International Journal for Quality Research 18(2) 473–486
ISSN 1800-6450

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Article info:
Received 01.07.2023.
Accepted 29.01.2024

UDC – 005.6
DOI – 10.24874/IJQR18.02-10

KEY PERFORMANCE INDICATORS (KPIs) IN THE QUALITY MANAGEMENT SYSTEM

Abstract: *Key Performance Indicators (KPIs) are often used in business of various sizes and industries to assess operational efficiency and evaluate process effectiveness. A universal model for implementing and utilizing KPIs has been elaborated in the company, and its functionality has been verified in a selected enterprise. In accordance with the developed model, efficiency indicators have been proposed, and among them, key performance indicators (KPIs) have been selected. In addition to commonly used financial indicators, indicators evaluating the performance of the quality management system have been included, along with the need for quality cost optimization.*

Keywords: *Key Performance Indicators (KPI), Quality Management System (QMS), functioning model of KPIs*

1. Introduction

A quality management system compliant with the requirements of ISO 9001 is a system based on risk and opportunity analysis and continuous improvement processes. The implementation and application of the requirements outlined in the standard should ensure stability and repeatability of identified processes within an organization. The fundamental concept embedded in the standard is the process approach, which involves identifying the processes taking place within the organization and managing the relationships between these processes. Applying the process approach in a quality management system allows for the identification of processes, considering them in terms of value-added, achieving effectiveness in executing the processes, and continually improving them based on data and information assessment (ISO 9001:2015). Within the process approach, the organization should determine the necessary processes for the quality management system, their application within the organization, and should also:

- identify the required inputs and expected outputs of the processes,
- determine the sequences of these processes and their interactions,
- define and apply criteria and methods (including monitoring, measurements, and related performance indicators) needed to ensure the effective execution and monitoring of these processes,
- identify the resources required for these processes and ensure their availability,
- assign responsibilities and authorities within these processes,
- consider the risks and opportunities,
- evaluate these processes and implement any necessary changes to ensure that they achieve the

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expected results,
- continuously improve the processes and the quality management system.

Managing processes and the system as a whole can be achieved in an organization by applying the PDCA cycle: Plan - Do - Check - Act. During the planning stage (Plan), the organization should establish the objectives of the system and its processes, identify the resources needed to deliver results in line with customer requirements and organizational policies, and identify and consider risks and opportunities. The next stage is Do, where the planned actions are implemented, followed by the Check stage, which involves monitoring and, where applicable, measuring processes and the products and services that result from them against policies, objectives, requirements, and planned activities. Based on the obtained and presented results, actions (Act) should be taken for improvement if necessary.

If an organization wants to achieve success, it should be continuously focused on improvement. Improvement in the organization is a process that has its inputs (such as potential areas for improvement), actions (representing its course), and outputs (being an enhanced form of a process, product, or service). This process is crucial for the organization to maintain the current level of performance, respond to changes in internal and external conditions, and create new opportunities. Improving the quality management system is a necessary action in the face of a changing environment, increasing requirements, and customer expectations. It is a continuous process that seeks opportunities to enhance all aspects of organizational functioning in the interest of both the organization and its customers, aiming to improve effectiveness and deliver products that meet expectations. Improvement should be treated as a tool for managing processes and as corrective action to ensure their implementation. The organization should promote the establishment of improvement objectives, develop and implement processes for implementing improvement projects within the organization, establish improvement mechanisms and an evaluation system for implementing improvement projects, evaluate the achieved results, and standardize tools and methods to solve problems and achieve improvement goals. It should also integrate ideas for improvement with the development of new or modified products, services, and processes. All actions carried out in the organization, comprising the identified processes related to leadership, planning, support, operational activities, performance evaluation, and improvement, should strive for the outcome of customer satisfaction. Operational actions, among others, include planning, determining product requirements, design and development, production, acceptance of products, handling nonconformities in output processes, and overseeing processes, products, and services delivered externally. The requirements for products and services also strongly emphasize the importance of customer contact.

