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## THE IMPACT OF TQM PHILOSOPHY FOR THE IMPROVEMENT OF LOGISTICS PROCESSES IN THE SUPPLY CHAIN

**Abstract:** *The purpose of this publication is to characterize the philosophy of TQM guidelines and show how this implementation can improve logistics operations. The article is based on an analysis of the literature on the issues of quality in logistics. It is based upon an analysis of key publications on the definition, implementation and application of TQM in logistics. Moreover, the research process was conducted on the group of 31 of Polish and German entrepreneurs. The result of the work is to highlight the areas of logistics management in which the implementation of modern quality management systems can be crucial for joint development. The implementation of TQM philosophy promotes the integration of the supply chain, builds positive relationships with customers, improves the level of logistics customer service and develops logistics subsystems. You can also formulate a thesis that high quality products and logistics processes are the foundation of supply chain management strategies.*

**Keywords:** *TQM, logistics, supply chain, quality, improvement*

### 1. Introduction

A relatively large range of amenities and profits resulting from the implementation of the requirements of the quality management standards make the system more and more popular among companies representing different industries and different business profiles (Zimon, 2015). Organizations operating in the wider logistics industry are no exception. It is worth emphasizing that the implementation of standardized quality management systems in enterprises operating in logistics is the most reasonable because the main tasks of logistics and

quality management are converging. The implementation of standardized quality management systems is only the first step towards process improvement in the logistics (Hietschold et al., 2014; Mitreva et al., 2016). The next step leading to the comprehensive improvement of the basic processes in the organization is the implementation of TQM philosophy. The discussion on the meaning and the development of TQM philosophy is popular and relatively frequently raised. However; according to the author there is a lack of research regarding its impact on the improvement of logistics processes in the supply chain. This publication can partly fill this gap. The purpose of this publication is to characterize the philosophy of TQM guidelines and show how this

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implementation can improve logistics operations in supply chain. For this purpose author reviewed the literature concerning the relation between TQM and logistics. The research process was conducted on a group of 31 Polish and German companies. The author also attempted to develop a model of total quality management in the supply chain. The model can serve as an introduction and help in proper implementation of TQM philosophy in the supply chain.

## 2. TQM definition – review of the literature

One of the most outstanding characteristics of TQM literature is the lack of a consensus on a TQM definition (Coleman and Douglas, 2003; García-Bernal and García-Casarejos, 2014; Zelbst et al., 2010; Philip and McKeown, 2004). There is neither a unique theoretical formulation nor a final list of practices therewith associated. Many researchers agree on the significant difficulty they find at attempting to define the principles, practices and elements required for quality implementation (Fuentes et al., 2006). TQM first took its roots in improving quality of physical products, as the measurement of quality performance of such products was easier. Subsequently, TQM found its strongest root not merely in improving the quality performance of products, but in organizational transformation specifically in bringing about the cultural change, in improving employees morale and in facilitating an empowering working climate for attaining excellent human performance.

The philosophy of TQM is important to any organization as it is to manufacturing because it competes more effectively for profound growth and sustains more consistently in the context of continuous change and ever expanding competition have become overwhelming and all pervasive concerns for all types of enterprises (Al-Dhaafri and Al-Swidi, 2016; Zimon, 2016a,

2016b, Zimon et al., 2016). TQM focuses on the integration and coordination of all activities in a work process and aims at a continuous improvement in quality (Brown, 2013). Quality means not merely the quality of end products but the quality of all kinds of means such as: data, information, decision, objectives, strategy, people, materials, machinery, systems etc. (Mohanty and Lakhe, 2008). On a similar note speak Veek et al., (2007) claiming that TQM is concerned with the control of quality. Statistical process control is a key aspect of this approach, but TQM goes further than this. The production process is considered as one integrated system in which each successive department or employee is the “customer” of the previous one in the process. Each customer, whether internal or external, must be happy. The same opinion is Luburić (2011) recognizing that TQM is a philosophy whose underlying premises are continual improvements and efforts to be made by all employees in an organisation to understand, meet and exceed requirements, needs and expectations of clients.

