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## QUALITY FUNCTION DEPLOYMENT FOR SUPPLIERS SERVICES IMPROVEMENT IN PLASTICS INDUSTRY – STUDY OF CURRENT SITUATION

DOI: 10.21008/j.0239-9415.2024.089.07

The paper focuses on the issue of improving the quality of logistics services on the plastics market. The aim of the study is to identify the possibility of applying the Quality Function Deployment (QFD) method to improve the services provided by raw material distributors in the plastics market. In the first part of the paper, the processing of plastics was characterized and a set of current and significant problems of distributors. Secondly, the QFD method was defined, focusing in particular on the issue of mapping the so-called Voice of Customer. Thirdly, referring to the current state of knowledge, the possibility of applying the QFD method to improve the quality of services of suppliers in the plastics market was identified. The research refers to the method of Systematic Literature Review using the Web of Science database. As a result of the bibliometric analysis, it was indicated that the current state of work related to supply chain management in the plastics market is in the growth phase and the actual number of publications available is still relatively small. The recognized collection of publications relating to the applications of the QFD method in the plastics market refers to the issues of product improvement. There is still a lack of studies pertaining to improving the quality of logistic services in the plastics market using the QFD method. While analyzing the thematic areas of publications, it has been recognized that a significant collection of works falls within the area of management and quality science problems.

**Keywords:** QFD, Literature Review, Customer-driven Quality Management, Quality Function Deployment, Logistics Services, Plastics Industry

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## 1. INTRODUCTION

This paper focuses on the issue of improving the quality of logistics services on the plastics market. The aim of the study is to identify the possibility of applying the Quality Function Deployment (QFD) method to improve the services provided by raw material distributors in the plastics market. The QFD is also called matrix product planning, decision matrices, customer-driven engineering (see American Society for Quality, ASQ, [asq.org](http://asq.org)). The QFD is a systematic method that allows you to transform customer preferences, requirements and needs into specific product parameters. This is an approach that emphasizes the so-called Voice of Customer and integrates it into the process of product design and improvement (the Voice of Company). Despite the wide use of QFD in various industries, the literature lacks detailed analyses of its use in the plastics processing industry, which emphasizes the significance of the current work. Improving the supply process in the market of plastics processors is crucial due to growing customer demands, changing market trends, and the need to continuously enhance the quality of services in this dynamic industry. The plastics processing industry, like many other industrial sectors, is increasingly dependent on customer satisfaction. By implementing quality management methods such as, among others, QFD or Kano (i.e., model of customer perception versus customer reality), key areas for improvement can be identified and customer service processes can be adapted to better meet market expectations.

In the first part of the paper, the processing of plastics was characterized and a set of current and significant problems of distributors operating in the plastics market was determined. Secondly, the essence of the Quality Function Deployment method was defined, focusing in particular on the issue of mapping the so-called Voice of Customer. Thirdly, referring to the current state of knowledge, the possibility of applying the QFD method to improve the quality of services of suppliers in the plastics market was identified. The research refers to the method of systematic literature review using the database of scientific publications Web of Science. The last part of the paper summarizes the obtained results and indicates possible directions of further research activities for improving the quality of services in the plastics market.

## 2. CUSTOMER-DRIVEN QUALITY MANAGEMENT IN THE PLASTICS MARKET

### 2.1. Specificity of distributors' activities in the plastics market

Plastic processing is a branch of industry involved in the transformation of polymer raw materials into a variety of products with different shapes, sizes and properties. Plastics, being organic materials, can be formed under the influence of heat



and pressure, which allows them to be processed into end products with a wide range of applications. Plastics are made of polymers, which are long chains of molecules made up of repeating units called monomers. These monomers can be of natural origin, like cellulose, or synthetic, like polyethylene or polypropylene. The plastic manufacturing process typically begins with the synthesis of polymers, which are then further processed to obtain the desired physical and chemical properties. Polyamide 6, also known as Nylon 6, is produced by the caprolactam polymerization process. During the production process, the plastic goes through various stages, including extrusion, molding and cooling (Plastinord promotional materials, [plastinord.it](http://plastinord.it); Plastipol Fair, [plastipol.pl](http://plastipol.pl)). During the polyamide granulate screening process, the granulate is transported from the machine in the form of small, white pellets, which are then collected and packaged for further distribution. This process is carried out using specialized machines that ensure the right size and quality of pellets, which is crucial for the subsequent use of polyamide 6 in various industrial applications. After the polyamide 6 production and packaging stage is completed, the raw material is ready to be processed into various final products. Plastic processing encompasses a number of technologies and methods that allow polymers to be molded into different products. The choice of the appropriate processing method depends on the requirements for the final product, such as strength, flexibility, transparency, and most importantly, production cost. Plastics have a wide range of uses and are applicable in almost every area of life. In the automotive industry, they are used for the production of automotive parts such as bumpers, dashboards and fuel tanks. In electronics, plastics are used for device housings, insulation of wires and internal parts (Burzych, 2000). In the packaging sector, plastics are essential for the production of bottles, containers, foil and protective packaging (Polish Chamber of Packaging, 2017). In construction, plastics find application in the production of pipes, windows, doors and insulation materials (Osiecka, 2005). In medicine, plastics are used in the production of medical equipment, pharmaceutical packaging and surgical tools (Czarnecka-Komorowska, 2023).

