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## OPERATIONAL PROCESSES THAT THE MANUFACTURING COMPANIES EXPECT TO BE IMPROVED BY SUPPLIERS

**Abstract:** *The aim of the article is to identify, on the basis of the analysis of the literature and the results of empirical research, the expectations of enterprises towards suppliers regarding the improvement of their operational processes. It can be noticed that manufacturing companies, while improving their processes, also require actions in this area from suppliers. The article presents the results of empirical research conducted using the computer-assisted telephone interview (CATI) technique in medium and large manufacturing companies operating in Poland. The results of these studies show that manufacturing companies focus their expectations towards suppliers mainly on the improvement of quality control processes (deliveries, semi-finished products, as well as the finished products). The research results presented in the article have several important implications for representatives of science and business.*

**Keywords:** *Manufacturing companies; Operational processes; Supplier; ISO; TPS*

### 1. Introduction

The expectations of purchasing companies towards suppliers are increasingly focused not only on ensuring technical quality, but also on improving operational processes (Qiu & Yang, 2018; Negash et al., 2020; Melnyk et al. 2021; Zimon et al., 2020). This applies to both the main operational processes and supporting processes. The main operational processes include: customer service, research and development, purchasing, production, packaging and delivery of products and services. Supporting processes include activities related to quality control, production planning, technical preparation of production, maintenance and waste disposal. Manufacturing companies have especially expectations regarding the improvement of operational processes (Jovičić, et al., 2022; Li & Mishra, 2021). These expectations are related to the need to ensure and improve the

technical quality of products, as well as to improve the efficiency and effectiveness of operational processes in supply chains. Manufacturing companies very often define such expectations as criteria for the initial and periodic evaluation of suppliers (Yazdani et al, 2021; Zakeri et al., 2022; Zimon, 2016). The fulfillment of these expectations determines the status of suppliers' qualifications and the possibility of further cooperation with them. The verification of buyers' expectations is carried out through a multi-criteria assessment (Min et al., 2018; Sinha and Anand, 2018; Memari et al., 2019; Hendiani et al., 2020; Mucha, 2021). Process improvement by suppliers is particular importance for companies that have implemented quality and environmental management systems, as well as other operational process improvement tools (such as Toyota Production System or Lean Management).

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When reviewing the literature, many studies are noticed on the impact of management systems and concepts on the improvement of enterprises (Damić et al., 2021; Fonseca et al., 2019; Domingues et al., 2016). More and more researchers are also taking up the issue of the impact of the management concept on the improvement of supply chain management (Dellana & Kros, 2019; Zimon et al., 2022; Jum'a et al., 2022). However, there are not enough studies that focus on the impact of management systems on supplier-recipient relationships. Therefore, there is a research gap which this article will fill to some extent and will provide the basis for researchers to extend the presented research results.

## **2. Literature review**

### **2.1 Importance of buyers' expectations towards suppliers regarding the improvement of technical quality of products**

In building relationships in supply chains, a special role is played by ensuring the technical quality of products by providers (Chen et al., 2017; Fonseca et al., 2020; Zimon et al., 2018). Guaranteeing the quality of products requires strict compliance with legal requirements relating to safety (contained in European Union directives and in technical standards). Product quality also depends on the effective supervision of operational processes related to product realization, such as customer service, product design and development, purchasing, manufacturing and delivering products and services to buyers. Important guidelines for the supervision of operational processes are specified in the international requirements for quality management systems published by the International Organization for Standardization. For this reason, purchasing companies very often require their suppliers to implement a quality management system based on the requirements of the ISO 9001 standard. The last amendment to this

document in 2015 was based on the risk management concept. The main assumptions of this concept have been published in the ISO 31000 series standards. The quality management system takes into account the assumptions of the risk management concept in the context of building relationships with suppliers (Yoo, 2014). The implementation of this concept allows suppliers to ensure effective supervision over the technical quality and safety of the purchased products. This supervision begins with the buyers defining the technical specifications of the products. Effective supervision of technical quality assurance requires the definition of guidelines for product control (González-Benito & Dale, 2001). The scope of quality control required by customers may refer to the course of sequential activities related to the assessment of technical parameters of materials / parts, semi-finished products and the finished product. (Ueki, 2016). Buyers' requirements may also apply to the use of the necessary equipment for product quality control. Supervision of this equipment should ensure the reliability of the assessment results and give an acceptable or unacceptable status to the product and process control. This applies to the control of purchased materials / infrastructure elements, semi-finished products, and the finished product. Control records allow to define the inspection status as well as identify the product at different stages of the operational processes. This is particularly important in the event of complaints and allows suppliers to identify the cause of non-compliance.

