Improving Procurement Process Management by Application of KPIs in the Company from Metal Industry

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The procurement process is one of the most critical processes for any company, as it ensures the provision of all necessary material resources. Improving the procurement process can contribute to reducing procurement costs by acquiring higher-quality raw materials, shortening delivery time, producing higher-quality products, and enhancing business relationships with suppliers. The subject of this paper is the improvement of the procurement process management, based on Key Performance Indicators (KPIs). The paper presents a set of five KPIs defined and implemented in the procurement process management on a case study of a real company from the metal industry. The result of the application of selected KPIs is improved procurement process that observed company use for monitoring supplier performance and the procurement department's efficiency. It also led to the applications of corrective measures, such as contract revision and modification, or termination of partnerships in favor of more reliable suppliers, as well as enhanced efficiency in the operations of the procurement department.

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1 Introduction

In recent decades, the procurement process in every modern company has become increasingly significant, both administratively and strategically. The growing role of the procurement process has been influenced by numerous factors (rising energy prices, inflationary trends, raw material price increases, economic crises and others). Procurement refers to all activities through which a company acquires the necessary material resources required to ensure the smooth and continuous operation of the production function at the lowest possible cost impacted by many factors, both objective (market conditions) and subjective (procurement policies, organization of procurement departments, employees involved in procurement and others) (Kakwezi & Nyeko, 2019). Considering that procurement costs accounted for 40 [%] of total costs by the end of the 20th century and that today they present almost 60 [%] of total company costs (Đukić Vujanović, 2021), it can be concluded that in today's global, dynamic and increasingly competitive market, the importance of the procurement process, in terms of managing overall business costs, has never been more important. For this reason, companies that manage to achieve a higher degree of differentiation from competitors pay significant attention to controlling procurement costs. A basic prerequisite for effective procurement process management is the availability of all necessary data related to procurement, starting with the current state. This means it is essential to have access to a full range of procurement performance indicators, based on which a strategic procurement plan will be done, and the success of its implementation could be continuously monitored. One approach that can improve procurement process management is the use of Key Performance Indicators (KPIs). These KPIs help achieve objectives, enhance strategies, improve and optimize the implementation of all procurement-related activities, aligned with the core production goals (Parmenter, 2020).

The subject of this paper is the improvement of procurement process management through the application of KPIs in the company Vendom, a company from the metal industry that exports most of its products to foreign markets. The paper presents a set of six KPIs, defined and implemented to improve the management of the procurement process. The defined set of KPIs was applied in a case study of the company Vendom, to improve procurement process management in this renowned company. The paper consists of six chapters. After the introductory considerations, the second chapter provides theoretical insights into the procurement process in the

company. The third chapter presents the basic concepts related to KPIs, while the fourth chapter emphasizes the set of KPIs defined for improving the procurement process management. The fifth chapter shows the application of the defined set of KPIs in the case of the company Vendom. The sixth chapter presents concluding remarks.

2 Procurement Process

The procurement process refers to a series of steps necessary to obtain raw materials, products or services, while the three most important ones are (Baily et al., 2008): ordering goods, receiving goods and paying for goods/services. The main objective of this process is to reduce costs, decrease procurement time for materials and build strong business relationships with suppliers. In a manufacturing company, procurement presents a set of activities, measures and tasks carried out to purchase materials for reproduction, machines, equipment, accessories and tools, ensuring the smooth operation of the work function (Vasiljević et al., 2024). The procurement process can be viewed in both a narrow and broad sense. These tasks can include those performed daily and frequently, related to procurement and categorized as operational tasks, as well as tasks that are performed occasionally and categorized as strategic tasks. Procurement includes the following operational functional tasks (Ferišak & Stihović, 1989): receiving, examining, and consolidating procurement requests; requests to suppliers; receiving and analyzing offers; selecting suppliers; ordering products; monitoring delivery deadlines; receiving and inspecting ordered products and documents; handling complaints with suppliers; keeping procurement records; inventory control; collaborating with other business systems; reporting; selling surpluses and waste. On the other hand, procurement in the broader sense involves operational, tactical and strategic activities over a longer period (from one to 10 years), while, from a company's perspective, it includes procurement of materials and services, rights (licenses, rentals, leases), energy and resources, such as equipment and investment goods (Žilbert, 2007). Companies operating in larger markets are expected to have a dedicated unit responsible for procurement tasks. The responsibilities of this department, among other things, include: ensuring a continuous supply of raw materials, consumables and services required for the company’s operations, minimizing investment and losses related to inventory, maintaining high-quality standards for raw materials, forming and developing supplier networks, procuring standardized products whenever possible, sourcing

raw materials at the lowest possible price, improving the company's competitiveness, coordinating with other departments and achieving procurement objectives with the lowest possible administrative costs (Bloomberg, 2006).