The introduction of plastics to various industrial sectors has brought significant benefits, such as reduced products weight, increased durability and corrosion resistance, as well as the ability to produce complex shapes and structures. However, plastics processing also brings about ecological challenges, such as dealing with recycling issues and pollution caused by plastic waste. Recycling of plastics is a key element in the sustainable management of these materials. It consists in collecting, sorting and processing of plastic waste in order to reuse it in the manufacturing of new products. The recycling process can be mechanical, where waste is ground and processed into new materials, or chemical, where polymers are broken down into monomers and then re-synthesized. The plastics processing market is strongly dependent on technological and ecological trends. In recent years, growing environmental awareness and environmental regulations have had an increasing impact on the industry. Companies must adapt their production processes to the

requirements of sustainable development, which includes both reducing the consumption of raw materials and improving the efficiency of recycling plastic waste. Another important trend is the development of plastics processing technology. Innovations in the field of materials, such as biopolymers, or materials with enhanced mechanical and thermal properties, enable the creation of higher quality and more efficient products. In addition, the automation of production processes and the introduction of Industry 4.0 technology contribute to increasing operational efficiency and reducing production costs.

The plastics processing industry faces numerous challenges related to customer service, which result from both the specificity of the production process and dynamically changing market conditions. This paper draws attention to the main challenges faced by suppliers operating in the plastics market in Poland. The analysis of the market situation and strategies of competitive industry leaders such as Polymer Projekt, Ultrapolymers, Danje Polymer and Granulat Chmielarz (industry report, see [eplastics.pl](http://eplastics.pl)) allows for a better understanding of the challenges and opportunities facing enterprises in this field. Through the analysis of the topics of the presentations and discussions held during the Plastpol Trade Fair in Kielce (23–26.05.2023; [targikielce.pl/plastpol-2023](http://targikielce.pl/plastpol-2023)) and the Warsaw Plast Expo (6–8.02.2024; [warsaw-plastexpo.com](http://warsaw-plastexpo.com)) the issues such as, i.e., logistics and supply chain management, personalization and customization of products, regulations, technological innovations, price competition and sustainable development (Pręcerek, 2024).

Customers operating in various industrial sectors have various needs and expectations as to quality, timeliness of deliveries, price and other factors. Distributors must be able to adapt their sales and logistics processes to these diverse requirements, which often requires high flexibility and quick response to changes in orders. Effective supply chain and logistics management are key to maintaining competitiveness in the plastics processing industry. Customers expect fast and timely deliveries, which requires distributors to effectively manage the inventory, transport and cooperation with suppliers. Delays in delivery can lead to the loss of customers and the enterprise reputation. Changes in legal regulations regarding environmental protection as well as growing requirements related to sustainable development, pose additional challenges for enterprises. Enterprises have to adapt their production processes to new standards and regulations, which often entails additional costs and the need to invest in modern environmentally friendly technologies. An example is the introduction of a European standard by 2030 that requires adding a certain percentage of regranelite to the production of new plastic products to increase their sustainability. In addition, the increasing environmental awareness of consumers forces companies to use more sustainable practices, which may affect the entire management and marketing strategy (Furfari, Szyman, 2020). Nowadays, customers increasingly expect products tailored to their individual needs. Customization of products can be a challenge for manufacturers, who must be able to flexibly adapt their production processes to the specific requirements of customers. This

requires not only advanced production technologies, but also close cooperation with customers at the design and production stages. Effectively dealing with the aforementioned challenges is crucial for the success of enterprises in the plastics processing industry in a competitive market. Enterprises must constantly improve their processes, invest in new technologies and adapt flexibly to the changing needs and expectations of customers. The introduction of methodologies such as Quality Function Deployment (QFD) can significantly help in the identification and achievement of these goals, which is particularly important in the dynamically developing branch of industry, such as plastics processing.

