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## Development of a product quality improvement strategy

**Abstract.** In modern competitive conditions, product quality is becoming one of the main indicators that users pay attention to when choosing a product. Thus, it is relevant to analyse the process of forming a high-quality production strategy. The purpose of this study is to analyse the methods of forming a strategy for improving product quality based on examples of individual companies. The main research methods used in the study were: analysis, forecasting, historical, etc. The paper examines certain methods of product quality management, namely: Lean Management, Six Sigma, Theory of Constraints, and Total Quality Management. Their features, purpose of use, and implementation stages were outlined. In particular, it was shown that the main goal of Lean Management is to reduce time and costs to ensure high quality standards, while Total Quality Management is more focused on investigating customer preferences and optimising the internal motivations of company employees. Thus, it was concluded that each of the methods can be used by different companies at different times and lead to different performance indicators. This indicates the relevance and necessity of conducting separate research by the company's managers to choose the approach that will be most effective for them. In addition, the implementation of these methods in individual enterprises was evaluated, and the problems and advantages that were obtained from them were described. The conducted research brings new knowledge to the theory of marketing, and its conclusions can be used by companies in practice, for example, during the process of creating their own competitive strategy in the market

**Keywords:** entrepreneurship; marketing; economy of Ukraine; competition; sales

### INTRODUCTION

In modern conditions, competition between enterprises is growing at a significant pace. This is conditioned by both rapid changes in technologies (the need for companies to be able to adapt to them quickly) and high attention to the quality of products and services (due to increased customer demand). Another crucial factor has been globalisation, as businesses are trying to enter the global market and compete in it, which requires even more effort. Therefore, companies are forced to apply various strategies to improve their own competitive positions.

One of these strategies is to improve the quality of products. As noted above, especially in developed countries, it is not the price that plays an increasingly important role, but the usefulness of products, the possibility of their long-term

use, etc. Thus, if earlier the main goal of enterprises was to get the opportunity to reduce the price of their products as much as possible, now they have many options for their own development. This also results in market segmentation. However, product quality improvement strategies vary and may vary depending on the industry and individual enterprise. Therefore, it remains relevant to evaluate existing methods and to study real-world use cases for various strategies. This is especially relevant for Ukraine, which is at war, and therefore requires special efforts on the part of enterprises to be able to function in the current conditions.

A significant number of researchers were engaged in assessing the current features of the development of Ukraine and its enterprises. L. Pronko & K. Tokar (2022)

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studied the establishment of marketing strategy in the development of competitiveness of enterprises in Ukraine. Nevertheless, their research was quite theoretical, without any real examples of the use of certain methods by companies. I. Kotelnikova (2022) paid more attention to the innovative component of enterprises in the context of increasing their competitiveness. The researcher described in sufficient detail the digital products that can be used for these purposes, but also did not give any practical examples. T. Omelchenko (2022) investigated the possibilities of developing Ukrainian companies in wartime conditions. However, the researcher examined a very small amount of statistical data to form final conclusions in this context. Now the study of the problems of further functioning of Ukrainian companies in such conditions is still relevant.

The role of the quality management system in ensuring the competitiveness of industrial enterprise products was investigated by I. Vlasenko (2021), who described in sufficient detail the reasons for the importance of using quality management techniques in enterprises, and also noted the interpretation of the concept of quality by other researchers. However, his paper also lacks practical context. A similar problem is present in the study by T. Lepeyko & A. Shcherbak (2018), where the authors proposed using scenario planning technology. I. Kryvonohova (2021) identified three main approaches to the process of developing a strategy for innovation and investment activity of a food enterprise, and also proposed her own approach to developing such a strategy. However, her research did not develop a methodology for rational organisation of innovation and investment activity. Thus, it is still important to investigate the practical component of the development of quality management in Ukrainian companies.

The purpose of this study was to provide recommendations on the future improvement of product quality improvement strategies in Ukraine and to describe quality management methods. By giving examples of their use in the world, the efficiency of local companies will increase.