TQM can be explained in the following way:

- total - every person in the company is committed to a broadly-understood quality (if only possible, so are the customers and suppliers),
- quality - customer expectations are entirely fulfilled,
- management - managers at every level, especially the highest, support and actively d in implementing a pro-quality corporate culture.

On the other hand Fawcett (2000) argues that the TQM is a process that focuses on the people in an organization and on empowering them to “get it right first time”. The product of successful TQM is a consistent performance to customer expectations. Quality management should never be confused with standards such as ISO 9001 that focuses on procedures. Such standards mainly underpin TQM but their

main weakness is that whilst they can deliver consistent performance to set procedures that performance is not necessarily to customer expectations. In other words, if the procedures deliver mediocrity then the standards will ensure consistent mediocrity.

The above mentioned theories are only a part of the definitions which are included both in domestic and foreign literature. They show that TQM is undoubtedly equivocal, including different approaches to quality management. However, most of the presented theories can distinguish some common assumptions presented below:

- strongly highlighted customer orientation,
- organizational structure based on teamwork skills,
- establishing policies, vision, mission, objectives and strategies and directions of development and ways to achieve them,
- the total involvement of all employees of the organization in the quality activities,
- the core of a comprehensive quality management are the people who are the creators of quality,
- providing a continued ability to improve key processes within the organization,
- the activities of organizations subordinate to internal and external customers,
- the impact on society (Zairi, 2002)

Lederer and Karmarkar (1997) identify the key characteristics of TQM program as:

- A company-wide dedication to totally satisfying customer needs and expectations,
- Quality concerns are fully integrated and central aspects of business planning,
- Using factual data to support decision making,
- Involving the employers,
- Prevention of quality problems, designing them out of products and

the processes that create them and on planning for quality,

- A policy of continues improvement.

In practice, organizations operating according to the principles of TQM are those with excellent articles or activities in finance, marketing, sales and production achieved lasting success in the market while meeting all customer requirements. More recently Dahlgaard-Park, (2011) stated that since the beginning of this century TQM is losing its attractiveness in the industrialized parts of the world. Therefore, TQM must change, evolve and improve, open to innovative (Steiber, and Alänge, 2013) and strictly impact on key areas of business management such as logistics and supply chain management.

### 3. Relation between logistics and TQM

According to Blaik's (1999) logistics concept, in which the basis is in a systemic approach and orientation of flow and cross-cutting, is the major premise and the plane of application of the concept of total quality management. The basic elements of these programs, and also the guidelines of TQM philosophy are customer orientation, employee involvement and improving internal processes and making quality activities covering all the supply chain. It should also be emphasized that the supply chains operating in accordance with the principles of TQM philosophy are typically well-established and have a social recognition. The implementation of the principles of total quality management beyond the significant increase in the level of logistics customer service affects positively the efficiency of the supply chain by:

- significant increase in the quality of the offered services and products,
- minimizing losses while increasing the efficiency of realized processes (Calvo-Mora et al., 2014),

- use of modern quality management instruments,
- integration of the activities of individual supply chain (Wong, 1999),
- improving the competitive position,
- increase the involvement of employees.

It is worth mentioning that processes and quality of services are decisive factors for customer satisfaction. The product quality is influenced, e.g. by the handling and transportation processes. TQM concepts are gradually transferred to the field of logistics (Kopecki et al., 2016).

In opinion of Nikolaidis (2013) TQM is a system approach that works backwards and forwards along the supply chain. At the heart of TQM lies the concept of a continuous improvement and “customer value”. Value is delivered to the customer during the “use process”, which includes all the activities that customer goes through in using a product: find, acquire, transport, use, dispose.

Furthermore, the implementation of TQM principles in the supply chain can positively affect the development of the cells and the construction of cooperation on the principles of sustainable partnerships (Bellah, et al., 2013; Titov et al., 2015). Relying on test results available in the literature it can be concluded that:

- the relationships between companies applying the principles of total quality management and their suppliers are long-term and enhance mutual learning processes,
- organizations applying TQM requirements put on partnerships with various actors in the supply chain,
- there is a close relationship between quality management, supply chain management and the positive results the company achieves by cooperation,

- companies should strive to integrate the principles of TQM with the strategy of supply chain management.

