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The use of QFD method advantages and limitation

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Abstract

The following paper concentrates on some problems resulting from the use of Quality Function Deployment method in industrial enterprises. It is not an easy task although the method itself has many advantages. The aim of the paper is to analyse basic international literature as well as the main advantages and limitations of the Quality Function Deployment.

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1. Introduction

The QFD (Quality Function Deployment) method was invented in Japan but now it is a widespread quality management method used especially in the process of designing new projects (CWIKLICKI, M., OBORA, H. 2008a, CWIKLICKI, M., OBORA, H. 2008b, CWIKICKI, M. 2017b, CWIKLICKI, M. 2017b). QFD can be defined as: a method of planning and development of a project or service, enabling research teams to precisely define the needs and requirements of customers, and, then, to translate them into the parameters of the product or service; its components and parameters of the production process itself (CLAUSING, J.R., CLAUSING, D. 1998, WOLNIAK, R., SEDEK, A. 2009, WOLNIAK, R. 2017).

The QFD method is used to design new products and services and to modify existing ones in such a way that they satisfy (to the highest possible degree) the requirements specified by the client. It belongs to customer-oriented design methods (WOLNIAK, R. 2016b).

This publication concentrates on the literature analysis concerning advantages and limitations connected with the implementation of this method in organizations, especially industrial organizations. The aim of the paper is the comparison and analysis of those advantages and limitations.

2. Advantages of using QFD method

Research shows that the QFD method provides the company that uses it with many different benefits that can be divided into the following groups (WOLNIAK, R. 2016a):

- Organizational - related to the organizational structure, organization work, etc.
- Economic - costs and profits resulting from the application of the method.
- Socio-psychological - feelings of employees and customers, satisfaction, management styles, communication, etc.

Another list of benefits resulting from the use of the QFD method can be found in J. Toruński and E.S. Jaiswala. They distinguish the following advantages of using this method (TORUŃSKI, J. 2013, JAISWAL, E.S. 2012):

- a simple method of implementation, analysis and documentation,
- taking into account customer requirements,
- product planning becomes an integral element of quality planning,
- constant improvement of product quality,
- better planning of quality costs,
- planning and shaping products according to the client's requirements,
- transformation of customer requirements into specific research and development requirements in the enterprise,
- getting to know your own advantages and weaknesses in relation to other companies,
- possibility to use in strategic planning of production,
- fewer changes to the construction and production process,

- shortening the duration of the product development cycle,
- lower production costs,
- improvement of intra-organizational communication,
- multidisciplinary,
- the opportunity to gain a competitive advantage due to better meeting the client's needs,
- proactivity of the method.

Among the practically observed benefits of using QFD, for example, one can mention (WOLNIAK, R. 2016b):

- reduction of technological changes by 30% - 50%,
- shortening of production cycles by 30% - 50%,
- reduction of start-up costs by 20% - 60%,
- decrease in the number of warranty claims by 20% - 60%.

One of the main benefits of using the QFD method is its impact on costs in the enterprise. The reduction of company costs may take place by reducing any of the following factors (HMAYER, M., LEHNER, A.P. 1997):

- costs of purchasing products and services from sub-suppliers,
- costs related to the organization of management and the production or service process,
- wages,
- waste and the need to do the same things again.

An example of interesting research on the advantages of the QFD method are studies by J. Politis on the relationship between the use of the QFD method and the competitiveness and productivity of the organization. The research was conducted in the United Arab Emirates. 359 questionnaires from companies from various industries were obtained. The analysis shows that the use of the QFD method has a positive impact on both the creativity and productivity of the organization (where the impact on productivity is greater). As the results of the research show, in order for the positive effects of using the method to materialize, certain principles should be maintained, which include (POLITIS, J.D. 2005):

- involvement of the top management in QFD projects,
- facilitating cooperation for employees in the application of QFD,
- using QFD also at the strategic level,
- building an information base that can be used in the QFD method,
- building relationships with clients,
- using the skills and potential of employees to meet identified customer needs,
- teamwork orientation and a flexible approach.

Another analysis regarding the best practices in the field of applying the QFD method in organizations was made by P. Cauchich. He analysed seven large companies from seven countries (including Germany, Brazil, the United States) using the QFD method to identify the best practices regarding the use of the method. The sample tested was small, but it should be taken into account that these companies were especially selected from several hundred companies to which the survey was addressed in the first stage of the research.

Other extensive studies of this kind were conducted by D. Ginn and M. Zairi. Their analysis was based on questionnaires obtained from 283 Ford employees using the QFD method, and 80 external QFD practitioners from 27 organizations. Table 1 summarizes the main benefits of using the QFD method, in the opinion of the respondents. The largest group paid particular attention to better understanding of the client and team work (GINN, D., ZAIRI, M. 2005, ASI QFD).

The respondents were also asked what type of QFD analysis they considered the best results (Table 2). Most chose the option - adapted to the tasks being performed, followed by a simple one-matrix analysis - only small part of researched companies used more complex and comprehensive approaches.

Table 1. The most important benefits of using the QFD method in the studies of D. Ginno and M. Zairi

Benefits	Percentage of respondents [%]
Better understanding of the client	47
Focus on teamwork	31
Continuous improvement	26
Prioritization of clients	22
Better knowledge of the product	21
A structured, systematic approach	18
Increased organizational knowledge	18

Source: GINN, D., ZAIRI, M. 2005.