3 Key Performance Indicators

Procurement process management is just one part of production management. To fully understand all aspects of procurement management, it is necessary to consider which elements of the procurement function have the potential for performance identification and performance management. Performance encompasses the quantification of the effectiveness and efficiency of events that have occurred in the past and the comparison of results with selected reference indicators (Neely, 2004). A performance indicator is a set of data collected through regular monitoring of the performance of specific activities, processes or systems (Atanasov, 2016). It presents a crucial tool for tracking the functioning, monitoring and controlling or overall management of activities, processes and systems (Fitz-Gibbon, 1990). KPIs are metrics used in business to plan and monitor the outcomes achieved by a company. They focus on organizational aspects that are most critical to the current and future success of the business (Parmenter, 2020). A broader definition of KPIs is provided by (Belić, 2019), who states that "key performance indicators are metrics that, when considered together, provide a meaningful, concise and general picture of the performance of a company and its processes, reflecting the critical success factors". The concept of KPIs has become increasingly popular in recent business practices, indicating that companies recognize the need to measure and track their performance to make informed decisions and improve their operations. The popularity of these indicators is supported by certain studies that show that over 90 [%] of the most successful companies worldwide apply some form of KPIs (BCG, 2024). By using KPIs, companies can assess their progress in achieving strategic and operational goals within the framework provided by the performance indicators. These indicators also offer valuable insights into various aspects of business operations, allowing managers and stakeholders to track progress and make decisions based on the obtained information. The selection of criteria for the selection of performance indicators is a crucial step in measuring performance. KPIs help to assess and monitor outcomes, as well as the achievement of set objectives and their deviations from the company's strategies. Recent approaches to performance measurement emphasize measuring a smaller number of KPIs,

focusing on the connection between the measured data and critical success factors, as well as alignment with the company's strategy (Kojić, Dajić & Vučković, 2017).

4 Key Performance Indicators for the Improvement of the Procurement Process Management

In this chapter, a set of six KPIs for improving the procurement process management is presented.

KPI 1. $NDCR_i$ – Non-delivery compliance rate by the supplier

Failure to comply with the agreed delivery time by the supplier is a crucial indicator for the company. Specifically, in cases where the supplier exceeds the delivery time, serious consequences for production may occur, leading to delays in the delivery of products, unforeseen costs and damage to the company's reputation. The calculation of KPI 1. $NDCR_i$, for each supplier individually, is presented with a formula (1).

$$NDCR_i = \left(\frac{CNDD_i}{CN_i}\right) * 100\ [\%] \tag{1}$$

where:

- $NDCR_i$ – Non-delivery compliance rate by the supplier i [%];
- $CNDD_i$ – The total number of contracts with a supplier i that had a delivery delay [1];
- CN_i – The total number of contracts with the supplier i [1];
- i – supplier, where $i = 1, \ldots n$ (n – total number of suppliers).

The aimed value of KPI $NDCR_i$ should be as low as possible.

KPI 2. $PNCQ_i$ – The percentage of non-compliance with the delivery of the contracted quantity of goods by the supplier

The percentage of non-compliance with the delivered contracted quantity of goods by the supplier is also an important indicator for the company, as it can lead to the company being unable to deliver the ordered quantity of products to its customers,

thereby incurring compensation (penalties) stipulated by the contract. The calculation of KPI 2. $PNCQ_i$, for each supplier individually, is presented with a formula (2).

$$PNCQ_i = \left(\frac{TCQ_i - TDQ_i}{TCQ_i}\right) * 100\ [\%] \quad (2)$$

where:

- $PNCQ_i$ – The percentage of non-compliance with the delivery of the contracted quantity of goods by the supplier *i* [%];
- TDQ_i – Total delivered quantity from supplier *i* [t];
- TCQ_i – The total contracted quantity from the supplier *i* [t];
- *i* – supplier, where *i = 1, ... n* (n – total number of suppliers).