### **2.2 Importance of buyers' expectations towards suppliers regarding the improvement of operational processes**

Many manufacturers (and especially Original Equipment Manufacturers) expect suppliers to pay special attention to their research and development processes. In the hi-tech sectors, very close cooperation between suppliers and customers is required. This is especially important in the case of joint R&D projects

on new and modified products (Flanckegård et al., 2021, Wang, 2021). Close cooperation to a high degree allows to ensure their high level of safety (Manders et al. 2016). In the case of design processes in high-tech sectors, suppliers are required to very carefully identify the requirements and expectations of buyers regarding products (Ylimäki, 2014; Li et al., 2021). The requirements and expectations of buyers include legal requirements, technical parameters, as well as conditions of use of products in order to ensure safety (Taifouris et al., 2020). The various stages of product design should include appropriate reviews and verifications. The final result of the design should be validated. The result of the validation determines the degree of compliance with the expectations of buyers / users in terms of technical parameters, as well as the requirements of applicable legal regulations. Successfully carried out validation of the product documentation, manufacturing processes and the prototype allows to reduce the risk associated with innovations (Schwabe, 2020).

Buyers in the B2B market should precisely define the requirements for suppliers (Zhou et al., 2021). These requirements concern product parameters, operational processes, technology and equipment, quality control, as well as personnel competences (Mohan et al., 2021). Requirements for suppliers should be specified in the criteria for their evaluation (both initial and periodic). Forms of supplier selection and evaluation should be improved to reduce the risk associated with purchasing (Torres-Ruiz and Ravindran, 2018). Suppliers must also be effectively monitored to ensure product quality supervision and order fulfillment on time. It can also be noted that buyers pay particular attention to the processes of communication with suppliers (Zheng et al, 2022). These processes include the exchange of information between customers and suppliers in the field of order processing, complaints or problems related to products. Important processes that affect the relationship between partners are also after-

sales services, such as installing products at customers, providing technical service, or consulting and training.

The expectations of buyers are also focused on improving processes related to planning and technical preparation of production, product production, planning and maintenance. Production planning by suppliers should be based on the collected information from customer orders and demand forecasts (Liu-yi et al., 2006). This process is to ensure the efficient flow of materials and information in order to implement the production process. This planning includes activities from determining the material requirements for raw materials / parts, processing / assembly to the final product. Production management by suppliers should include supervision over the process parameters influencing compliance with customer requirements (Hajji et al., 2011). Particularly important in this process is the traceability of materials / parts, production batch or serial number. Packaging is to ensure effective protection of the product in logistic processes such as storage and transport (Sarkar et al., 2019). Maintenance by suppliers should ensure effective supervision over the operating parameters of devices. This maintenance also includes activities related to the maintenance of infrastructure. This process is also important in emergency situations to ensure continuity of product flow in supply chains (Glavee-Geo, 2019). Effective supervision over this process determines timely deliveries to customers.

### **2.3 Customer evaluation of supplier processes**

Enterprises that are customers formulate their expectations towards suppliers regarding the quality of products and the supervision of operational processes by formulating specific guidelines. The verification of these expectations is carried out by preliminary evaluation and supplier selection (Lou et al., 2022; Sun et al., 2022; Wang et al. 2022).

Large international concerns start the initial assessment of suppliers by sending them self-assessment questionnaires (Urbaniak, 2021). Very often, the questions included in the supplier self-assessment questionnaires refer to the international requirements included in the quality, environmental and safety management standards. The reliability of the data contained in the self-assessment questionnaires is verified by audits at suppliers. Audit assessment focuses on:

- planning and implementation of operational processes,
- quality control of products (materials, semi-finished products, finished products);
- applied technologies (related to the manufacturing process, storage, transport, IT support for processes);
- infrastructure supervision (inspections of buildings, machines and devices);
- innovative potential (research and development, efficiency in implementing process innovations),
- implemented management systems that allow to ensure and improve the organizational efficiency of the supplier (Hosseinasab & Ahmadi, 2015; Nikoofal & Gümüş, 2020; Asif et al., 2022).