## **MATERIALS AND METHODS**

As part of the study, tools for improving product quality were analysed through a systematic review. The evaluation of methods for improving product quality can be approached from different angles, since different types of their classification can be carried out. This study mentioned individual methodologies such as Lean Manufacturing (LM), Six Sigma (SS), Lean Six Sigma (L6S), Theory of Constraints (TOC), and Total Quality Management (TQM). Moreover, using the example of individual companies, such as Toyota, AT&T, Bank of America and some others, the practical possibilities of using these models (in particular, SS and TQM) were shown. All calculations were made in Microsoft Excel.

Other scientific methods were also used during the study. For example, the historical method allowed evaluating past data that characterised the development features of individual companies (used as examples to demonstrate

the functioning of selected methodologies), and these systems in general. In turn, the abstraction method made it possible to disregard the impact of individual factors on the process of improving product quality at enterprises if they were not significant enough. The forecasting method helped to make estimates of how a given industry can develop in the future based on known current and historical data. The analysis allowed conducting a qualitative and quantitative assessment of existing information that characterised the most common methods of improving product quality in the world. Using the modelling, a model of the functioning of the TQM system was constructed, and its image was performed using the graphical method. The method of deduction was also used, which identified the main problems in the context of improving the quality of products in Ukraine based on available information about the country's development. In addition, it was used to evaluate the general features of approaches to product quality management and describe how they were actually used in enterprises. The comparison was used to evaluate individual approaches to improving product quality to form an understanding of their strengths and weaknesses in comparison with each other. It also allowed assessing the differences in the implementation of approaches to improving product quality at different enterprises.

However, this scientific study had a certain number of limitations. Thus, the paper briefly presented LM, SS, TOC, and TQM, but no other methodologies were described. In addition, the assessment of these systems was based on international experience, and only this data was used to formulate advice for Ukrainian enterprises, but without using a significant amount of information on the implementation of these methods in Ukraine (including due to the lack of publicly available information). Analysis of the use of approaches based on data from foreign enterprises was also limited since they also do not provide complete and open results of their implementation.

## **RESULTS AND DISCUSSION**

Methods for achieving the desired product quality can be divided into three groups: technical, organisational, and economic and social. Technical measures include the use of scientific and technological achievements in product design, compliance with technological discipline, product certification, and improvement of individual quality indicators. Organisational measures provide for the modernisation of production and management methods, the implementation of self-control, and the development of direct business ties. Economic and social measures cover forecasting, pricing, personnel motivation, and adaptation of personnel policy to market conditions. All this, especially in symbiosis, leads to improved product quality and increased profits, mainly due to higher prices for improved products. Although its prime cost may increase in such conditions, however, an increase in the price of products and demand for them in such conditions allows increasing the company's revenues.

In general, there are quite a significant number of methodologies that allow improving the quality of manufactured products. One of them is LM, which is based on reducing the time from placing a customer to receiving a payment to reduce costs. The method identifies seven areas of loss, including excessive movement, frequent and unnecessary transportation, excessive inventory, waiting, unnecessary processing, excessive production, and defects. Manufacturing companies often face problems such as inefficient organisation of work, resource waste, and improper management of employee teams, which aims to solve LM by increasing team efficiency and improving the process of achieving goals. To implement LM, companies begin by organising employee training on the 5S concept, covering such stages as selecting unnecessary items, better organisation of work and systematic activities, maintaining cleanliness and cleaning, cleanliness of the workplace and the habit of self-discipline of employees. All of these 5 components are designed to increase efficiency, maintain order, and create healthy habits at work (Tissir *et al.*, 2022; Rathi *et al.*, 2023).