## 2.2. QFD for customer-driven quality management

In the area of customer driven quality management, quality is defined as follows: quality is the degree to which a specific object (thing, service) corresponds to a specific user – consumer or meets the requirements of a specific user – consumer. If the user is highly satisfied with the object, the quality of the object is very high, if the user's satisfaction with the object is low, the quality of the object is low. The quality improvement and the engineering characteristics affecting product performance are primarily identified and improved to optimize customer needs (Kiliński, 1979). Limited resources and increased market competition and product complexity require a customer-driven quality management in product development and in achieving higher customer satisfaction (Hyun Park et al., 2017). In this approach, it is particularly important to understand the study of the Voice of the Customer, VoC. VoC refers to collecting and analyzing information about customers' requirements and expectations, which are then converted into technical specifications of products or services. By systematically collecting and considering the customer feedback in the design and manufacturing process, organizations can ensure that their products or services are more attractive and competitive in the marketplace. According to the American Quality Association (ASQ), the concept of "customer voice" is crucial for the successful implementation of QFD, as it enables you to understand and meet customer requirements by systematically collecting and analyzing data. This approach helps businesses identify key areas for improvement and innovation, leading to higher customer satisfaction and a better competitive position in the market. In order to understand the customer, see Figure 1, the first step is to capture the VoC, which can be gathered in a number of ways, including, a.o., Online customer surveys or questionnaires, Customer interviews, Social media, Website behavior, Online customer reviews, Customer complaints, Focus groups, Feedback forms, Sales and technical trip reports, Warranty claims, User support forums or help lines (ASQ).

The voice of the customer is a key source of data that drives the entire QFD process (Hamrol, 2015). QFD consists in systematically collecting, analyzing and implementing information from customers, which allows to create products and

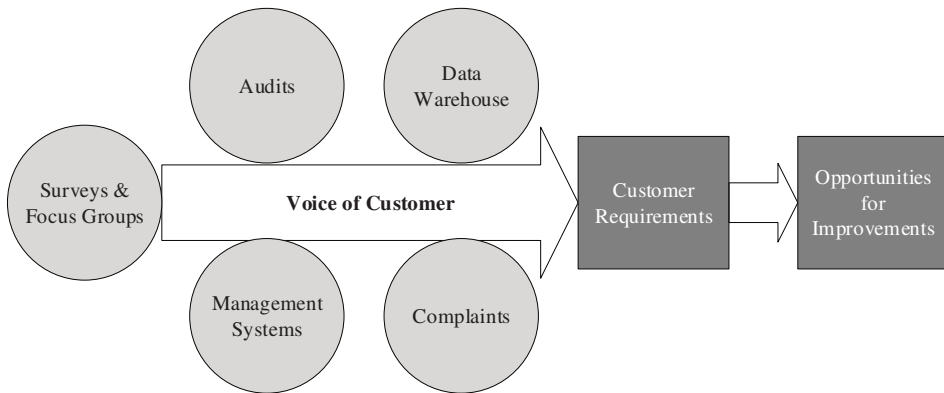


Fig. 1. The concept of the Voice of the Customer (own study based on American Quality Association, [asq.org/quality-resources/voice-of-the-customer](http://asq.org/quality-resources/voice-of-the-customer))

services that are better suited to their requirements. QFD supports the collection of opinions (suggestions for improvements) from all parties that participate in the process of designing products and services, and then presents them in a systematic way, which simplifies communication between these groups (Zymonik et al., 2013). The main stages of QFD include collecting data on customer requirements, creating a House of Quality (HoQ) matrix, identifying key technical parameters, comparing to the activities of main competitors (the so-called competitive benchmarking) and formulating improvement activities. QFD was originally proposed to develop products with higher quality to meet or surpass customer needs. The primary functions of QFD are product development, quality management, and customer needs analysis. Later, QFD's functions had been expanded to wider fields such as design, planning, decision-making, engineering, management, teamwork, timing, and costing (Chan et al., 2002).