The result of the preliminary assessment allows to select qualified suppliers that meet customer requirements. Qualified suppliers are periodically assessed. This assessment is carried out by means of measures or scoring methods included in the supplier scorecard (Creighton et al., 2022). Many multinationals require periodic reporting from suppliers. These documents determine the degree of compliance with the goals set for suppliers, included in the Performance Feedback Reports Cards. The information contained in Performance Feedback Reports Cards is verified by audits. Buyers may require an audit of the supplier in the cases of non-conformities resulting in quality complaints or delivery delays. These non-conformities may be caused by disruptions in operational

processes resulting in serious failures or low production efficiency. Therefore, it can be concluded that buyers, when assessing suppliers in terms of improving products and processes, perform a systematic, comprehensive evaluation of them (Kaur & Singh, 2021). It should also be noted that the supplier evaluation criteria are increasingly related to the implementation of the sustainability concept (Chang et al., 2021).

### **3. Methodology of research and results**

The subject of the conducted research was to define the processes which the suppliers expect to be improved by the surveyed manufacturing companies. The research was conducted between October and November 2018 using the Computer Assisted Telephone Interview (CATI) technique. The research covered 150 producers (employing over 49 people) who were suppliers for enterprises from the automotive, metal and chemical sectors operating in the Polish B2B market. All companies participating in the study had an implemented quality management system compliant with the guidelines contained in the ISO 9001 standard. Almost half of the surveyed economic entities (47.33%) were enterprises with foreign capital (including large international concerns with global activity). The expectations of production companies towards their suppliers regarding the implementation of the sustainability concept were assigned a rank on a scale from one (the least important criterion) to five (the most significant). The study was commissioned to a specialized research agency that conducted a targeted selection of companies registered in the Bisnode database, which is a business directory search platform. The results of the research showed that companies focused their expectations towards suppliers in terms of process improvement, focused on control processes (finished product, accepted delivery and production process), complaint handling, processes (supplier evaluation and selection),

production, planning and technical preparation of production, the process of delivery to the customer, as well as the provision of technical service (maintenance and repairs). For the surveyed companies, the following processes were relatively less important: packaging, maintenance, receiving

orders from customers, product design, training and consulting related to the use of the product, installing the product at the customer's site, or waste disposal. Detailed results of the research are presented in the tables 1 and 2.

**Table 1.** Processes that the surveyed manufacturing companies expect to be improved by suppliers. (general results and a comparison between the segments depending on capital and the number of employees, and the number of employees, average)

Processes	General N=150	Capital		Number of employees	
		Polish N=79	Foreign N=71	50-250 N=65	251- N=85
Quality control of the finished product	4.79	4.78	4.79	4.80	4.77
Quality control of the accepted delivery	4.79	4.75	4.83	4.78	4.80
Quality control of the production process	4.70	4.68	4.71	4.75	4.65
Complaints service	4.63	4.57	4.69	4.48	4.73
Process of initial assessment and selection of sub-suppliers	4.57	4.55	4.58	4.39	4.70
Production	4.54	4.44	4.67	4.50	4.58
Process of delivering to the customer	4.50	4.46	4.54	4.44	4.55
Production planning process	4.45	4.42	4.48	4.44	4.45
Process of periodic evaluation of sub-suppliers	4.42	4.37	4.48	4.30	4.51
Technical services	4.41	4.38	4.44	4.20	4.55
Process of technical preparation of production	4.40	4.35	4.46	4.38	4.42
Packing	4.31	4.32	4.30	4.26	4.35
Maintenance	4.30	4.32	4.28	4.29	4.31
Accepting orders from customers	4.25	4.11	4.42	4.25	4.25
Product design process	4.16	3.92	4.36	4.03	4.23
Training and consultancy related to the use of the product	4.08	4.06	4.10	4.00	4.14
Installing the product at the customer's site (if required)	4.07	3.96	4.18	4.29	3.94
Waste disposal	4.07	3.94	4.20	3.79	4.28