Another methodology is SS. It aims to achieve a high level of quality corresponding to Six Sigma, where the number of defective products per million is extremely low. The stages of the methodology include: formulation of project goals and quality improvement plans through the use of individual tools such as “Voice of the Customer”, Quality Function Deployment (QFD) and comparative analysis; implementation of a business process measurement system (using tools such as sequence graph and flow chart data analysis); conducting business process analysis to identify methods to bridge the gap between the current sigma level and the target value (using tools such as cause-and-effect diagrams, brainstorming and detailed process mapping); optimising business processes to reduce costs and minimising errors (using project management tools, kinship diagrams, and tree diagrams); monitoring business processes after implementing improvements (using reporting systems). Thus, this methodology includes a fairly impressive list of tools that can be used by companies to improve their own competitiveness. Both methodologies can be used simultaneously, in which case the L6S methodology is created, which allows performing the functions of both approaches simultaneously even more effectively.

Theory of Constraints, or TOC, developed by Dr. Elia Goldratt in the 1980s is also a widely used concept in

organisational management. The concept focuses on identifying and managing a key constraint in the organisational system that determines the overall effectiveness of the organisation. The main key points of it are: increasing the impact (emphasis on achieving the greatest effect by increasing the impact on a small number of factors of the system, and not on solving several problem areas at the same time) and limiting (not only factors that limit the development of the system, but also serve to raise the system to a new level, provided that it is effectively controlled). In general, the author of this theory noted several types of restrictions. One of them is the power limit, that is, the lack of resources needed to create an additional product per unit of time. The other was highlighted as limiting the volume of the market, namely, not using market opportunities. The latter limitation is related to time, i.e., the inability to respond quickly to market needs, which leads to problems with execution and increasing business capacity. Thus, the company’s goal in this case is to find system restrictions and then make a decision about their solution.

The latest concept considered in this study is TQM, a management approach aimed at achieving long-term success through customer satisfaction. Under this model, all company members should participate in improving processes, products, services, and organisational culture. The main components of this concept are: customer orientation (the product created by the company should be such that the client would like first of all, and it is the customer who evaluates its quality); full involvement of employees (all employees should actively participate in the work on achieving common goals); process orientation (emphasis on process thinking, where processes are defined, controlled and constantly improved to transform input data into the desired results); system integration (the need for interconnectedness of horizontal processes in the organisation); strategic and systematic approach to the development of the company; continuous improvement of internal processes; decision-making based only on facts effective communication both during meetings and in everyday life. This system aims to ensure the long-term success of the company’s development by improving its main internal processes, in particular, in the field of production, and improving the principles of corporate culture. The essence of the TQM system can be described in Figure 1, which shows the basic principles of this model.

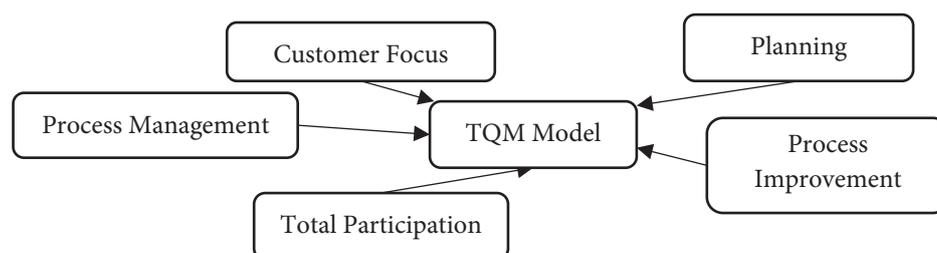


Figure 1. TQM principles

Source: compiled by the author

The TQM model will be incomplete without the components shown in Figure 1, because they are the focus of managers' attention when implementing it in a company. In fact, they have already been described above: attention should be paid to customers to assess the quality of products; special attention should be paid to the planning of the company's work and the process of its functioning; in addition, it is important to ensure full return from employees for the project, especially from the management team.

It is also worth giving examples of the use of these systems in individual companies. Thus, one of the examples of using TQM is the Toyota case study. As already noted, the basis for the functioning of TQM in the company is that the company's management is committed to it at all levels, for which work is being done to promote the growth of workers' motivations, expand their business opportunities, etc. In this regard, the company expanded the responsibility of management for the efficiency of doing business, analysed how consumers used its products for continuous improvement, focused on minimising the negative impact of bureaucratisation of internal procedures on the functioning of the company. Toyota constantly checks the quality of products, equipment, tools and resources that ensure the production process. A decentralised decision-making system is also widespread. The existing job management system prioritises customer satisfaction through loyal and efficient product delivery at a reasonable price. The company's goal is to achieve such indicators as quality, speed, flexibility, reliability and cost, which is now quite effective for the company, including due to many years of experience in this business.