With that opinion agrees Ciesielski (2008) considering that between TQM and logistics there are close relationships:

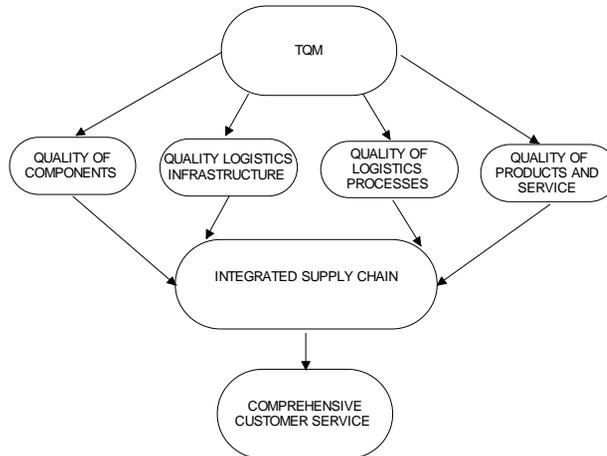
- both TQM and logistics process in the supply chain are focused on the realizations of the same objectives,
- two elements are interrelated and interdependent,
- TQM affects all factors determining the smooth functioning of the logistics.

Zsidsin and Ritchie believe (2008), that to improve internal quality and capabilities, firms have invested heavily over the past decade in programs such as TQM. However, internal actions that include outbound and inbound logistics are still susceptible to issues that can cause fluctuations in effective capacity and quality. Consequently, implementing the TQM philosophy in order to improve logistics processes should have an assurance that:

- It is a philosophy that requires the total commitment of staff and management,
- The center of attention is focused on the needs of customers,
- Individual customer groups are sorted accordingly,
- The company implements the guidelines of TQM philosophy after the integration and co-operation in the supply chain has been achieved.
- It is accepted by individual supply chain,
- Quality management and logistics are mutually reinforcing and complementary, and their development is dependent of each other,
- High quality products and logistics processes for achievements possible through the implementation of TQM philosophy are the foundation

of supply chain management strategies.

To sum up it can be stated that the TQM influences on improving the supply chain by creating quality in many areas (Figure 1).



Source: Own elaboration.

**Figure 1.** TQM influence on supply chain

Chart analysis suggests that there is a multi-faceted relationship between TQM and the supply chain, and its end result is to improve the logistics customer service. Vanichchinchai and Igel (2011) come to similar conclusions and recognize that there is a close relationship between TQM and supply chain management leading to improvement of all its cells. These arguments are supported by research conducted by the Talib et al. (2011) who recognize that there is a need to integrate TQM principles with supply chain management and is the basis for building lasting success of companies in the chain of supply. The authors' confirmations are reflected in the research conducted by Brah and Ying Lim (2006) which shows that TQM is the key to business strategy and is the basis for the implementation of new technologies in supply chains. In addition, TQM improves cooperations and partnerships, which affects the development of the logistics organization (Jušcius and Grigaite, 2011; Ho, 1997).

#### **4. Influence of TQM on improvement of logistics processes – research results**

The subjects of the empirical studies described in this paper were to identify the influence of TQM on improvement of logistics processes in Polish and German enterprises. The research was carried from November till March 2015. Questionnaires were sent do representatives of top management to two hundred enterprises in Poland and Germany in the form of mail survey. The selection of companies was intentional, questionnaires were sent to the 200 largest Polish and German companies (ranking from 2013, <http://www.lista500.polityka.pl/rankings/show>). 31 questionnaires were successful full completed returned (the result was at 7.5% response rate). In the study the purposeful selection of companies (manufacturing) was applied. These were large manufacturing enterprises considered as leaders in their branches. All the surveyed companies have implemented total quality management. Results are shown in Table 1.