In the process approach to management, it is assumed that every process within the organization creates value for the customer (external - end customer or internal - colleague). Therefore, it is necessary to assess the capability of processes to deliver products or services of a specified quality. Consequently, an analysis of the key attributes of each process should be conducted in the following aspects (Rydzewska-Włodarczyk & Sobieraj, 2015):

a) process costs, which include all costs incurred in carrying out activities within a given proces,
b) process duration, which refers to the average time required to complete all operations within the proces,
c) process flexibility, which is the ability to completely improve, combine, or divide tasks,
d) process quality, which is measured by its variability level or the number of errors,

e) significance for the organization, which represents the benefits generated by the process for the organization,
f) significance for the customer, which is measured by their satisfaction.

In the improvement of processes, indicators play an important role as they provide information about the results of actions, trends, and opportunities for change. Each organization should individually select indicators and tools through which measurements will be conducted.

The ISO 9001 standard includes requirements related to the evaluation of performance, which is associated with the process of monitoring and measuring processes. The organization should determine what needs to be monitored and measured, the methods to ensure the accuracy of the results, the frequency of monitoring and measuring, as well as how to analyze and evaluate the results of monitoring and measurements. The results of the analysis should be used to assess:

- conformity of products and services,
- level of customer satisfaction,
- effectiveness of actions and the effectiveness of the quality management system,
- whether planning has been effectively implemented,
- effectiveness of actions taken to address risks and opportunities,
- performance of external suppliers,
- needs for improvement of the quality management system.

According to the literature review (Ostapko, 2018; Grycuk, 2010; Zbierowski, 2011), it is evident that there are difficulties in selecting and formulating appropriate indicators, as well as conducting measurements and obtaining relevant information. However, every organization uses various indicators to assess the performance of processes, their effectiveness, achieved results, and resource consumption.

2. Key Performance Indicators (KPI)

Monitoring of the production process, which involves recording and collecting detailed data regarding its course, is a crucial element of enterprise management. The collected data can be used to assess the functioning of processes, identify emerging non-conformities, improve and optimize processes, as well as enhance the efficiency of resource utilization and increase production capabilities. Analyzing processes using raw data of diverse nature from different positions can be challenging. It is much more convenient to utilize synthetic numerical indicators that combine information from various sources. For this purpose, key performance indicators (KPIs) are used, which enable the evaluation of the functioning of the production system in terms of its performance, quality, and maintenance (Barecki et al., 2018; Czerwińska & Pacana, 2020).

Key Performance Indicators (KPIs), according to ISO 22400-1:2014 and ISO 22400-2:2014 standards, are defined as measurable and strategic metrics that reflect critical success factors of an organization. KPIs are essential for understanding and improving production performance from both a production perspective, enabling the elimination of waste, and a strategic goal achievement perspective.

KPIs are indicators that allow organizations to assess the extent to which their strategic objectives and plans are being achieved. They serve as a management control tool that enables the detection of problems even in the early stages, facilitates prompt decision-making, prioritizes actions appropriately, and promotes process improvement within the company. They also enable the identification of areas of inefficiency, monitoring changes over time, and evaluating employee effectiveness. A set of indicators developed for a specific organization, which fulfills its role and is

utilized for management purposes, should meet the following conditions (Rydzewski-Włodarczyk & Sobieraj, 2015; Grycuk, 2010; Grabowska, 2017):

a) Indicators should address issues that are important to the organization.
b) Indicators should be tailored to the situation and specific sector in which the organization operates.
c) The number of indicators should not be excessive, and measurement should focus on monitoring key processes rather than measuring everything.
d) Each indicator must have a defined benchmark or standard for the specific assessment period, such as results achieved by the organization in previous periods.
e) Benchmarks should be adjusted in subsequent periods to stimulate continuous improvement.
f) Only indicators that employees can realistically influence should be selected.
g) The majority of indicators should focus on processes related to meeting customer needs and measuring customer satisfaction.
h) The costs of data collection should not exceed the benefits of using indicators.