However, the introduction of TQM in Toyota was not without problems. Managers and quality managers face difficulties, including a lack of certain types of resources, in particular, financial and human resources, since the use of such a system requires not only qualified personnel, but also significant funds. In Toyota's case, problems with TQM implementation also include difficulties in developing new products, reliability issues, a mysterious culture, a dysfunctional organisational structure that hinders communication, and potential gaps in the production system due to inadequate training of internal personnel and interaction with individual partners, particularly suppliers. Lack of leadership at the top management level also sometimes creates problems in the implementation of TQM: the development of organisational structures and systems that affect quality requires responsibility from senior management and managers (Implementation of Total..., 2023).

An example of using L6S is AT&T, a major global telecommunications company. With a huge customer base and global presence, AT&T is a leading provider of broadband, long-distance, and local voice services. The company uses various components included in the SS methodology, including training programmes, online and offline webinars (Parkhi, 2019). Another example is Bank of America. In banks, many processes are prone to inefficiency, from outdated software that causes delays, to complex

documentation procedures that lead to errors and loss of time. Even seemingly routine tasks like sending checks, coordinating managers, opening accounts, and collecting debts involve complex processes that can be improved. The adoption of SS by Bank of America in 2001 demonstrated its commitment to comprehensive improvement of organisational processes. The initiative has produced significant results, including a USD 1.3 million reduction in the cost of moving new recruits, a USD 3.6 million improvement in credit card sales, USD 6.6 million in savings from reduced identity theft, nearly USD 1 million in more efficient federal tax returns, and a 70% reduction in bank robberies. Barbara Desoer, appointed chief executive of global technology from 2014 to 2019, emphasised that the company listens to customer feedback, based on which they try to improve the efficiency of doing business in accordance with their expectations. The bank's IT staff under her leadership focused on improving the efficiency of technologies, simplifying the opening of online accounts, optimising the acquisition processes of other financial institutions, and implementing the banking business of the 21<sup>st</sup> century with the principles of L6S (Making Bank: How..., 2018; Mousavi Isfahani *et al.*, 2019).

The L6S methodology was also used by Starbucks to increase the company's revenue and customer satisfaction. Its implementation included preliminary testing of the methodology, development of an implementation strategy, interaction with management and employees, data collection and analysis, work on solving problems that have arisen, and long work on achieving customer satisfaction. Starbucks, introduced in the early 2000s, was initially criticised for changes such as the introduction of a new espresso machine and steaming milk, which replaced manual frying. Despite initial difficulties and falling sales, the lean introduction of SS eventually led to significant success: in 40 years, Starbucks has grown from a separate store in Seattle to the largest coffee chain in the world. This has led the company to become a "trendsetter" in the coffee industry, using innovative strategies to attract customers and using sustainable business practices (Starbucks success story..., 2023). Separate strategy methods were also used in Coca-Cola (Sadraoui *et al.*, 2010). In particular, the company has reduced its electricity consumption and improved its own production lines within SS, which has significantly improved the quality of internal processes.

Based on the above information, some recommendations can be made for Ukrainian companies in terms of implementing strategies to improve product quality. Thus, they should implement one of the several most common methods of improving product quality, namely LM, SS, L6S, TQM, or TOC, considering the experience of foreign companies that have been able to achieve significant success in improving the efficiency of enterprises, namely, increasing sales, optimising costs, or changing the paradigm of the company's employees. However, before implementing it, managers should do a thorough research on which methodology will be optimal for their company at the moment,

considering the different situations, problems, and needs of their companies.