### 3. QFD FOR IMPROVING THE QUALITY OF SERVICES IN THE PLASTICS MARKET

#### 3.1. Research method

This part of the paper presents the results of the literature analysis regarding the application of the Quality Function Deployment (QFD) method in improving the quality of activities in the plastics market. To achieve the formulated research objective, i.e., to recognize the possibility of improving the quality of services provided by suppliers in the plastics market using quality methods, the Systematic Literature Review (SLR) procedure was used (van Dinter et al., 2021). Four phases of research activities were specified (Czakon, 2011; Czakon, 2016):

1. Determining the purpose of the study, i.e., recognizing the current state of knowledge in the field of improving the quality of logistic services in the plastics market using methods and tools that support quality management, in particular the concept of Quality Function Deployment.
2. Identifying primary literature using the Web of Science database; selection of publications by using a set of keywords appearing in the title of the work, abstract or in keywords specified by the authors; developing a database of publications, i.e., the so-called “database clean up”.
3. Bibliometric analysis, i.e., analysis of the number of publications in subsequent years; Content analysis, i.e., identification of the research problems undertaken in the analyzed set of publications related to the QFD and the plastics industry.
4. Development of a report.

At the stage of identifying the publication data set and determining search terms, four types of research problems were distinguished, which is presented in Table 1.

For the specified data sets, a quantitative analysis was carried out relating to the number of publications and citations over the years and publications selected from Web of Science Core Collection Categories. The content analysis referred to a set of publications that presented possible applications of QFD for improving the quality of activities in the plastics market ( $n = 7$ ).

Table 1. Research problems and search terms used at the publication selection stage

Research problem	Search terms	Number of publications
The issue of supply chain management in the plastics market	„Supply Chain Management” AND „Plastics Industry”	$n = 148$
Issues related to quality management in the plastics industry	“Quality” OR “Total Quality Management” OR “Quality Management” OR “Quality Control” OR “QFD” OR “Quality Function Deployment” AND „Plastics Industry”	$n = 70$
Recognition of problems occurring in the plastics market, which are solved using Quality Function Deployment (QFD)	„Quality Function Deployment” OR „QFD” AND „Plastics Industry”	$n = 7$
Confirmation of the validity of applying of QFD in improving the quality of services	„Quality Function Deployment” OR „QFD” AND „Service Quality”	$n = 245$
Recognition of the stage of development of the research area related with QFD	“Quality Function Deployment” OR „QFD”	$n = 4195$

Source: own elaboration based on Web of Science (7.09.2024).



### 3.2. Bibliometric analysis

Bibliometric techniques are used to analyze the selected collections of scientific publications in terms of selected features, i.e., the analysis of the number of publications and the analysis of the number of citations, which will allow to assess the size of the collection and its importance on the map of science (Czakov, 2016). The analysis of publications in the following years allows for assessing the stage of development of a given research area. Assuming that the number of publications is subject to lifecycle regularities, after birth there is a slow growth that accelerates, then stabilizes at a given level to finally decrease. Figure 2 shows the distribution of the number of publications and the analysis of the number of citations – in relation to the issues of supply chain management in the plastics market (search terms: “Supply Chain Management” AND “Plastic Industry”).

Referring to the results obtained, it can be noted that the research area in the scope of the specificity of the supply chain management in the plastics industry is in the second phase of growth. This means that the first results of research in this area have already been implemented and their results constituted a prerequisite for further research work.

Figure 3 shows the distribution of the number of publications and the analysis of the number of citations, referring to the issue of quality management in the plastics industry. (search terms: “Quality” OR “Total Quality Management” OR “Quality Management” OR “Quality Control” OR “QFD” OR “Quality Function Deployment” AND “Plastics Industry”).

