PERFORMANCE MANAGEMENT IN METALWORKING PROCESSES AS A SOURCE OF SUSTAINABLE DEVELOPMENT

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Abstract

In conditions of strong competition on the market and very quickly changing external environment, enterprises are constantly searching for new methods, tools and solutions which guarantee sustainable development. Enterprises are beginning to pay more attention to cost management, economic effectiveness and performance of business processes. Processes have become the key element of the contemporary enterprise. The modern structure is built around processes, which are treated as dynamic objects around which to build a system of relations within an organization. A process can be defined as a set of sequential steps that are associated with the cause-effect dependencies, or a series of activities or tasks that leads to the creation of a specific product. The current competitive context puts manufacturers under increasing pressure to provide products that meet the particular requirements of individual customers, calling for high flexibility in business processes.

In this paper a new approach to performance management is proposed. The main goal of this paper is to investigate the possibility of using Key Performance Indicators (KPI's) to measure and assess performance of metalworking processes. These indicators help to guarantee appropriate degree of product quality, execution time and costs of metalworking processes and assess the level of accomplishment of objectives including different kinds of indicators. Consideration of KPI's in the decision-making process allows permanent monitoring and control of the strategy realization of the company in day by day decisions and help to build sustainable development.

Keywords: key performance indicators (KPI's), metalworking processes, decision-making process, performance management

1. INTRODUCTION

The progress of globalization has led to industrial enterprises forming different kinds of collaboration links [1]. Strong competition in the market and a very quickly changing, uncertain, multicultural external environment has created new conditions of enterprise functioning [2]. Nowadays, industrial enterprises have to care not only about survival, but also about their sustainable development. They need to quickly create strategies which can make the most of every opportunity in the market. This means that new methods, tools and solutions are being sought, which guarantee and help companies to quickly realize new or frequently changing strategies.

The current competitive context puts manufacturers under increasing pressure to provide products that meet the particular requirements of individual customers, leading to the development of a sector of specialized enterprises which manufacture their products based on production orders (known as make-to-order...
manufacturing - MTO). Low cost and short lead times of production orders are key success factors in the MTO.

Modern structures are built around processes, which are treated as dynamic objects around which to build a system of relationships within an organization. This increases demand for high flexibility in business processes [3]. Enterprises are beginning to pay more attention to cost management, economic effectiveness and performance of business processes, therefore the role of performance management has increased.

One of the possibilities to measure performance of metalworking processes is the use of key performance indicators. This solution allows different kinds of indicators to be applied to measure cost, quality and time of metalworking processes. These indicators help to monitor and control the expected level of realization of these processes.

In this paper a new approach to performance management is proposed. The paper concerns the problem of assessment of metalworking processes in enterprises which manufacture functional products made from metal. The main goal of this paper is to investigate the possibility of using Key Performance Indicators (KPI’s) to measure and assess performance of metalworking processes, in order to help to guarantee appropriate degree of product quality, execution time and costs of metalworking processes and assess the level of accomplishment of objectives including different kinds of indicators. Consideration of KPI’s in the decision-making process allows permanent monitoring and control of the strategy realization of the company in day by day decisions and helps to create sustainable enterprise development.

2. PERFORMANCE MANAGEMENT APPROACH

Performance Management (PM) is a concept of management which focuses on providing employees with information necessary for the effective performance of their duties. According to M. Sumiński the main goal of PM is the integration of all the financial and operational data, ensuring its quality, reliability and availability [4]. PM includes the area associated with the planning, measurement and evaluation of the effectiveness of the organization [4].

Effectiveness is defined as the relation between the achieved results and used supplies [5]. Effectiveness of production processes in industrial enterprises means manufacturing high quality products at optimum costs and meeting the needs, expectations and requirements of the customer. Consequently, the quality and costs are key elements of effectiveness assessment [6].