Therefore, it is important to select and choose indicators appropriately, measuring and analyzing only those that are most important to the company and provide information about the organization's performance. From all the possible calculable indicators, only a few or a dozen should be selected that best reflect the level of achieving strategic goals. The developed KPI indicators should be simple, and the method of calculation should be understandable to employees. The indicators should be clearly and precisely defined to ensure reliable and comparable results across different periods. Measuring and assessing processes using key performance indicators aim to obtain information about their functioning and the need for improvement actions.

KPI indicators are used to measure economically, technically, and organizationally fundamental parameters characterizing the functioning of a company. They enable not only the determination of the values of applied KPI indicators but also the identification of selected factors influencing their values (Bartecki et al., 2018; Hollender, 2016).

3. Modelel and results

Key performance indicators are used not only for evaluating processes but can also be used for assessing the functioning of the quality management system and evaluating individual actions carried out within this system. The aim of the study was to determine whether efficiency indicators can be used to improve processes and the quality management system.

A medium-sized manufacturing company operating in Poland, which sells its products not only to the domestic market but also to the European Union, was selected for the study. This organization operates and develops quite dynamically. The investigated company is characterized by a high level of quality in its offered products as well as the executed processes. It typically runs large production batches but also has the capability to fulfill small batches if the need arises.

The organization has implemented and maintains a quality management system in accordance with the requirements of ISO 9001, which operates effectively and has obtained certification for compliance. Due to collaboration with the automotive industry, the investigated company has obtained certification for a quality management system in the automotive industry in accordance with the requirements of IATF 16949. It has also implemented the requirements of VDA standards and incorporates elements of sustainable

development.

Due to the implemented quality management system, the investigated organization, as part of its improvement efforts and in line with the principle of evidence-based decision-making, has decided to introduce process evaluation, including the use of effectiveness indicators. The main objective of focusing on KPIs was to increase production efficiency and eliminate unnecessary activities that do not benefit the company. A team was established within the company to oversee the monitoring, functioning, and improvement of KPI-related activities. The team consisted of representatives from different processes as well as a person from the analysis department. The first step taken by the team to implement key effectiveness indicators was the development of a universal model for their implementation, operation, and improvement. This model is presented in Figure 1. The developed model was verified within the researched company.

According to the developed model, the first step to be taken is to identify the processes or areas for which counting and analyzing KPIs are planned. In organizations that have implemented a QMS, processes are already identified and described.

The investigated organization has identified areas where it deemed it valuable to calculate effectiveness indicators. These areas include production, research and development of new products, orders, human resource management, financial area, customer relations, and maintenance.

The next step was to characterize the processes, determine their inputs and outputs, and identify the key attributes that are specific to each process. Then, as many indicators as possible were collected to describe the identified processes. These indicators were developed based on available literature, as well as the experience and knowledge of the employees.

The next crucial step is to select, from the prepared indicators (Table 1), those that are most important, significant, and provide the most relevant information for the process owner during management. The chosen indicators should be linked to the company's objectives and identify the needs of process stakeholders. They should be indicators that can be influenced by employees. By performing their tasks and responsibilities, they can actively respond to process parameters and affect their change.

Having such prepared efficiency indicators, it is necessary to establish and provide target values for these indicators. Target values for Key Performance Indicators (KPIs) represent the level of expectations, the value of the indicator that the organization should strive for when undertaking improvement actions. Determining target values for KPIs constitutes:

1. **Progress Indicator** - serves as a reference point for evaluating the organization's progress towards its goals. Comparing the current values of KPIs with the target values allows determining whether the organization is moving towards its defined objectives and to what extent it has already achieved them.
2. **Motivation and Performance Management** - target values for KPIs are used to motivate employees and teams. Setting realistic goals can inspire employees to greater engagement and effort in pursuing desired outcomes.
3. **Prioritization and Resource Allocation** - target values for KPIs help in establishing priorities and allocating resources within the organization. Identifying areas where KPI values fall below the expected values enables focusing efforts on improving those areas.
4. **Monitoring Strategy Effectiveness** - Target values for KPIs should be aligned with the organization's strategic objectives. Monitoring the achieved KPI results in relation to the target values allows for

evaluating the effectiveness of the strategy and taking corrective actions.