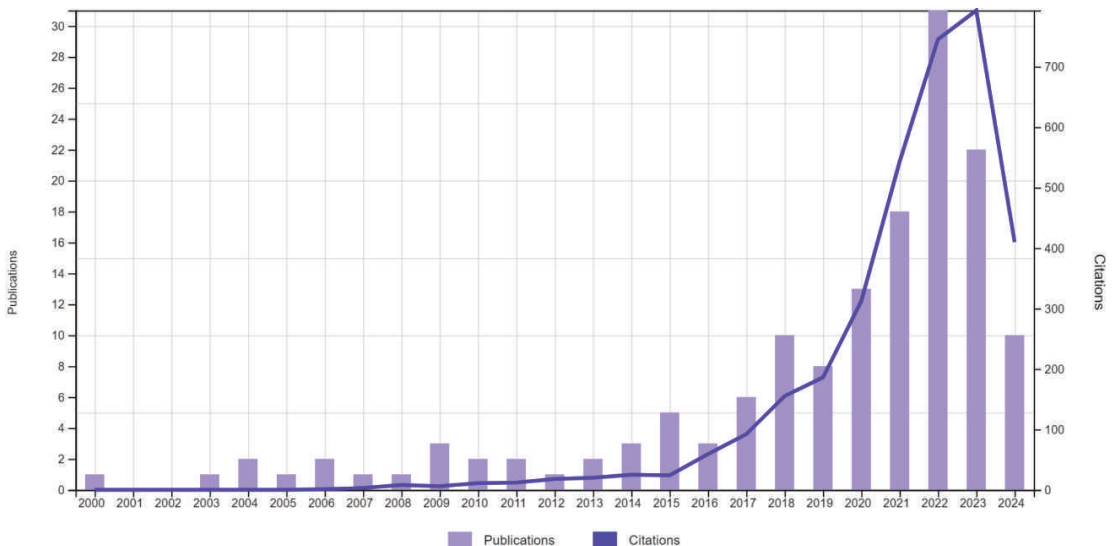


Fig. 2. Analysis of the number of publications and citations over the years – “Supply Chain Management” AND “Plastics Industry” (Web of Science, Citation Report)



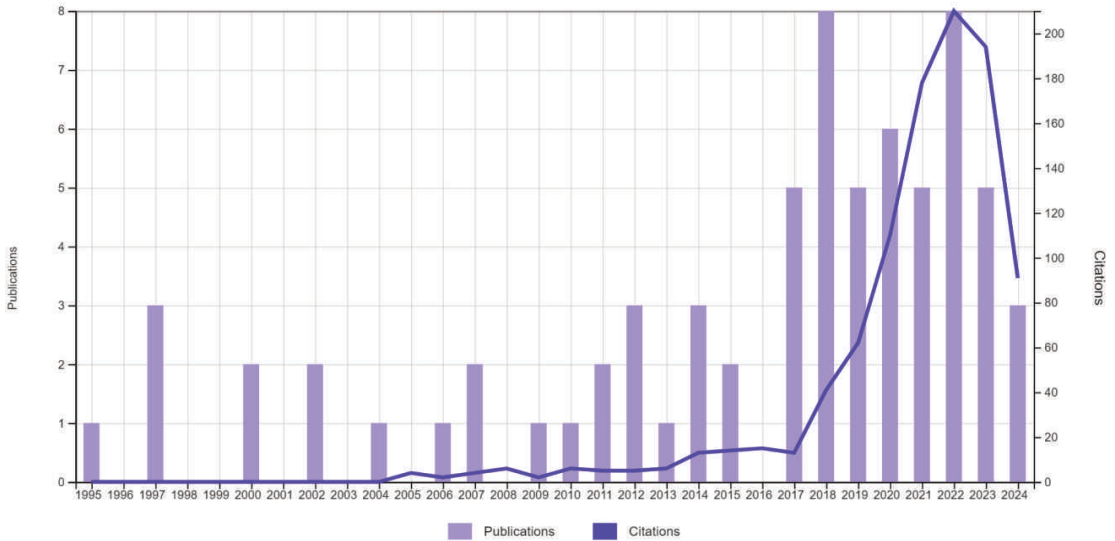


Fig. 3. Analysis of the number of publications and citations over the years – “Quality” OR “Total Quality Management” OR “Quality Management” OR “Quality Control” OR “QFD” OR “Quality Function Deployment” AND “Plastics Industry” (Web of Science, Citation Report)

Referring to the results obtained, it can be noted that the research area in the scope of the actual application of the quality management approach in the plastics industry is still in the phase of early growth. In individual years, there are publications dealing with the issue of quality management in the plastics market, but the number and increase in subsequent years is small. Since 2017, it has been possible, as can be seen in particular by analyzing the variability in the number of citations in individual years, to recognize the increase in interest in a given topic, which may indicate the transition from the first phase of the cycle to the second phase of the increase in interest in quality management issues in the plastics market. Figure 4 shows the distribution of the number of publications and the analysis of the number of citations with regard to the investigation of the possibilities and the appropriateness of applying QFD in improving service quality (search terms: “Quality Function Deployment” OR “QFD” AND “Service Quality”).

Referring to the results obtained, it can be noted that the research area in the scope of QFD application in service quality improvement went through all phases of the life cycle, being in the birth phase until 2004, followed by the slow growth phase until 2014, then dynamic growth until 2016, after which some stabilization can be recognized, and since 2019 a decrease in the number of publications is visible. The number of publications in the field of QFD application for service quality improvement ( $n = 245$ ) is low, referring to the number of publications related to the QFD methodology ( $n = 4195$ , Web of Science, TS = “Quality Function Deployment” OR “QFD”). Therefore, the current set of works and the presented results relating