The study of product quality improvement policy in the context of the new technological revolution was carried out by F. Psarommatis *et al.* (2020). They noted that the implementation of a quality management system based on various philosophies allows achieving significant advantages over competitors. Among them, it is worth highlighting the reduction of production time, reduction of its prime cost, etc. In addition, the study showed the importance of having a quality higher education to better understand the functioning of such tools. This indicates the need to form a standardised education in the field of quality management. The study also described the importance of using various tools related to improving product quality. This is especially important in Ukraine, which is at war. Local enterprises are quite weakened in the international arena, which indicates the urgency of implementing such methods by local companies.

Research on the strategy for improving product quality in the supply chain was conducted by H. Wang (2020). The researcher emphasised the importance of the manufacturer's price-to-cost ratio as a key parameter in the strategy for improving the quality of the two-channel supply chain. It was emphasised that this ratio plays a crucial role in influencing quality improvement parameters. This effect is especially evident if the enterprise has a decentralised decision-making process. Models for improving product quality, considering quality investments in processing policies and distribution of supply chain profits, were investigated by A. Sofiana *et al.* (2019). The researchers described two quality improvement policies for the production process with inspection and processing, considering the distribution of profits in the supply chain. The first policy provided for recycling at the same manufacturing facility, while the second policy provided for additional processing equipment. Researchers stressed the importance of improving quality in the context of supply chains at the enterprise, in particular, in the context of interaction with suppliers. A system was also proposed in which part of the profits should be given to suppliers, who, in turn, should be required to contribute to improving the quality of service delivery on their part. The methods of improving product quality described by H. Wang (2020) and A. Sofiana *et al.* (2019), were not evaluated in this paper, since the studies conducted by these researchers are rather limited, as they propose the introduction of quality parameters only for certain indicators or situations. Using holistic product quality improvement strategies should bring benefits at a larger level. However, the author of this study agrees that using both approaches is justified and necessary for enterprises if managers see their implementation as an opportunity to get a net present value.

TQM in small and medium-sized enterprises was investigated by C.F. Obunike & A.A. Udu (2018) and O.N. Anifowose *et al.* (2022). The latter noted that TQM has a positive impact on both the speed of innovation and

the operational performance of small and medium-sized companies. Accelerated innovation, especially in processes and products, is emphasised as a key factor for improving operational efficiency. The researchers recommend that manufacturing companies actively integrate TQM practices, ensuring continuous improvement, employee empowerment, and a culture that also contributes to product quality. They also emphasise the importance of reengineering business processes to maintain competitiveness. This article also examined the impact of TQM on enterprises, not on small or medium-sized ones, but on the Toyota Corporation. Therefore, it is fair to assume that such a judgment is true for both small and medium-sized companies and market giants. Features of the implementation of this system were also investigated by A. Permana *et al.* (2021). The researchers emphasised that TQM is widely used around the world due to its focus on increasing customer satisfaction, improving the quality of products and services, and overall organisational excellence. Leadership commitment and employee engagement stand out as important factors for successful implementation, and the simplicity and ease of implementation make it a solid concept. However, the definition of standard measurement methods for quantifying the implementation of TQM for sustainable development remains relevant. As noted above, TQM is indeed very popular among companies in the world, as evidenced once again by the use of this technique by corporations such as Toyota.

The detailed essence of the SS approach was described by F. Tsung & K. Wang (2023). The authors have shown how the use of this system has led to a significant number of positive results, allowing for more efficient customer service and better internal work in terms of employee and management interaction. The role of the SS approach for cost management was investigated by Y. Ramakrishna & H.M. Alzoubi (2022). Researchers have shown the impact of this approach on the cost and quality of manufactured products, which is especially important for companies in the financial sector, given the increase in their costs due to the economic situation in the world. In this paper, it was noted that this method is one of the most popular among those that are used specifically to improve the quality of products, and therefore it is used in many companies, including AT&T, Bank of America, and others.