The aimed value of KPI 2. $PNCQ_i$ should be as low as possible.

KPI 3. $PPQD_i$ – The percentage of goods delivered by the supplier that did not match the quality standards

The problem arises when suppliers deliver the ordered quantity of goods within the agreed timeframe, but those goods or their quantity, do not meet the required quality standards and cannot be used in production or can only be used with certain limitations. The calculation of KPI 3. *PPQDi*, each supplier individually, is presented with a formula (3).

$$PPQD_i = \left(\frac{OPQ_i}{TQD_i}\right) * 100\ [\%] \quad (3)$$

where:

- $PPQD_i$ – The percentage of goods delivered by the supplier *i* that did not match the quality standards [%];
- OPQ_i – The total quantity of goods delivered by the supplier *i* that did not match the quality standards [t];
- TQD_i – The total quantity of goods delivered by supplier *i* [t];
- *i* – supplier, where *i = 1, ... n* (n – total number of suppliers).

The aimed value of KPI 3. $PPQD_i$ should be as low as possible.

KPI 4. $PDGS_i$ – The percentage of delivered goods per supplier

The purpose of KPI 4. $PDGS_i$ is to calculate the supplier participation rate, thereby avoiding the risk of over-reliance on a single supplier or, if possible, reallocating deliveries from a supplier with a minimal impact on procurement to another supplier. This reallocation aims to achieve better procurement conditions by increasing the purchasing volume. The calculation of KPI 4. $PDGS_i$, for each supplier individually, is presented with a formula (4).

$$PDGS_i = \left(\frac{TDSi}{TDG}\right) * 100\ [\%] \tag{4}$$

where:

- $PDGS_i$ – The percentage of delivered goods by the *i* supplier [%];
- TDS_i – Total quantity of delivered goods of the *i* supplier [t];
- TDG – Total quantity of delivered goods from all suppliers [t];
- i – supplier, where $i = 1, \ldots n$ (n – total number of suppliers).

The aimed value of KPI 4. $PDGS_i$ is to be as high as possible.

KPI 5. $PGDP$ – The percentage of goods purchased directly from the plant

Direct procurement of goods from the plant is, when possible, the best solution for any manufacturer, as it eliminates the profit margin of intermediaries (suppliers). The calculation of KPI 5. $PGDP$ is presented with a formula (5).

$$PGDP = \left(\frac{TPP}{TPG}\right) * 100\ [\%] \tag{5}$$

where:

- $PGDP$ – The percentage of goods purchased directly from the plant [%];
- TPP – The total quantity of goods purchased from the plant [t];
- TPG – The total quantity of purchased goods [t].

The aimed value of KPI 5. *PGDP* is to be as high as possible.

KPI 6. *PIPG*– The percentage of internal requests for the goods procurement with a delivery time of less than seven days

Respecting the wishes of customers who require shorter delivery times for final products, it is necessary to procure all the required goods within a very short timeframe (up to seven days) to meet these demands. Procurement costs in such tight deadlines are significantly higher and this approach is not commonly used. However, it does happen because the company cannot disregard customer requests. The calculation of KPI 6. *PIPG* is presented with formula (6).

$$PIPG = \left(\frac{NIRG}{NTR}\right) * 100\ [\%] \tag{6}$$

where:

- *PIPG* – The percentage of internal requests for the procurement of goods with a delivery time of less than seven days [%];
- *NIRG* – The number of internal requests for goods procurement with a delivery time of less than seven days [1];
- *NTR* – The total number of requests for the goods purchased [1].

The aimed value of KPI 6. *PIPG* should be as low as possible.