In literature different approaches to assess the effectiveness of the organization are presented, taking into account their different aspects. Organization effectiveness measurement systems have, for a long time, been based on finance. To date, there are many very advanced systems to assess the financial effectiveness of enterprises [7], [8]. However, many experts have criticized the application of solely financial and often exaggerated indicators. Achievement of short-term financial results does not guarantee value creation in the long-term. This leads to expenses reduction in new product development, process improvement, staff development, information technology and systems, databases or customers and market development, which can reduce the enterprise’s possibility to create future economic value [9], [10], [11], [12], [13].

3. BALANCED SCORECARD AS A TOOL OF MEASUREMENT OF STRATEGY REALIZATION

Nowadays the most popular concept of multi-faceted assessment of the effectiveness of the organization is the Balanced Scorecard, introduced by R.S. Kaplan and D.P. Norton. They defined efficiency as the degree of implementation of the company strategy and considered in four different perspectives: financial, customer, internal processes and learning and growth [9], each of which should be determined by strategic objectives, measures, specific objectives and activities.
The financial perspective shows how the company is perceived by owners (e.g. shareholders). It is an essential element of the construction of the Balanced Scorecard because the defined level of return on investment is the most important objective of an industrial enterprise's functioning. The other perspectives should contribute to the implementation of the financial perspective’s objectives. There are two main mechanisms for the implementation of the financial strategy: to maximize revenues and productivity. The perspective of the customer shows how the enterprise should be seen by customers. The internal processes perspective determines which processes should be improved to measure up to the expectations of clients and owners. In the perspective of lifelong learning and growth, ways to create the potential for change and improvement in the enterprise in the future should be sought. The potential here is understood to mean the intangible infrastructure, i.e. employees, organization of information systems, culture, etc. Sometimes it is substantiated to create more perspectives, when there is another significant area for the industrial enterprise (for example cooperation with suppliers, relation with society, etc.).

In formulating the strategic objectives, the respectively correlated indicators for each of the perspectives should be chosen, which form the Key Performance Indicators (KPIs). Based on opinions from literature, implementation of these indicators forces managers to take a comprehensive approach to organization and pay attention to the uniform development of the company. Effectiveness of the organization should be closely connected with effectiveness of processes which are realized within it. The strategic goals of the organization must be clearly converted into operational activities. Therefore, BSC is a complex system which enables company strategy to be transformed into a measurement system which allows key success factors of the enterprise; identified in the strategy; to be monitored and controlled.

In the proposed approach, developing such a measurement system for strategy realization is suggested. This system consists of well-suited indicators in every perspective, according to the strategic goals of the industrial enterprise. The financial and customer perspectives have an external nature; whereas internal processes and learning and growth perspectives have an internal nature.

BSC should include 15-20 indicators which are used to measure progress of planned strategy implementation. A key element of building BSC is the selection of suitable indicators, which should be derived directly from the company strategy. The system should contain short-term and long-term indicators which have to form a coherent whole. Indicators should be connected to each other, creating cause-effect relationships. Every indicator should be an element of a cause-effect chain, the result of which is the improvement of financial results. The quantity of indicators must be limited to the minimum necessary. The detailed analysis of higher quantity of indicators is too time-consuming and impossible. BSC integrates some key success factors of the enterprise and their measurement, which allows it to quickly create detailed and synthetic information.

BSC describes enterprise strategy to ensure long-term economical results starting from long-term financial goals, in connection with necessary activities in the finance area; according to customer needs and requirements; in the scope of internal processes; and human resources and systems. Financial goals and indicators should play a double role: describe expected financial results of a strategy and establish final result for goals and indicators expressed in other perspectives.

The results of financial strategic goals are most often as follows:

- achievement of expected increase and structure of incomes;
- reduction of costs and increased performance;
- increased use of assets and effectiveness of investments.
At least some goals in customer, internal processes and learning and growth perspective are needed to achieve expected financial results. The most frequently used measures in the four perspectives are shown in tab. 1.