The effect of LM on healthcare professionals was studied by Z. Mahmoud *et al.* (2021). The researchers have shown that there is a positive relationship between the use of LM principles and the performance of healthcare professionals. In particular, this led to improved teamwork, communication, and job satisfaction, and identifying negative processes such as increased stress levels, workload, and dehumanisation. However, the researchers insist on a more critical attitude to the LM principles and their effectiveness, calling for new research on this topic. J.C. Prado-Prado *et al.* (2020) evaluated opportunities to improve competitiveness by implementing LM in healthcare systems. The study showed a significant improvement in the efficiency and effectiveness of working with patients due to the use

of this methodology. The researchers also emphasised the importance of focusing on processes, identifying waste in relationships between processes, and involving staff in task rescheduling. Setting key performance indicators to support compliance with LM principles also plays an important role. The importance of creating an internal climate of trust, simplifying processes and forming permanent teams at different stages of work was emphasised. Although the research conducted by the author did not provide examples of the functioning of the LM strategy, more attention was focused on L6S, which is a symbiosis of the two respective approaches. The use of L6S has also led to positive results, which may indicate that its use in the healthcare sector will also be effective.

## CONCLUSIONS

The study evaluated various methodologies to achieve the desired product quality and improve the overall efficiency of the organisation. The following systems were considered: LM, SS, TOC, and TQM. A brief description of each of them is also provided: LM aims to reduce time and costs by identifying areas of loss; SS aims at high quality standards; TOC focuses on managing key constraints in organisational systems to improve overall efficiency; TQM, emphasising long-term success through customer satisfaction, implies active participation of all members in process improvement and a strategic systematic approach to development. In addition, individual examples of the use of these systems by companies were shown, namely AT&T, Bank of America and Starbucks

(for SS), which showed successful results in reducing costs, improving sales and increasing customer satisfaction, and Toyota (for TQM), which significantly improved the efficiency of management processes in the company.

In general, the study makes it clear that there is a considerable variety of models for improving the efficiency of enterprise functioning and product quality. All of them have their own characteristics, and therefore, affect the work of the company in different ways. Thus, management representatives should conduct a qualitative assessment of their own enterprise and the environment to be able to choose the most effective methodology for them. In Ukraine, there are still few examples of using such systems. This suggests that there are still opportunities in the country to improve the efficiency of enterprises. Local managers should learn from the successful experience of global companies and actively use it on their own experience to achieve efficient and better results in the operation of enterprises. It is important for further research to find other methods of improving the efficiency of Ukrainian enterprises. In addition, it is important to continue to investigate the experience of foreign companies in this context to be able to get recommendations on the development of Ukrainian enterprises.

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## CONFLICT OF INTEREST

None.

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## **Формування стратегії підвищення якості продукції**

**Анотація.** В сучасних конкурентних умовах якість продукції стає одним із основних індикаторів, на який звертають увагу користувачі при виборі товару. Таким чином, актуальним залишається аналізувати процес формування стратегії якісного виробництва. Метою проведення даного дослідження є аналіз методів формування стратегії підвищення якості продукції на базі прикладів окремих компаній. Основними методами дослідження, що були використані в роботі, стали: аналіз, прогнозування, історичний та інші. В рамках дослідження були розглянуті окремі методи управління якістю продукції, а саме: Lean Management, Six Sigma, Theory of Constraints і Total Quality Management. Було описано їхні особливості, мета використання, а також етапи впровадження. Зокрема було показано, що основною ціллю Lean Management є скорочення часу та витрат для забезпечення високих стандартів якості, тоді як Total Quality Management більше націлений на дослідження вподобань клієнтів та оптимізацію внутрішніх мотивацій працівників компанії. Таким чином, було зроблено висновки про те, що кожен із методів може бути використаний різними компаніями в різний час та приносити різні показники ефективності. Це говорить про актуальність та необхідність проведення окремих досліджень менеджерами компанії для вибору підходу, що буде найбільш ефективним для них. Крім того, було проведено оцінку впровадження даних методів на окремих підприємствах, а також описані проблеми та переваги, що були отримані від них. Проведене дослідження приносить нові знання в теорію маркетингу, а його висновки можуть бути використані компаніями на практиці, наприклад під час процесу створення власної конкурентної стратегії на ринку

**Ключові слова:** підприємництво; маркетинг; економіка України; конкуренція; продажі