5 Improvement of procurement process management using Key Performance Indicators in the company Vendom

A defined set of six KPIs for improving procurement process management was applied in the case of the company Vendom that is engaged in manufacturing and service provision in the metal industry. It has various product ranges, including industrial and residential fences, small steel structures up to 100 [t] and demanding structures for industrial purposes up to and over 1,000 [t]. The company also produces underground and above-ground waste disposal systems, as well as cranes for container unloading. Structures, fences, steel moulds, underground and above-ground waste containers, cranes, steel constructions for buildings and others are

manufactured from various types of steel based on customer requirements or designs by the company's engineers (Vendom, 2025). Vendom procures all raw materials (goods) needed for production from suppliers, so, the procurement department was established to manage this process. The study used real data from this company for the year 2024. Special attention was given to suppliers (16 of them) who predominantly (over 99 [%]) supply the company with necessary goods (sheets, pipes, profiles, bolts, etc.). The implementation of KPIs in the company's procurement sector was carried out in 2024 to optimize procurement through monitoring and measuring the performances of the procurement department. The designed set of KPIs enables management to assess the efficiency of procurement processes and, based on the obtained KPI values, identify areas for improvement and make important decisions to enhance the procurement process.

KPI 1. $NDCR_i$ – Non-delivery compliance rate by the supplier

Table 1 presents the obtained values for KPI 1. $NDCR_i$ from which it can be concluded that most suppliers complied with the agreed delivery times, while suppliers 4, 8, and 14 did not, because their delay exceeds 5 [%]. If the same suppliers delay deliveries in the future, proposals for improvement are modification of contracts or terminations of partnerships. Given that the total number of contracts (CNi) is 196 [1] and the total number of contracts with delayed deliveries ($CNDDi$) is 6 [1], the KPI 1. $NDCR_i$ is 3.06 [%]. The company believes that the value of this KPI can be reduced to below 2 [%] as the aimed value, through specific actions and agreements with suppliers.

Table 1: Values of KPI 1. NDCR*i*

Supplier	1	2	3	4	5	6	7	8	
CN_i [1]	53	34	24	17	15	9	8	11	
$CNDD_i$ [1]	1	0	1	2	0	0	0	1	
KPI 1. $NDCRi$ [%]	1,89	0,00	4,17	11,76	0,00	0,00	0,00	9,09	
Supplier	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Sum**
CN_i [1]	4	3	5	4	1	4	3	1	196
$CNDD_i$ [1]	0	0	0	0	0	1	0	0	6
KPI 1. $NDCRi$ [%]	0,00	0,00	0,00	0,00	0,00	25,00	0,00	0,00	3,06%

Source: Own

KPI 2. *PNCQ$_i$* – The percentage of non-compliance with the delivery of the contracted quantity of goods by the supplier

The calculated values for KPI 2. *PNCQ$_i$* are presented in Table 2.

Table 2. Values of KPI 2. *PNCQ$_i$*

Supplier	1	2	3	4	5	6	7	8	
TCQ$_i$ [t]	2180	840	565	207	178	96	64	93	
TDQ$_i$ [t]	2138	822	553	196	168	96	62	87	
KPI 2. *PNCQi* [%]	1,93	2,14	2,12	5,31	5,62	0,00	3,13	6,45	
Supplier	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Sum**
TCQ$_i$ [t]	35	25	46	18	7	23	18	5	4400
TDQ$_i$ [t]	33	25	40	18	7	22	18	5	4290
KPI 2. *PNCQi* [%]	5,71	0,00	13,04	0,00	0,00	4,35	0,00	0,00	2,50

Source: Own

It can be concluded that there are issues with suppliers 11, 8, 4 and 5, whose percentage of undelivered goods exceeds 5 [%], considering that the company's aimed value is below 1.6 [%]. If these suppliers continue to fail to deliver the contracted quantity of goods, the proposal for improvement is to modify contracts or even terminate partnerships. The procurement department should consider forming reserves for certain critical raw materials. Given that the total contracted quantity (*TCQi*) is 4,400 [t] and the total delivered quantity (*TDQi*) is 4,290 [t], the average KPI 2. *PNCQ$_i$* is 2.5 [%]. The company believes that this KPI value can be reduced up to 1.6 [%] through specific actions and agreements with suppliers.