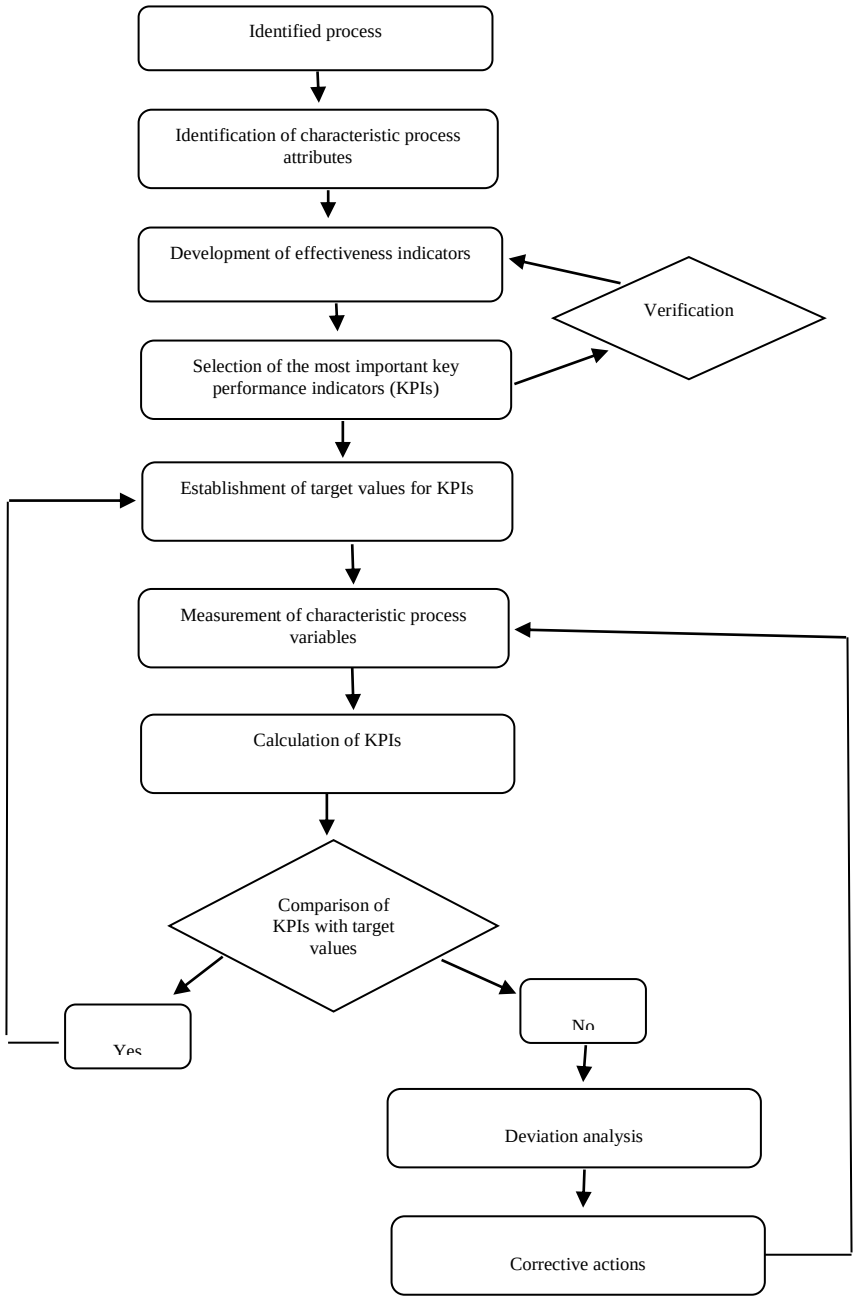

Figure 1. Implementation, maintenance, and improvement model of KPIs

Table 1. Key Performance Indicators (KPIs) established for selected areas.