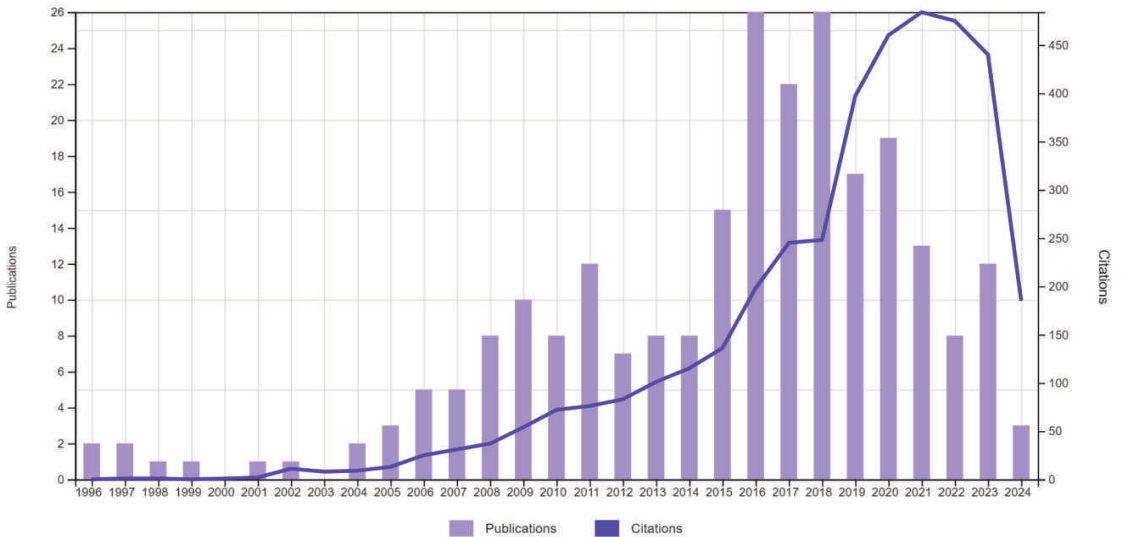


Fig. 4. Analysis of the number of publications and citations over the years – “Quality Function Deployment” OR “QFD” AND “Service Quality” (Web of Science, Citation Report)

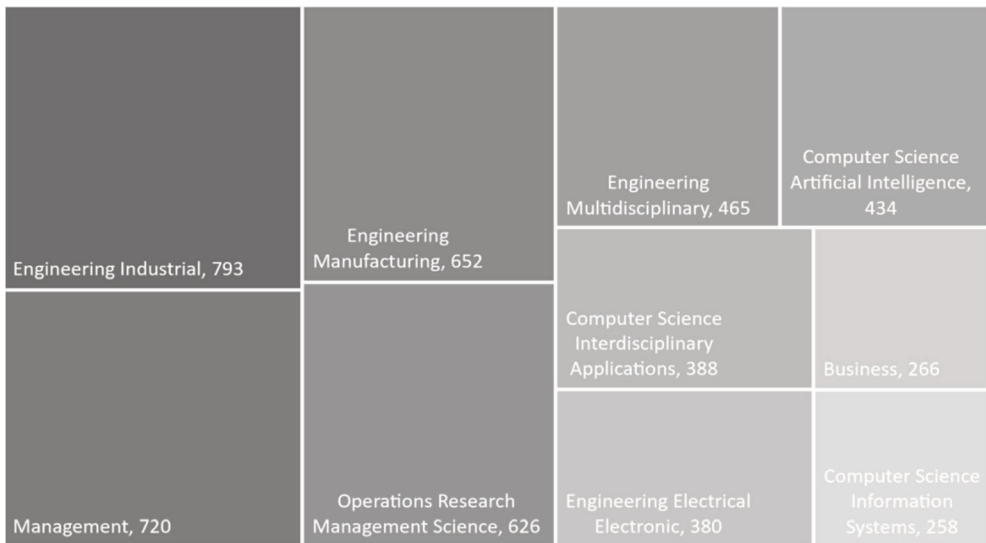


Fig. 5. Publications classified according to Web of Science Core Collection Categories – “Quality Function Deployment” OR “QFD” (own study based on Web of Science, Citation Report)

to the examples of QFD application for the improvement of service quality confirm the validity of conducting further research on the possibility of improving the quality of services in the plastics market with the use of Quality Function Deploy-

ment. Figure 5 presents the classification of publications in which the issue of quality management with the use of QFD is addressed, in relation to the Web of Science Core Collection Categories.

The largest number of publications was classified in the area of Engineering Industrial research ( $n = 793$ ). Importantly, from the research perspective of the authors of the publication, i.e., management and quality sciences, the second most numerous class of publications is the Management ( $n = 719$ ), as well as Operations Research Management Science ( $n = 626$ ), and Business ( $n = 266$ ). Thus, the QFD methodology is an important element of quality management and solving problems falling within the area of management and quality science.