**Table 1.** Research results

Influence of TQM on improvement of logistics processes						
Rate of influence					Area	Significance
no influence	little	medium	significant	very big		Rank
1	2	3	4	5		
	7%	23%	38%	32%	Improving logistics customer service	10
	7%	32%	32%	29%	Closer relationships in the supply chain	9
6%	26%	26%	26%	16%	Increasing of the competitiveness of the supply chain	8
		23%	45%	32%	Sourcing of higher quality components	7
3%		10%	55%	32%	Improving cooperation with suppliers	6
3%	10%	23%	16%	48%	Minimization of inconsistencies	5
25%	7%	32%	16%	10%	Minimization of the cost of logistics processes	5
19%	39%	26%	16%		Inventory minimizing	4
		16%	42%	32%	Improvement of warehouse processes	3
6%	10%	55%	19%	10%	Streamlining of distribution processes	2

Source: Author's research

When analyzing the research results it can be concluded that:

1) Respondents stated that the most important aspect is to streamline logistics customer service. The choice of the respondents was dictated by the fact that the chart-topping companies have similar technological potential and they can search for sources of competitive advantage in improving relationships with customers. Distribution of responses shows that the management of the company in accordance with the guidelines of TQM is in most cases (70%), a significant or very significant impact on the improvement of logistics customer service. This is due to the fact that the quality management systems put

customers and their needs in focus. Representatives of the researched organizations emphasized that the implementation of TQM principles has led to the improvement of communication with customers, increased awareness of the employees in this respect and implemented instruments for improving relationships with customers (FMEA, QFD, SERVQUAL). Similar views presents Vasic et al., (2015), suggesting that TQM significantly improves the processes related to customer service and contributes to the improvement of a number of processes in the supply chain.

2) Another important area was to strengthen relationships within the

supply chain. Respondents stated that TQM supports the establishment and maintenance of cooperation, supports the construction of a single strategy in the area of quality and supports the development of common standards and procedures. A similar opinion can be found in the work of Faisal and Talib (2016), which shows that TQM and supply chain management are key concepts that improve the functioning of enterprises in the supply chain, however, a necessary condition to increase its efficiency is their multi-faceted integration. When asked about the impact of TQM on the increase of the competitiveness of the supply chain the opinions were divided. A significant number (32%) of respondents did not notice significant relationships between these areas. On the other hand, 42% of respondents said that the philosophy of TQM affected the growth of competitive position. The answers of this group of respondents are confirmed in a study conducted by Braham and Ying Lima (2006) on a group of companies operating in logistics. The findings suggest that the implementation of the concept of TQM improves the operation of the surveyed companies on many levels and leads to increased competitiveness. Furthermore Sila et al., (2006) consider that the TQM and supply chain management are two of the most important concepts that can be used by manufacturing companies to gain a competitive advantage.

- 3) The analysis of the results shows that TQM is a significant or very significant impact on improving the quality of components (77% of responses). The positive opinion was primarily due to the restrictive selection of suppliers, strengthening the relationships with them and passing control obligation on suppliers. The author assumptions are confirmed by the next question which shows that in 87% of the companies

greatly improved relationships with suppliers after the implementation of TQM philosophy. In addition, more than half of the respondents (64%) considered that the implementation of TQM reported minimizing errors and inconsistencies in the implementation of the main logistics processes. Similar conclusions were reached by Vokurka and Lummus (2003), who based on the conducted research process found that TQM philosophy implemented in the supply chain leads to higher standards of product quality, minimizes errors and improves relationships with suppliers.