Area	Indicator	Information obtained from the calculation of the indicator
Production	Parts per Million (PPM)	Number of defective units per million pieces
	Overall Equipment Effectiveness (OEE)	Efficiency of machine and equipment utilization
	Material consumption in production	Material usage during production
	Production cycle time	Time required to complete one cycle of the process
	Inventory turnover	Flow of goods in the warehouse over a specified period, e.g., a year
	Defect rate	Percentage of defective products in relation to the total number of units produced
Quality Management System	Cost of Quality Indicator	Measures the magnitude of costs incurred for quality (costs related to quality control, prevention of defects, costs of non-conformance) in relation to production costs.
	Effectiveness of Corrective Actions Indicator	Measures the effectiveness of corrective actions taken to eliminate the causes of product or service defects.
	Product Quality Indicator	Measures the level of product conformity with quality requirements, the percentage of products that meet quality standards.
	Customer Complaint Response Time Indicator	The time measured from receiving a complaint to taking corrective actions.
	Customer Satisfaction Indicator	The level of customer satisfaction measured through surveys and/or customer satisfaction studies.
	Audit Effectiveness Indicator	Level of Effective Implementation of Corrective and Improvement Actions Proposed in Post-Audit Activities
Development of New Products	Project Completion Time	The time required to complete a project for the implementation of a new product or changes/improvements to existing products.
	Percentage of Development Costs	The percentage of costs dedicated to activities related to product development in relation to the costs of other processes.
	Time to Market	The time required to design, produce, and launch a new product into the market.
Logistics	Inventory Turnover	The ratio of inventory value to sales value.
	Order Picking Accuracy	The correctness of order picking.
	Order Fulfillment Cost	The cost incurred in fulfilling an order.
	Order Fulfillment Cycle Time	The time required to complete one order fulfillment cycle.
	Percentage of Logistics Costs	The percentage of costs dedicated to logistics activities in relation to the costs of other processes.
Human Resource Management	Employee Hiring Cost	The cost associated with hiring an employee.
	Training Cost	The cost associated with conducting training per employee.
	Recruitment Costs	The cost of recruitment activities.
	Employee Satisfaction	The level of employee satisfaction.

Financial Area	Return on Sales (ROS)	The amount of net profit earned per one unit of sales revenue.
	Return on Assets (ROA)	The amount of net profit earned per unit of total assets.
	EBITA Earnings Before Interest, Taxes and Amortization (EBITA)	The profitability of the company before interest, taxes, and depreciation, calculated as a percentage of equity.
	Earnings Before Deducting Interest and Taxes (EBIT)	The profitability of the company before interest and taxes, calculated as a percentage of total assets.
Customer Relations	On Time in Full (OTiF)	The percentage of deliveries that are in accordance with the order,
	On Time Delivery (OTD)	Measuring the timely and complete delivery to customers.
	Customer Acquisition Cost	The cost associated with acquiring a new customer.
	Number of Complaints	The percentage of complaints in relation to the sales volume.
	Customer Satisfaction	The level of customer satisfaction.
Supplier Management	On Time in Full OTiF	Percentage of Deliveries in Accordance with the Order
	On Time Delivery (OTD)	The percentage of deliveries received from suppliers that are delivered on time.
	Number of Rejected Deliveries	The percentage of deliveries that are rejected due to quality issues in relation to the total number of deliveries.
Maintenance Management	Maintenance Cost	Costs incurred in connection with machine and equipment maintenance.
	Reporting time for performed maintenance.	The time required to prepare a report after maintenance has been conducted.
	Mean Time To Repair (MTTR)	Average time required to resolve a breakdown.
	Mean Time To Failure (MTTF)	Average uptime of the device/machine before a breakdown occurs.
	Mean Time Between Failures (MTBF)	Mean time between failures

Target values should be established in a measurable, achievable, and contextually appropriate manner for the organization's activities. It is also important for these values to be realistic and monitorable, enabling effective management and continuous improvement of the organization's operations.