### 3.3. Content analysis

At the content analysis stage, the scope of application of QFD for the plastics market was identified by referring to a collection of scientific publications from the Web of Science database ( $n = 7$ , Web of Science, search terms – “Quality Function Deployment” OR “QFD” AND Plastics Industry). The content analysis in terms of the research topics allowed us to identify the main areas on which the application of QFD focuses, such as improving product quality, optimizing production processes, and improving logistics and customer service. The identified issues are summarized in Table 2.

Table 2. Analysis of the content of selected publications relating to the application of QFD in the plastics market

Selected Publication	Research Problem and QFD application	Citations
Bergmann, et al., Dörmann, H; Lange, R; Interpreting process data of wet pressing process. Part 1: Theoretical approach; 2016.	Research Problem: The wet pressing process represents a new production method for carbon fibre-reinforced plastics components. Due to the low cycle times, authors indicated that it is suitable for use in the automotive industry. QFD: The knowledge about relevant process parameters, their interactions, and influence on the part quality builds the basis of an economic process.	16
Kazancoglu et al.; In the nexus of sustainability, circular economy and food industry: Circular food package design; 2023.	Research Problem: The aim of the paper was to investigate the impact of food packaging design on sustainability and to determine the relationship between circularity and food packaging design, and to minimize the conflicting food packaging design characteristics against sustainability by circular design are other aims of this study. QFD: Quality Function Deployment method is applied for 29 consumer expectations about circular food packaging design (What's) and 34 technical requirements for these expectations for circular food packaging design (How's).	6

Selected Publication	Research Problem and QFD application	Citations
Saliba et al.; A modular, reconfigurable end effector for the plastics industry; 2010.	<p>Research Problem: The purpose of the paper was to address a problem where large and different batches of freshly produced units need to be unloaded from the injection-moulding machines and relocated, using automation.</p> <p>QFD: The new solution is reached through a formal design approach, including a function analysis, a product design specification, a quality function deployment exercise, the generation of a number of conceptual solutions, and concept evaluation using morphological charts, failure mode and effect analysis and a decision matrix.</p>	5
Jagoda et al., Environmentally sustainable plastic food packaging: A holistic life cycle thinking approach for design decisions; 2023.	<p>Research Problem: Enhancing the sustainability of food packaging (FP) is challenging due to the conflicting environmental and functional requirements, even though it leads to many negative environmental impacts over different life cycle phases.</p> <p>QFD: Kano's theory and Quality Function Deployment (QFD) were used to identify the user requirements, applicable design features, and prioritization.</p>	4
Thanh; Dynamic Decision Support System for Sustainable Supplier Selection under Fuzzy Environment; 2022.	<p>Research Problem: The raw materials supplier selection in the plastics industry is a complex decision, and decision makers must consider many qualitative factors, quantitative factors and environmental attributes during the decision making.</p> <p>QFD: The QFD approach integrated with multicriteria decision making model (MCDM) strategy for sustainable supplier selection in the plastics sector under fuzzy environment circumstances.</p>	1
Andrade et al.; Communities of practice and QFD method for green logistics in the cosmetics industry: a suggested review; 2020.	<p>Research Problem: The research proposed to identify the perception of sustainability in recycling, mainly plastic packaging, and to suggest the use of Green Logistics and Cradle-to-Cradle concepts and the use of Communities of Practice.</p> <p>QFD: The companies' perceptions regarding sustainability and a suggestion of the application of the QFD method in the systematic unfolding between the needs of the consumer and the quality characteristics of the product was proposed.</p>	–
Yuliarty, and Ardiwijayanta; The design of front and back grille of KAD-927 B fan with Nigel Cross Approach at PT. X (A Manufacturer of Household Appliances); 2018	<p>Research Problem: The research took several parts, namely Front &amp; Back Grille iron material that will be redesigned with plastic material. The result of the design of Front &amp; Back Grille is based on the customer needs (Engineering Staff).</p> <p>QFD: The method used in this study is Nigel Cross design principles, with sequential process stages: clarification of purpose, function setting, requirements setting, characteristic determination (QFD), morphological chart, alternative evaluation (AHP), and communication / improvisation.</p>	–

Source: own study based on Web of Science.