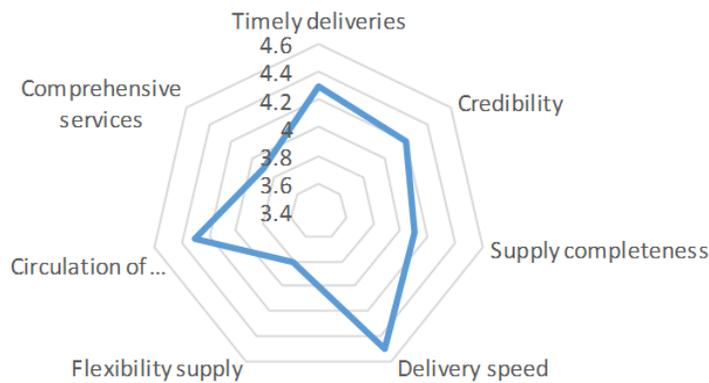
- 4) When analyzing the distribution of answers on the impact of TQM to minimize logistics costs it is difficult to draw firm conclusions. Part of entrepreneurs (26%) stated that by improving logistics processes and minimize errors the costs decreased. A similar number of respondents considered that the effect is partial, and that there is no effect. Quite a skeptical assessment in this regard is due to the nature of TQM philosophy, which is focused on the continuous development and follows the requirements of the customer, and does not look for savings.
- 5) When considering the impact of TQM on inventory management it can be concluded that the TQM philosophy itself has no significant impact on minimizing inventory levels, but to a large extent it improves warehouse processes (Łuczak and Wolniak, 2016).
- 6) The respondents noticed most often the average impact of TQM on streamlining distribution processes. It can be assumed that the distribution is the area where the commitment to quality is slowly slipping away from the hands of the manufacturer, therefore the influence is not significant in most cases.

In order to verify the results obtained  $\chi^2$  independence test was applied. On the basis of calculations it was found that:

- 1) Organizations that recognize implemented TQM as a mature philosophy highly assessed the level of logistics customer service ( $p = 0.0006$ ).
- 2) Organizations that operate according to the principles of TQM philosophy for over 8 years, very well evaluate their relationships with partners in supply chain ( $p = 0.0058$ ).
- 3) Organizations that operate according to the principles of TQM philosophy for two years notice a little impact of the TQM philosophy on improvement of logistics processes ( $p = 0.0055$ ).

Business representatives were also asked to indicate the extent to which TQM philosophy improves various aspects of logistics support (Figure 2).

The degree of the impact of TQM to improve logistics customer service (according to a scale of 1 -negligible, 5 -very large)



Source: Author's research

**Figure 2.** The degree of the impact of TQM to improve logistics customer service

Based on the analysis of distribution of answers it can be concluded that the implementation of TQM philosophy significantly affects the improvement of logistics customer service on many of its levels. According to the respondents particularly increased effectiveness of actions in the areas of speed and timeliness of deliveries, improving forms of communication and minimizing errors. According to the author this is due to the fact

that the TQM philosophy influences the definition and improvement of operational criteria related to transportation, storage and distribution of goods, by defining instructions and procedures bench, training programs, providing the necessary resources and constant monitoring of the needs of individual customers.

The next stage of the research was to thoroughly familiarize with the opinion of respondents regarding the impact of TQM to

improve the efficiency and effectiveness of processes carried out within the supply chain. Analysis of distribution of responses shows that the TQM philosophy has the greatest impact on the development of a strategy that is acceptable to all participants in the supply chain. It forms the basis for the implementation of quality objectives and leads to an increase involvement of the different links in the chain in efforts to improve quality and streamline our processes. According to the respondents the least impact TQM philosophy has on improving the forms of communication, presumably due to the fact that the surveyed companies communicate with customers were already well organized before they decided to operate in accordance with the provisions of TQM. Analysis of open questions also allowed, draw the following conclusions:

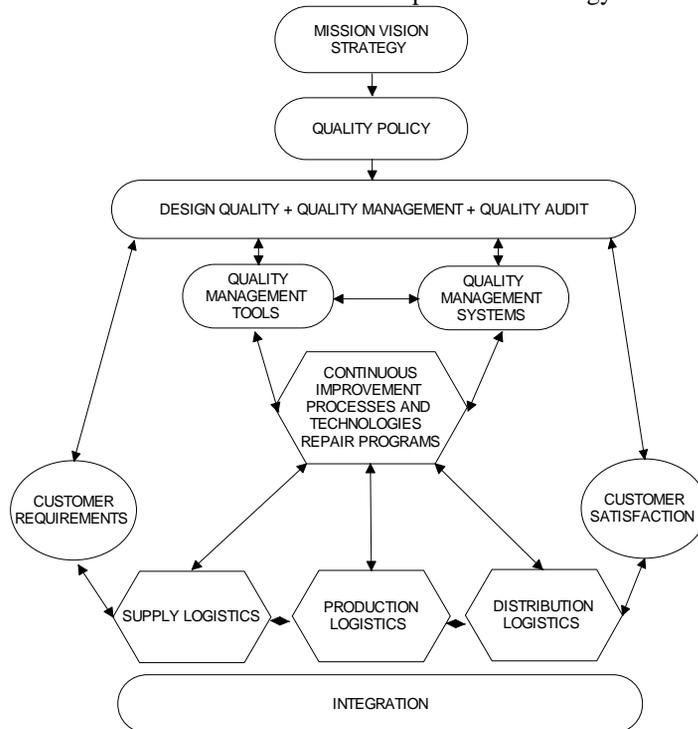
- TQM and logistics management is focused on achieving common