Determining the value of a given indicator at the initial stage of its implementation, and subsequently verifying its changes within specified timeframes, enables the organization to examine the impact of its actions on the indicator values. The implementation of key performance indicators should be an important component of any system, allowing for the identification, measurement, and monitoring of its functioning.

After setting the target values, the organization should measure its processes to calculate the performance indicators and then compare the obtained values with the target values. If the target values are achieved, the organization should analyze what contributed to the success and continue

striving for improvement. It should establish new, more ambitious target values for KPIs. Through this approach, the organization can continue to grow and increase its efficiency.

If the target values are not achieved, the organization should also thoroughly analyze what contributed to their non-achievement. In such a situation, areas and processes that require corrective and improvement actions should be identified. Implementing such solutions should improve the functioning of the processes in question and contribute to achieving the target values or getting closer to them in the next period.

In the analyzed company, most of the developed indicators were calculated and analyzed, but not all of them were included in the key performance indicators. The primary indicators verified within the proposed model are:

- Return on Equity (ROE);
- Overall Equipment Effectiveness (OEE);
- Inventory turnover;
- Number of complaints;
- Cost of quality indicator;
- Customer satisfaction indicator.

These indicators should provide necessary information about the functioning and effectiveness of individual processes, and they should also be helpful in making managerial decisions at both operational and strategic levels. The indicators have been defined according to the SMART rule, which means they should be: Specific, Motivational, Attainable, relevant, and time-bound (Otręba & Knop, 2019; Kazimierska et al. 2014; Bjerke & Renger, 2017; Mourtzis 2018; Podgórski, 2015; Zhou & He, 2018).

The next step was to establish the target values for KPIs, which are the expected values that the organization should strive for as part of improvement efforts. When setting the target values, the organization followed the SMART methodology. The established target values for KPIs were both realistic and motivating for improvement actions. After determining the target values, the actual values of the KPIs were calculated to evaluate the performance of the analyzed processes. If the actual value of the indicator does not differ from the target value, it indicates that the process exhibits high efficiency, and according to the developed model (Figure 1), the target value of the KPI should be increased to enable further improvement of the process by the organization. Typically, goals are set to be 2-5% more ambitious than in the previous period, which stimulates continuous improvement processes. In case of deviation between the target value and the actual value, the reason for not achieving the expected value should be examined. The analysis of the process should lead to identifying the cause of such a situation and proposing corrective and improvement actions. Implementation of these actions should contribute to the improvement of the process functioning and, consequently, to the improvement of KPIs.

In the examined company, the target values for KPIs were determined in April, and the actual values were calculated in the following month. The KPIs were recalculated at the end of July. The data regarding target and actual values are presented in Table 2.

Return On Equity (ROE), is an important indicator in ratio analysis that illustrates the profitability of equity. It represents how much profit has been generated in the company from the contributed equity. The higher the value of this indicator, the more favorable the company's situation. The value of the indicator is determined on an annual scale. In the examined company, this indicator is higher than the set target value, which means that there is no need for improvement actions to be implemented.