The analysis of abstracts of scientific publications provided information on the application of the QFD method in the plastics industry. The obtained results show that there is a significant interest in the subject of quality management in industry, which is reflected in the number of publications identified in a broad search ( $n = 4195$ ). In turn, a more specific search concerning QFD and the plastics industry ( $n = 7$ ) indicates that QFD is used in various contexts, both in the improvement of production processes and in the design of sustainable packaging. There are still few publications on the use of QFD in the context of improving the quality of services ( $n = 245$ ), including logistic services.

#### 4. CONCLUSIONS

The aim of this study was to identify the possibilities of improving the quality of logistic services in the plastics market with the use of Quality Function Deployment. In the first part of the paper, the market of plastics was characterized, specifying a set of current and significant problems of distributors. In the second part of the work, using the method of systematic literature review, the current state of knowledge in the field of QFD applications for improving the quality of activities in the plastics market was determined. The paper focuses on the following research problems, (1) what is the current progress of work in the field of supply chain management in the plastics market; (2) what is the current state of knowledge in the field of quality management in the plastics industry; (3) what problems related to activities in the plastics market are solved using Quality Function Deployment (QFD); (4) whether OFD is an appropriate method for solving problems related to improving the quality of services; (5) whether QFD is a quality methodology used to solve problems falling within the scope of management and quality science. As a result of the bibliometric analysis, it was indicated that the current state of work related to supply chain management in the plastics market is in the growth phase and the actual number of publications available is still relatively small. Only seventy publications have been specified that directly address the issue of quality management in the plastics market. This may result from the selected search terms, i.e., when integrating the plastics market with other industrial sectors that use plastics in the production of specific products, the number of publications increases. This is evident in the number of publications and the quantitative collection of publications related to the methodology of Quality Function Deployment ( $n = 4195$ ). The recognized collection of publications relating to the applications of the QFD method in the plastics market refers to the issues of product improvement and meeting customer requirements. There is still a lack of studies pertaining to improving the quality of logistic services in the plastics market using the QFD method. While analyzing the thematic areas of publications in the field of QFD applications, it has been recognized that a significant collection of works falls within the area of man-

agement and quality science problems. Through a distribution analysis of publications related to the improvement of services using QFD, a collection of works that confirm the validity of using the QFD concept in service quality management can be identified. However, the current phase of the decline in the number of publications from 2020 indicates that dynamic changes in the service market may require improvements and enhancements in the Quality Function Deployment methodology.

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## ROZWIĘCIE FUNKCJI JAKOŚCI DLA DOSKONALENIA JAKOŚCI USŁUG DOSTAWCÓW NA RYNKU TWORZYW SZTUCZNYCH – BADANIE AKTUALNEJ SYTUACJI

### Streszczenie

Artykuł odnosi się do problematyki doskonalenia jakości usług logistycznych na rynku tworzyw sztucznych. Celem pracy jest rozpoznanie możliwości zastosowania rozwinięcia funkcji jakości (ang. Quality Function Deployment, QFD) w doskonaleniu jakości usług oferowanych przez dystrybutorów surowców na rynku tworzyw sztucznych. W pierwszej części pracy dokonano charakterystyki rynku tworzyw sztucznych, wyszczególniając zbiór aktualnych i istotnych problemów dystrybutorów. Po drugie, przedstawiono podstawowe założenia QFD, w tym w szczególności zagadnienia związane z określaniem tzw. głosu klienta (ang. Voice of Customer). Po trzecie, odnosząc się do aktualnego stanu wiedzy, zidentyfikowano możliwość zastosowania metody QFD do poprawy jakości usług dostawców na rynku tworzyw sztucznych. W badaniach zastosowano metodę Systematycznego Przeglądu Literatury, odwołując się do bazy publikacji naukowych Web of Science. W wyniku analizy bibliometrycznej wskazano, że aktualny stan prac odnoszących się do zarządzania łańcuchem dostaw na rynku tworzyw sztucznych jest w fazie wzrostu, a liczba publikacji jest wciąż niewielka. Rozpoznany zbiór publikacji odnoszący się do zastosowań metody QFD na rynku tworzyw sztucznych dotyczy problematyki doskonalenia produktów. Wciąż brakuje prac odnoszących się do doskonalenia jakości usług logistycznych na rynku tworzyw sztucznych z zastosowaniem metody QFD. Analizując obszary tematyczne publikacji z zakresu zastosowań QFD, rozpoznano, że znaczący zbiór prac mieści się w obszarze problemów nauki o zarządzaniu i jakości.

**Słowa kluczowe:** zarządzanie jakością nastawione na klienta, rozwinięcie funkcji jakości, QFD, usługi logistyczne, rynek tworzyw sztucznych, przegląd literatury





