to measure its own performance using set goals (these goals fulfill the conditions of SMART (specific, measurable, achievable, realistic, time-dependent), which should be attained in individual areas of the company/company activities. Criteria and KPI have been established. KPI are always calculated and reported on a monthly basis. At the same time, there are established data sources, methods of data collection, methods for calculating KPI and roles and responsibility for data collection and KPI calculation. The company has a total of six KPI. Performance is determined using customer satisfaction, audits of the overall system (internal and external), monitoring and measuring processes, the product, investigating incidents and monitoring and measuring key environmental criteria.

3) It includes the decision-making process. Moreover, the PDCA cycle has been applied to the system in order to implement the principle of continual improvement.

4) It is composed of individual sub-systems – the main sub-system is the system of performance measurement.

5) The system elements, e. g., customers, employees, technology, IT, etc., engage in mutual interaction.

6) The system exists in the framework of a wider system, i.e., the company, and engages in mutual interaction with it.

7) The system has boundaries – they are those of the factory/manufacturing company.

8) It has resources available as part of the decision-making process assigned by the company’s top management.

9) The system guarantees continuity by applying the PDCA cycle. [25], [26]

A graphic depiction of the system for managing and measuring performance of the studied manufacturing company – its position in the company, including an expression of mutual relationships and flows, is evident from the following illustration (see Fig. 2).

![Fig. 2 depiction of the System for Managing and Measuring Performance in the Company's System](image)

The business system described above currently includes two systems – PMF (performance management framework) and PMS (performance measurement system). As a system, the company includes a range of inputs, e. g., infrastructure, equipment, technology, people, capital, know-how, output materials, etc. With the help of various documents/documentation connecting to the system, the system also has established requirements for these inputs, resources for acquiring inputs, responsibility, etc. System outputs are defined in various ways – a product, semi-finished product, profit, goal fulfillment, achievement of strategy, satisfying customers, employees, etc. It is possible to consider PMF a significant part/subsystem of this business system. The configuration of this system plays a key role, e.g., the configuration of the reporting structure, ways of using data from the PMS, establishing responsibility, etc. This system is located at the top of strategic management in the company. The SMV is a subsystem of the PMF. This system serves as a basis for managing performance in the company; performance is then managed on the basis of measuring the performance of individual company areas/activities. Inputs – the subjects investigated in this system are, for example: work performance (individual and group); processes (their configuration and quality); and products (semi-finished products, products). Quality, fulfilling the product requirements/specifications; key traits of the environment; investigation of incidents; the satisfaction of customers, employees, owners and stakeholders; the performance of suppliers, etc. are all measured. In the
manufacturing company studied, the balanced scorecard model was applied for measuring and managing performance as well as financial analysis and benchmarking, which is used mainly for comparing individual factories around the globe. Financial and non-financial criteria and six KPI (key performance indicators) have been established for measuring performance [25], [26].

The systems approach concerns all processes in the company, categorized here into four basic groups:

- management processes – the strategic framework is defined here,
- processes concerning protecting the environment as well as ensuring the safety and protecting the health of all company employees while at work,
- manufacturing processes – where inputs are transformed into outputs,
- subsidiary processes – they provide support for the manufacturing and management processes. [25]

The functioning and development of the overall system is ensured using the processes listed above. There is a regular process of criteria review as part of the system that takes place twice yearly. The company has installed software support that was developed specifically for the company.

The most important driving forces for the overall business system are value-creating, financial and communication flows. The transformation of inputs into outputs as part of the manufacturing process results in the creation of a final product intended for sale on the market – this overall process represents the value-creating flow. Financial and communication flows are present in all business activities. Communication flows can be considered of key importance for the overall business system. Communication occurs across the whole company – from establishing the mission, vision, strategy and key goals through to their delegation, monitoring the manufacturing process, measuring and managing the performance of company activities and providing feedback information for strategy revision. Establishing a company culture where all of the company's concerned parties significantly participate in accepting the system and perceiving it positively is fundamental for implementing and applying the system. [25], [26]

The evolutionary development of a system for measuring and managing performance is dependent on a number of basic factors as stated by Kennerly and Neely [21]. The following table lists these factors in the context of the observed manufacturing company (see Table II).

<table>
<thead>
<tr>
<th>Processes</th>
<th>Systems</th>
<th>People</th>
<th>Culture</th>
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<tbody>
<tr>
<td>The continual process of criteria review aimed at monitoring performance in individual areas, establishing a regular measurement schedule, responsibility and resources</td>
<td>The existence, provision, maintenance, updating and usability of IT systems</td>
<td>The availability of assigned human resources for facilitating the revision and modification of criteria and processes</td>
<td>The culture contributes to understanding the advantages of measurement, the provision of easy system implementation and understanding changes</td>
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<tr>
<td>The integration of measuring with initiatives for improving system management and the revision or formulation of a new strategy</td>
<td>The flexibility of IT systems that enable the modification of data collection, analysis and provide suitable tools for reporting</td>
<td>Providing internal self-examination of the system with the help of a human agent</td>
<td>Accepting the need for development</td>
</tr>
<tr>
<td>It was possible to ensure a consistent approach to continuity using measuring</td>
<td>The integration of IT, strategy, operating goals and resources for attaining these goals</td>
<td>The availability of appropriate abilities for effective use of the entire system (including in-depth knowledge of operation and the requirements of the participating parties, the ability to develop systems, etc...)</td>
<td>Effective communication across the system for using the established medium or media</td>
</tr>
<tr>
<td>Processes identify internal and external triggers for change, a study of these triggers leads to quicker reaction to change</td>
<td>Having sufficient financial resources available for providing IT systems</td>
<td>Creating and developing a community of system users for the transfer of tested practices (e-mail, user groups, etc.)</td>
<td>Using outputs from the system or its subsystems for quick action, correction, reflection on the strategy and processes</td>
</tr>
<tr>
<td>Providing the mechanisms for the transfer of tested practices, quicker information flow</td>
<td>Maximizing the accessibility of data, minimizing reporting</td>
<td>The transparency of processes and activities of the entire system</td>
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</table>

**Table II factors Influencing the Development of a System of Measuring and Managing Performance at the Studied Manufacturing Company**

**CONCLUSION**

The systems approach for both measuring and managing performance and for the company as a whole has been applied.
at a relatively sophisticated level within the studied manufacturing company. This fact is testified to by the sophistication of the business system, which includes systems for measuring and managing performance and establishing value-creating, financial and communication flows. In connection with four factors influencing the performance and establishing systems and culture. It is possible to state that the problematic connection with four factors influencing the system of measuring and managing the performance and establishing sophistication of the business system, which includes systems manufacturing company. This fact is testified to by the company, etc.

REFERENCES