Detailed cross-sectional analyzes of the responses of individual segments of the surveyed economic organizations were conducted. The criteria for the identified enterprise segments were the origin of capital (foreign, domestic), the number of employees (medium and large enterprises) and the producer sectors (automotive, electromechanical and chemical). The comparisons of the responses show interesting differences between the surveyed

enterprise segments. It should be noted that the quality control of the finished product by suppliers is especially important for buyers who operate in the electromechanical sector. On the other hand, the quality control of the accepted delivery is of particular importance for economic entities with foreign capital, especially from the automotive sector. The need to improve the quality control of the production process by suppliers is the focus of medium-sized organizations (employing

50-250 employees) from the electromechanical sector. Improving the handling of complaints by suppliers as well as the processes of initial / periodic assessment and selection of their sub-suppliers are particularly important for large business entities (employing over 250 employees) with foreign capital from the automotive sector. Large enterprises with foreign capital operating in the electromechanical sector focus primarily on the improvement of the production process by suppliers. In turn, the

processes of delivery to the customer and technical service are indicated in particular by organizations employing over 250 employees with foreign capital from the chemical sector. The improvement by suppliers of the processes of product design (parts, components), planning and technical preparation of production, as well as receiving orders from customers is particularly important for foreign companies from the automotive sector.

**Table 2.** Processes that the surveyed manufacturing companies expect to be improved by suppliers (comparison between the segments depending on sector)

Processes	Sector		
	Automotive N=63	Electromechanical N=36	Chemical N=51
Quality control of the finished product	4.77	4.88	4.75
Quality control of the accepted delivery	4.86	4.74	4.74
Quality control of the production process	4.65	4.84	4.65
Complaints service	4.76	4.43	4.60
Process of initial assessment and selection of sub-suppliers	4.66	4.43	4.55
Production	4.57	4.61	4.46
Process of delivering to the customer	4.50	4.45	4.53
Production planning process	4.54	4.35	4.40
Process of periodic evaluation of sub-suppliers	4.54	4.48	4.23
Technical services	4.36	4.36	4.53
Process of technical preparation of production	4.47	4.35	4.35
Packing	4.28	4.19	4.41
Maintenance	4.30	4.29	4.31
Accepting orders from customers	4.30	4.15	4.26
Product design process	4.26	3.94	4.14
Training and consultancy related to the use of the product	4.07	4.00	4.14
Installing the product at the customer's site (if required)	4.05	4.25	4.00
Waste disposal	3.92	4.16	4.18

Packaging processes as well as training and consulting related to the use of the product, as well as the disposal of waste by suppliers are particularly important for large foreign entities from the chemical sector. An analysis of responses was also undertaken in the segmentation cross-sections of the surveyed organizations depending on the implemented process improvement tools. All surveyed

companies had an implemented quality management system compliant with the guidelines contained in the ISO 9001 standard. More than half (50.6%) of the surveyed business entities implemented an environmental management system consistent with the guidelines contained in the ISO 14001 standard. In the surveyed group, 26% of manufacturers implemented tools

included in the Toyota Production System (like Kaizen, 5S, Total Productive Maintenance) and 16% of companies

implement Lean Management projects. The detailed results of the responses of the surveyed companies are presented in Table 3.

**Table 3.** Processes that the surveyed manufacturing companies expect to be improved by suppliers (comparison between the segments depending on the implemented process improvement tools, average)

Processes	ISO 9001 N=150	ISO 14001 N=76	TPS N=39	Lean Management N=24
Quality control of the finished product	4.79	4.85	4.89	5.00
Quality control of the accepted delivery	4.79	4.88	4.86	4.96
Quality control of the production process	4.70	4.72	4.81	4.83
Complaints service	4.63	4.74	4.72	4.78
Process of initial assessment and selection of sub-suppliers	4.57	4.56	4.66	4.71
Production	4.54	4.61	4.81	4.50
Process of delivering to the customer	4.50	4.65	4.56	4.62
Production planning process	4.45	4.52	4.60	4.38
Process of periodic evaluation of sub-suppliers	4.42	4.61	4.74	4.73
Technical services	4.41	4.56	4.55	4.59
Process of technical preparation of production	4.40	4.48	4.61	4.74
Packing	4.31	4.35	4.46	4.33
Maintenance	4.30	4.35	4.33	4.21
Accepting orders from customers	4.25	4.21	4.25	4.39
Product design process	4.16	4.36	4.14	4.67
Training and consultancy related to the use of the product	4.08	4.27	4.17	4.17
Installing the product at the customer's site (if required)	4.07	4.03	4.11	4.33
Waste disposal	4.07	4.31	4.09	4.32