objectives, concepts are mutually reinforcing,

- Companies Implementing TQM philosophy must recognize the wide influence on supply chain partners, customers and the environment
- TQM greater or lesser extent, affects all logistic processes,
- Lack of attention to the quality destabilizes entire chain of supply.

### 5. Proposed model of total quality management in the supply chain

Each organization and each supply chain has its own characteristics and operates under different external conditions. With this in mind, the author propose a general model of quality management in the supply chain (Figure 3), which should be enhanced with industry-specific systems and supported instruments individually matched to the implemented strategy and current needs.



**Figure 3.** Model of total quality management in the supply chain  
Source: Author's research

Implementation of the model in enterprises operating in the chemical industry will certainly bring number of benefits. It should be noted however, that the process of implementation of the model is relatively complicated, and companies can have some problems. To the most significant barriers should be included:

- The implementation of the model is for the company a major undertaking of innovation and investment. It requires an appropriate organizational preparations, having a well-qualified staff and a substantial commitment of the management organization.
- Integration of quality management processes with the processes of logistics technology requires high skills which is necessary to translate system requirements on occupational standards (instructions, procedures). Errors made in this area greatly reduce the effectiveness of the model.
- Maintenance and improvement of the model requires considerable funding. However, the costs should be classified as so-called costs "Good quality", which will affect later to minimize costs resulting from errors, mistakes and wastage.
- Correct implementation of the model requires a change in the mentality of both employees and management (an increase in commitment, submission to the customer, taking into account social, change of management and motivating subordinates, sustainable development) etc. It is worth noting that not all employees (especially mid-level) will be able to find they selves in a new reality.

## 6. Conclusions

The logistic puts the organizations in front of the new challenges. Currently, the logistics strategy should be built based on customer requirements. Implementing total quality management can be very helpful in that process. It should be emphasized that quality and logistics processes should interact with each other. The product of very high quality and very efficiently executed logistic services will not affect the instant success. Only the interaction of these elements will help the organization to function effectively in the market and attract new customers. From the research and considerations carried out in the article one may conclude that:

- There is a strong dependence between TQM and an improvement of logistics processes within the supply chain
- TQM greatly improves logistics of customer service, which is also the most important aspect to be taken into account by the respondents,
- Implementation of TQM philosophy improves relationships with suppliers, and facilitates cooperation in the supply chain,
- There are no clear conclusions on the impact of TQM on minimizing costs in logistics processes,
- 30% of representatives of organizations confirm a TQM positive impact on the growth of competitive position,
- Implementation of TQM philosophy increases a pro-quality awareness of employees and executives,
- Taking care of the quality of processes and products are an integral part of the supply chain management,
- implementation of TQM philosophy allows to create a unified concept of quality, which forms the basis of

efficient logistics in the supply chain,

- TQM is a continually expanding philosophy, its future is moving towards new technologies, the ethical development of customer needs, creating quality throughout the supply chain, improving the forms of communication, sustainability and working out finer relationships with suppliers.

To sum up, it is worth noting that the development of logistics and supply chain management should go hand in hand with the development of TQM philosophy. In managing logistics processes, there are significant areas to create quality, thus increasing customer value.

In addition, TQM philosophy should evolve in the direction of:

- Effective and efficient management of technology,
- Comprehensive approach to supply chain management,
- Ethics shaping customer needs.
- Greater emphasis on the idea of sustainable development.

Research presented in the publication will be continued by the author and focused on establishing relations and links between the concepts of quality management, logistics processes and the development of technology and sustainable development.

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