Table 2. Target and Actual Values of Selected KPIs in the Examined Company

KPI Indicator	Target Value	Actual Value May 30th	Actual Value July 30th
ROE	Min. 0,15 / year	0,16	0,16
OEE	Min. 90% / month	89,87%	89,93%
Inventory Turnover	Min. 0,85 / month	0,84	0,81
Number of Complaints	Max 1 / month	0	0
Quality Cost Index	Max 35%	39%	38%
Customer Satisfaction Index	95%	92%	93%

The Overall Equipment Effectiveness (OEE) indicator reflects the efficiency of machine and equipment utilization in the company. Its main component is the measurement of time, and the calculation result, in simplified terms, represents the portion of plans and expectations that have been achieved at the current level of process organization. The OEE indicator reveals improper resource utilization in processes. By implementing improvement actions, these inefficiencies can be easily eliminated. Therefore, a decision has been made to implement improvement actions. Proposals for these actions were developed based on consultations with the implementation team and included in the actions to be carried out in the near future. The first improvement actions were implemented in the first month. The effects are visible as there was an increase in the indicator in the following month. Due to the proper trend of the indicator's change, it was decided to continue applying the same improvement actions.

The inventory turnover ratio indicates how many times the inventory has been turned over in the warehouse during a specified time period, in the analyzed company, it is analyzed on a monthly basis. It allows calculating how long it takes for the financial resources invested in goods to be recovered. In the initial measurement, the actual value of the ratio in the analyzed company was nearly close to the target value. Therefore, it was decided not to implement improvement actions but to observe its performance in the following month. In the subsequent month, the ratio value was even lower and significantly below the target value. This situation was attributed to the holiday period and production downtime. In July, the number of planned orders to be fulfilled decreased, which in turn affected the decrease in the inventory turnover ratio. Therefore, no improvement actions have been taken for now. Actions will be initiated if such a situation continues in the upcoming months.

The indicator regarding the number of complaints determines how many complaints have been reported to the company. The target value for this indicator was set at 1. However, in the analyzed company, the actual value of this indicator during both measurements remained at 0, indicating that the quality of the products sold is satisfactory for customers.

The cost of quality indicator determines the costs associated with quality control, costs of defects, deficiencies, and non-compliance, as well as the costs of preventive actions in relation to production costs. The actual value of the cost of quality indicator calculated in both periods deviates from the target value. A higher cost of quality indicator indicates that the company incurred higher costs related to quality management than planned. These costs may include quality control, repairs, addressing non-compliance, or preventive actions to avoid non-compliance in the future. Actions taken in the area of cost of quality contribute to the elimination of defects and non-compliance in the

production process and the implementation of preventive measures aimed at improving the process. The costs incurred in the analyzed period may only yield results in subsequent periods. This indicator demonstrates the effectiveness of the implemented improvement actions.

The customer satisfaction indicator represents the percentage of surveyed customers who are satisfied with the products purchased from the surveyed company. A lower value of the indicator may indicate that not all customers are satisfied with the quality of the offered products. The lower level of customer satisfaction is not due to product quality issues, as no complaints have been received by the company during this time, as indicated by the complaint indicator being 0 in the current period. Comparing both indicators, it can be concluded that customer dissatisfaction does not stem from product defects, but rather from a mismatch with customer expectations. It would be worthwhile to conduct surveys among customers to obtain information about the reasons behind such evaluations of the products.

In the examined company, it is necessary to continue monitoring processes and analyzing KPI indicators. The research conducted indicates that there is currently no need to take actions to change the target values. These values are currently properly established, and the company should continue its improvement efforts to enhance processes and consequently improve KPI indicators.

4. Conclusions and Discussion

Key performance indicators (KPIs) are important navigational tools used by managers and executives. They allow them to assess and understand whether the company is on track for success. A properly selected set of KPIs enables the determination of the performance of the analyzed processes and highlights areas that require attention.

The implementation of KPIs requires certain assumptions from the company, such as understanding the processes, aligning KPIs with the company's goals, selecting an appropriate set of indicators focused on outcomes, process effectiveness, and providing the necessary information for managers and stakeholders. The indicators should be chosen in a way that allows employees to measure the real impact of their actions and responsibilities (Grycuk, 2010; Torbacki & Torbacka, 2015; Ostapko, 2018; Bhadani et al., 2020; Kaganski et al., 2017).