The expectations towards suppliers regarding the improvement of their processes are most strongly emphasized by enterprises that have implemented the Toyota Production System tools and Lean Management projects. It can also be observed that economic entities that have implemented Toyota Production tools very clearly expect suppliers to improve such processes as: quality control (delivery, production, finished product), handling complaints, initial evaluation and selection of sub-suppliers, delivery to the customer, technical service, technical preparation of production, as well as placing orders with a

sub-supplier. In turn, enterprises that implement Lean Management projects focus their expectations towards suppliers on processes such as: production planning, production, periodic evaluation of sub-suppliers, packaging, maintenance, as well as accepting orders from customers. On the other hand, companies that have implemented an environmental management system compliant with the guidelines contained in the ISO14001 standard clearly expect suppliers to improve technology in the processes related to waste disposal. The relationships presented above probably result from the

specificity of these improvement tools implemented by the surveyed organizations. By implementing Toyota Production tools, enterprises aim to organize and ensure the continuity of processes (including the continuity of the flow of the processed product). In turn, business organizations implementing Lean Management projects strive to avoid / eliminate unnecessary operations in processes and waste, and thus shorten the time of implementation of activities and improve efficiency. On the other hand, enterprises that have implemented an environmental management system compliant with the guidelines contained in the

international management standard ISO 14001 expect their economic partners to limit their negative impact on the natural environment.

#### 4. Discussion

Considering the impact of the implementation of improvement systems and tools by manufacturing companies on the requirements for suppliers to improve operational processes, it can be noticed that they are high and similar to each other (figure 1).

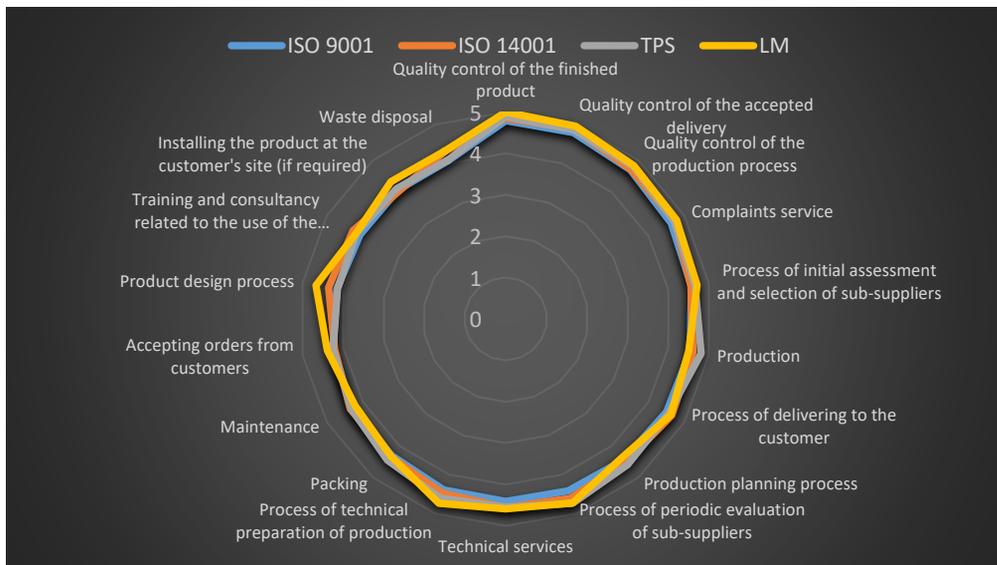


Figure 1. Comparison of the obtained research results

The average requirements on the 1-5 scale were, respectively: for ISO 9001 (4.40), for ISO 14001 (4.50) for TPS (4.52) and for LM (4.57). However, there are some differences resulting from the specificity of the improvement tools mentioned in the previous section. Considering the results in total, it can be concluded that companies that adhere to the concept of Lean Management and the Toyota Production System have the most stringent requirements for suppliers. This may be influenced by the fact that the essence of these concepts is to obtain high

productivity and quality of products, with the maximum improvement of the organization and all operational processes (Thorhallsdottir, 2016). It may seem quite surprising that companies that have decided to implement the ISO 14001 standard have slightly stricter requirements for suppliers than companies that comply with the requirements of ISO 9001 standard. It is worth emphasizing that these systems are complementary to each other and their integration causes synergistic effects.