Table 2. Significance of individual types of the QFD method in the studies of D. Ginno and M. Zairi

The type of QFD method	Percentage of respondents [%]
Adapted to the problem	77
One-matrix analysis of the "House of Quality" type	17
Four-matrix method	12
Multi-matrix development (more than four-matrix)	9

Source: GINN, D., ZAIRI, M. 2005.

An example of an organization in which the QFD method is used when developing new products is Toyota. The application of this method enabled this company in the period 1977-84 to reduce costs to the level of 39% of initial costs (CAUCHIK, A.M. 2013).

There are numerous studies in the world in the field of determining the benefits of using the QFD method in enterprises. One of such studies was research conducted in the 1980s in Sweden. In these studies, 35 companies belonging to various industries were identified, of which 31 were tested. Table 3 presents the results of research in two areas (SHER, S. 2006, EKDAHL, F., GUSTAFSSON, A. 1997):

- percentage of respondents using QFD to achieve specific benefits,
- positive results of applying the QFD method in an enterprise.

The data collected in Table 3 shows that the QFD method was used in Sweden most often to improve the product development process and improve customer

satisfaction. The best results are achieved in the situation of improving internal communication between organizational units that deal with the design, production and sale of a specific product.

Table 3. The results of using QFD in Swedish enterprises

Benefits	Percent of subjects using QFD for specific benefits [%]	Positive results of using the QFD method [%]
Improving the product development process	68.2%	41.8%
Shorter time to market a new product	31.8%	16.4%
Improving communication	35.5%	64.5%
26/5000 Increased customer satisfaction	68.2%	31.8%

Source: EKDAHL, F., GUSTAFSSON, A. 1997.

3. Limitations and problems using QFD method

E.S. Jaiswala also identified the most important problems that can be encountered when using the QFD method. The following issues can be included (BOUCHERAU, V., ROWLANDS, H. 2000) (Table 4):

- if one tries to use more complex, multi-matrix methods, the size of all matrices and analysis can be very large. It can also cause difficulties in the implementation of numerous conclusions resulting from the analysis.
- the method is mainly of a qualitative nature; it is often very difficult to categorize them due to the ambiguity and fuzzy nature of the client's needs.
- the connection between customer requirements and technical requirements can be difficult.
- the method is not suitable for all applications. For example, in automotive industry there is only a limited number of customers.

The detailed advantages and disadvantages of the method depend on what specific version of the QFD method are dealt with, because different versions of the method may need different approaches. Table 5 contains the most important advantages and disadvantages of the three main versions of the method.

Table 4. Advantages and limitations of QFD method

Advantages	Limitations
Targeting the customer Connecting in a coherent way a very large number of data The need to use team work engaging people from different departments of the organization Re-education of new projects development times by 50% Reducing costs of new projects by 30%	Vagueness of the categories used The need to analyse a large amount of data, often of a subjective nature Difficulty of cooperation between multidisciplinary teams Creating complex matrices and analyses is time-consuming and labor-intensive In practice, organizations very

Organization of data in a systematic and logical way The possibility of using both products and services Improving the relationship between the client and the organization Increased customer satisfaction	often limit themselves only to the first phase of analysis in its simplest version, which does not allow for the materialization of all the advantages of the method The method, especially in the case of extended versions, is too large and comprehensive Specifying target values for technical attributes is imprecise It is very difficult to precisely define the strength of relations between customer and technical attributes The method is based mainly on qualitative data
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Source: BOUCHERAU, V., ROWLANDS, H. 2000.

Table 5. Advantages and disadvantages of selected versions of the QFD method

	Four-matrix version	Matrix matrix	Comprehensive approach
Year	From the beginning of the method	The 80's.	Early 90s
Person	Fukuhara	Akao	King
Advantages	Easy to understand the method Low level of complications	Very developed and detailed High flexibility	High flexibility
Limitations	Not flexible	It is very difficult to learn and carry out because of its very comprehensive nature	It requires a lot of knowledge and skills of the team carrying out the method

Source: ABU-ASSAB, S. 2011.

The next Table 6 lists the most important problems for QFD projects that result from the discussed research. In particular, respondents often pointed to issues such as the slowness of the analysis being carried out, the difficulty in working interdisciplinary teams or the low level of understanding of the QFD method.

Table 6. The most important problems of using the QFD method in the studies of D. Ginno and M. Zairi

Problem	Percentage of respondents [%]
Slowness of performing QFD analysis	45
Difficulties in maintaining the integrity of the interdisciplinary team	23
A small understanding of the QFD method	22
Lack of sufficient financial resources (eg for carrying out surveys)	20

Excessive bureaucracy	16
Insufficient training on the QFD method	16
A small understanding of the client's needs	15
Problems with maintaining the proper orientation of the analysis	15

Source: GINN, D., ZAIRI, M. 2005.

4. Summary and conclusion

The QFD method can be used in an industrial enterprise to improve the design of a product. The use of the method has many advantages, especially connected with better adjustment of the product to the customers' needs and the shorter time of the product release. However, there are also some limitations and problems which should be taken into account for the method to be used properly. The most experienced teams using QFD to design product know how to deal with this problem so as to approach the method in a comprehensive and successful way.

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使用QFD方法的优点和局限性

關鍵詞

客户满意度
QFD
质量功能展开
质量改进
质量方法

摘要

本文着重介绍了在工业企业中使用质量功能展开方法所承认的一些问题。除了该方法的许多优点之外，这不是一件容易的事。本文的目的是在国际文献综述研究的基础上分析质量功能展开的主要优点和局限性。