**Tab. 1 Measures in different perspectives**

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial</strong></td>
<td>Profit, profit rate, cash-flow, ROE, ROA, sales level, participation in market;</td>
</tr>
<tr>
<td><strong>Customer</strong></td>
<td>Level of prices, customer rankings, time of order realization, agreement of deliveries with orders, participation in market, market share, percentage of customers kept, customer satisfaction, brand recognition;</td>
</tr>
<tr>
<td><strong>Internal processes</strong></td>
<td>Length of cycle, production per worker, complaint ratio, percentage of accepted offers;</td>
</tr>
<tr>
<td><strong>Learning and growth</strong></td>
<td>Staff turnover, time of introducing innovation to the market, training expenses, new technology expenses.</td>
</tr>
</tbody>
</table>

Source: own study based on: [6], [17], [18]

There are three groups of processes in the internal processes perspective: innovative processes; operational processes and processes of after-sales service. The enterprise investigates customer needs and creates a product or service to meet these needs in innovative processes. Using operational processes, a company creates a product and delivers it to a customer. Processes of after-sales service serve changes of cost structure, increased value of work, etc. [12].

4. **ASSESSMENT OF METALWORKING PROCESSES**

Assessment of metalworking processes is a difficult according to many aspects which can be monitored and controlled, and simultaneously not enough time to analyse. The authors of this paper suggested selecting these areas which are directly connected with strategic goals of the enterprise. This solution allows only few the significant areas for the enterprise to be monitored and controlled.

The research conducted shows those indicators for assessment of metalworking processes should be created based on the most often used goals of enterprise which are in the following areas:

- quality of manufactured elements of products (improvement quality of manufactured elements, defects reduction, correction costs reduction, quantity of complaints reduction, etc.);
- timeliness (shorten time of anticipation, shorten time unplanned stoppages, etc.);
- assets utilization (high supply reduction, overproduction reduction, during production loss reduction, etc.) – (see [19]);
- costs (elimination the redundant processes, improvement of workers productivity, etc.).

Some strategic goals can concern two or more areas (e.g. improvement of workers productivity can time and reduce). In determined areas should be planned indicators. For this reason is needed to choose the significant 4-6 goals from all areas. The proposed example of indicators is presented in Table 2. They should be measured in the determined period of time for example once a week, month, etc. A key part of measurement of these processes is a target value of indicators to plan which allow an enterprise strategy to be realized in a given time.
Tab. 2 Proposed example of indicators for assessment of metalworking processes.

<table>
<thead>
<tr>
<th>Area of assessment</th>
<th>Goal</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Reduction in defects</td>
<td>Quantity elements manufactured correctly (without defects and rejections) / total orders</td>
</tr>
<tr>
<td>Quality</td>
<td>Improvement quality of manufactured elements</td>
<td>Quantity of measurement of finished products / total finished products</td>
</tr>
<tr>
<td>Timeliness</td>
<td>Shorten time unplanned stoppages</td>
<td>Time of unplanned stoppages / Total working time</td>
</tr>
<tr>
<td>Assets utilization</td>
<td>High supply reduction</td>
<td>Inventory turnover of supply</td>
</tr>
<tr>
<td>Assets utilization</td>
<td>Increase NCN machine utilization</td>
<td>Capacity utilization NCN machine</td>
</tr>
<tr>
<td>Costs</td>
<td>Improvement of workers performance productivity</td>
<td>Quantity of manufactured elements on the one workstation / quantity of man-hours</td>
</tr>
</tbody>
</table>

Source: own study

5. CONCLUSIONS
The research conducted underlines that Key Performance Indicators can be applied to assess metalworking processes. The Balanced Scorecard approach, as a part of performance management in an industrial enterprise, plays a significant role. It not only allows metalworking processes to be monitored and controlled, but it is also an element of a complex system which quickly assesses strategy realization of the whole company. A key merit of this solution is that strategic goals realization can be measured to such a level as is required for and relevant to the company strategy, allowing the industrial enterprise to focus on what it would like to achieve in the future.

In this approach an assessment of metalworking processes is made to the level that is of most importance to the enterprise. Implementation of financial and nonfinancial indicators allows assessment of all key aspects of enterprise activities. The significant aspects for metalworking processes, as the research underlines, are: product quality, assets utilization and process improvement.

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LITERATURE

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