The research results also showed that enterprises focused their expectations towards suppliers in terms of improving their operational processes on control processes (finished product, accepted delivery and production process), complaint handling, processes (supplier evaluation and selection), production, planning and technical preparation. production, the process of delivery to the customer, as well as the provision of technical service (maintenance and repair). Processes such as packaging, maintenance, receiving orders from customers, product design, training and consulting related to the use of the product, installation of the product at the customer's site, and waste disposal were relatively less important for the surveyed companies.

It is also worth noting that currently building relationships with suppliers is not only based on setting ever greater requirements that focus on continuous improvement of products and processes. Increasingly, customers, and especially international concerns, offer the supplier development programs (Sudeep & Srikanta, 2018; Benton et al., 2020). These companies use development programs to help suppliers meet stringent requirements. Most often, these programs are based on consulting and training focused on improving products and processes (Saghiri & Wilding, 2021). These programs also focus on the implementation and improvement of quality, environmental, safety management systems. This allows supply chain partners to mitigate product and process risk (Zhou et al., 2022). Increasingly, customers (especially OEMs) are also trying to educate their suppliers about operational improvement tools, such as Six Sigma, Toyota Production System, or Lean Management (Golmohammadi et al., 2018). Customers conduct joint projects with suppliers to help them implement continuous improvement tools. Increasingly, it can be observed that customers offer suppliers participation in Lean Six Sigma implementation programs (Costa et al., 2021). These programs are overseen by delegated supplier development advisors. The mapping

of value streams by suppliers under the supervision of advisors allows to shorten the time of process implementation and reduce costs related to the use of material resources by limiting losses, eliminating unnecessary operations or over-exploiting the infrastructure. Current and future trends indicate that supplier development programs are increasingly focused on implementing the concept of sustainability (Rashidi and Saen, 2018; Rogers et al., 2019; Fan et al., 2021; Pedroso et al., 2021; Saghiri & Wilding, 2021).

These programs focus on suppliers achieving environmental targets (such as reducing the use of harmful substances, carbon dioxide emissions). These programs are referred to as green supplier development (Bai & Satirb, 2020).

New trends also include supplier development programs focusing on improving product safety (reducing the number of production defects, customer complaints) and processes by reducing the risk of accidents or emergencies (Dou et al., 2014; Gulsen, 2015; Awasthi & Kannan, 2016).

It can also be noted that in recent years these programs have also focused on helping suppliers in the implementation of the principles of ethical conduct specified in the supplier code of conduct specially developed for them (Asif et al, 2019; Sona et al., 2019).

## **5. Conclusions**

Summarizing the conducted literature analyzes and the results of empirical research, it should be stated that manufacturing companies focus their expectations towards suppliers mainly on the improvement of quality control processes (deliveries, semi-finished products and finished products). It can therefore be concluded that buyers expect suppliers to reduce the risk associated with the purchased products. Processes related to building relationships with partners in the supply chain, such as complaint handling, selection and periodic evaluation of suppliers,

are also important. The expectations towards deliveries are aimed at avoiding nonconformities and emergency situations in order to ensure the continuity of processes in the supply chains and to make them resistant to possible disruptions (Torabi et al, 2015; Wong, 2019). Therefore, buyers expect suppliers to monitor the processes related to the production and delivery of products.

The research results presented in the article have several important implications for representatives of science and business.

Entrepreneurs can use research results to make more informed decisions regarding the implementation of management systems and concepts, and to improve forms of cooperation with suppliers. In turn, researchers may treat the obtained results as an introduction to more detailed analyzes of the relationships that occur between entities within supply chains. Future research directions may include standards and concepts omitted in the article, such as ISO 31000, ISO 28000, or ISO 22300.

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