In the examined company, KPIs have been implemented based on the developed model for introducing, maintaining, and improving KPIs. Literature presents various models for implementing KPIs, but they mainly focus on the preparation and introduction stages in a company (Lindberg et al., 2015; Grycuk, 2010; Orłowski et al., 2015). The presented model may provide less detailed information on the process of identifying and developing indicators, but it includes actions to be taken depending on the actual results achieved. In case of discrepancies between the target and actual values, it is necessary to identify the area or location within the company or process that contributed to the deviation. Then, the cause of the deviation should be identified, and corrective and improvement actions should be implemented. These actions aim to eliminate the reasons for the discrepancies and prevent similar occurrences in the future.

KPI indicators are used in companies of various sizes and industries. The impact of properly selecting KPI indicators on the decision-making process in small and medium-sized enterprises (SMEs) has been studied by Pîrlog and Balint (Pîrlog & Balint, 2016). According to the authors, KPI indicators serve as early warning signals for a company. Properly approaching this information, making appropriate decisions,

and implementing corrective actions can lead to overall improvement in the company's performance. In Business Intelligence (BI) systems, the Key Performance Indicators (KPIs) are considered measurement tools that assess and demonstrate how effectively a company achieves its business goals. A long list of KPIs that lacks clear connections to the overall company objectives may indicate a larger problem: a lack of strategic alignment. Properly selected KPI indicators lead to:

a) great business insights;
b) clear and relevant information;
c) easy access to historical data;
d) faster and better decisions;
e) overview of overall company performance.

Therefore, it is important to select key relevant indicators for which data can be obtained. They should be applied in circumstances that provide the organization with necessary information to determine factors contributing to inefficiencies in key supply chains and performance improvement strategies/policies.

Chae (2009) also emphasizes the importance of proper selection of indicators. According to him, the correct selection of KPIs is not easy. He believes that "less is more" when it comes to developing performance indicators. Companies should focus only on a small list of KPIs that are crucial for managing operations, customer service, and financial profitability. Potential KPIs should be developed, measured, reported, and managed in order for the company, department, or project to be perceived as successful. Monitoring KPIs reveals the gap between planning and execution and helps identify and address potential issues and problems. These indicators make it easier to achieve the proposed goal set at the beginning.

KPI indicators are also used in companies to assess the performance of quality management systems, where meeting customer requirements is an important element. This is a crucial factor for companies in terms of survival in the market and generating profits in the medium and long term. Building trust with customers and achieving a high level of customer satisfaction are important attributes. The quality of products is examined during the production process as well as during customer usage. Implemented quality management systems help monitor quality. Additionally, audits are conducted within the system to identify process non-conformities. Non-conformities often lead to defects and discrepancies, which, if unnoticed within the company, appear in the market and are purchased by customers. In such cases, customers have the right to file complaints and express their dissatisfaction during customer satisfaction surveys. Therefore, KPI indicators are also necessary in quality management systems to assess the effectiveness of improvement actions, the number of complaints, and the level of customer satisfaction. Additionally, quality costs and related indicators can be measured to determine the extent to which improvement actions have optimized costs and reduced non-conformance costs, consequently impacting production costs (Balon, 2012; Sulowska, 2012; Sadkowski, 2020; Ayach et al., 2019).

Key Performance Indicators (KPIs) are one of the most important management tools in organizations. Their proper implementation and use support the improvement and control of both processes and the effectiveness of actions taken within the organization. Well-chosen indicators are a key element in the proper utilization of control and management in an organization. When applied in a manufacturing company, key performance indicators (KPIs) need to be integrated into the company's structure and management system. Monitoring the production process through the use of indicators serves as a tool for steering the organization and identifying problems within the company, enabling dynamic response and documenting actions and their effects.

Acknowledgment: Publication financed by the Cracow University of Economics as part of the Conference Activity Support - WAK-2023.

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