KPI 3. *PPQD$_i$* – The percentage of goods delivered by the supplier that did not match the quality standards

From Table 3, that presents the calculated values for KPI 3. *PPQD$_i$*, can be observed that most suppliers delivered goods that met quality standards. However, during the analyzed period, issues were identified with suppliers 7, 9, 12 and 15, whose percentage of goods with poor quality exceeded 5 [%]. If these suppliers continue to deliver substandard goods, certain measures should be taken to establish partnerships with more reliable suppliers. The value of KPI 3. *PPQD$_i$* should be as low as possible. The company's objective is to be no more than 1 [%]. Given the total quantity of goods delivered by the supplier (*TQDi*) is 4,400 [t] and the total

quantity of goods delivered by the supplier that did not match the quality standards (*OPQi*) is 70 [t], the average KPI 3. $PPQD_i$ is 1.59 [%]. This value indicates that certain corrective actions need to be implemented to reduce this KPI value to the desired value.

Table 3. Values of KPI 3. *PPQDi*

Supplier	1	2	3	4	5	6	7	8	
TQD_i [t]	2180	840	565	207	178	96	64	93	
OPQ_i [t]	34	11	9	2	0	0	5	3	
KPI 3. $PPQD_i$ [%]	1,56	1,31	1,59	0,97	0,00	0,00	7,81	3,23	
Supplier	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Sum**
TQD_i [t]	35	25	46	18	7	23	18	5	4400
OPQ_i [t]	2	0	2	1	0	0	1	0	70
KPI 3. $PPQD_i$ [%]	5,71	0,00	4,35	5,56	0,00	0,00	5,56	0,00	1,59

Source: Own

KPI 4. $PDGS_i$ – The percentage of delivered goods per supplier

From Table 4, that shows the calculated values for KPI 4. $PDGS_i$, it can be observed that only three suppliers 1, 2 and 3 participate in a total of 81.89 [%] of the total delivered goods. This indicates that the company Vendom mostly depends on the deliveries from these three suppliers, highlighting the issue of their share. Eight suppliers contribute less than 1 [%] of the total delivered goods. Based on the value of this KPI, it can be concluded that the number of suppliers providing exceptionally small quantities of goods should be reduced to enable better contract terms for suppliers with a higher participation rate.

Table 4: Values of KPI 4. *PDGSi*

Supplier	1	2	3	4	5	6	7	8
TDS_i [t]	2138	822	553	196	168	96	62	87
KPI 4. $PDGS_i$ [%]	49,84	19,16	12,89	4,57	3,92	2,24	1,45	2,03
Supplier	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
TDS_i [t]	33	25	40	18	7	22	18	5
KPI 4. $PDGS_i$ [%]	0,77	0,58	0,93	0,42	0,16	0,51	0,42	0,12

Source: Own

KPI 5. *PGDP* – The percentage of goods purchased directly from the plant

Considering that out of the total quantity of purchased goods (*TPG*) is 4,400 [t] and the total quantity of goods purchased from the plant (*TPP*) is 3.98 [t], the value of KPI 5. *PGDP* is 0.09 [%]. The company believes that this KPI is at a very low level and should be increased to at least 0.5 [%] in the future, that would lead to a reduction in procurement costs.

KPI 6. *PIPG*– The percentage of internal requests for the goods procurement with a delivery time of less than seven days

Considering the total number of requests for the goods purchase (*NTR*) is 196 [1] and the number of internal requests for goods procurement with a delivery time of less than seven days (*NIRG*) is 5 [1], the value of KPI 6. *PIPG* in the company Vendom for the observed year is 2.55 [%]. This is within the desired value range defined by the company Vendom, as it slightly exceeds the aimed value of 2.5 [%].

6 Conclusion

This paper presents the application of a selected set of KPIs that can improve procurement process management. The chosen and defined set of KPIs focused on monitoring supplier performance in terms of compliance with agreed quantities, qualities, delivery times and supplier participation. This set of KPIs was applied to a case of the company Vendom from the metal industry. The results showed that there is potential for improvement in the procurement process management in the observed company by implementing certain corrective measures, such as revision and modification of contracts or terminating partnerships in favour of more reliable supplier. Some of the identified shortcomings can also be addressed by improving the efficiency of the procurement department, particularly in creating stockpiles of goods supplied by suppliers who have delays in deliveries, fail to meet agreed quantities or provide substandard raw materials. Additionally, the company should focus on procuring raw materials directly from plants whenever possible. Future research directions of the authors of this paper aim at identifying another set of KPIs to further enhance procurement process management from additional perspectives.

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