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Review, analysis and classification of the literature on QFD—Types of research, difficulties and benefits

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ABSTRACT

This paper presents a review, analysis, classification and codification of the literature on quality function deployment (QFD) produced between 2002 and 2006. The publications were classified into two main groups: conceptual research and empirical research. The studies focused more on quality matrix problem solving and the main difficulties are reported. However, few studies have been done on solutions for other important aspects. Further research is needed on how to reduce the difficulties of using QFD.

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1. Introduction

QFD—quality function deployment is an important product development method, dedicated to translating client requirements into activities to develop products and services. However, there are several difficulties in its application, among them: interpreting the customer voice, defining the correlations between the quality demanded and quality characteristics (Chan and Wu, 2005), defining the projected quality due to the ambiguity in the quality demanded and quality characteristics (Ramasamy and Selladurai, 2004) difficulty in working in teams, and lack of knowledge about using the method (Martins and Aspinwall, 2001).

These difficulties have discouraged its use. For this reason, it is important to carry out studies to understand QFD, the purposes for which it has been used, the benefits of its applications and the difficulties in its use in order to seek solution to facilitate its application in the future. In this sense, the objective of this paper is present a review, analysis, classification and codification of the literature on QFD. The publications were identified through a number

of databases, consulting works published between 2000 and 2006. The publications were classified into two main groups: conceptual research and empirical research. An affinity diagram and a tree diagram were used to organize the data from the QFD literature. The articles were then classified and the principal QFD information groups organized by the diagrams were codified to permit the visualization of all the information of interest in the article.

2. Methods used in the present study

This study can be described as theoretical–conceptual, but it is specifically devoted to searching and reviewing the literature on the QFD method. It is important to stress from the outset that to identify, locate and acquire publications of interest, the following databases were consulted: ACM (Association for Computing Machinery), ACS (American Chemical Society), AIP (American Institute of Physics), Blackwell, Cambridge University Press, Emerald, Gale, HighWire Press, IEEE (Institute of Electrical and Electronic Engineer), Nature, OECD (Organisation for Economic Co-operation and Development), Ovid Technologies, Oxford University Press, ProQuest, Sage Journal Online, SciELO (Scientific Electronic Library Oline), Science Direct Online and Wilson.

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To consult the referred journals, the key word 'QFD' was used to search the abstracts, and when this first option was not available for the database consulted, the term QFD was searched for throughout the entire text. Articles published between 2000 and 2006 were accessed.

Articles from journals were used in the analysis because they are published after passing a selection process and are evaluated according to some criteria, as compared with articles from congresses and symposia. Also left out were the analysis of book synopsis and abstracts of dissertations and theses. In the end, 157 articles were analyzed.

A table used in Martín et al. (1999) was adapted to record the articles. The articles were organized into two groups: "conceptual research" and "empirical research." Articles whose goal was to develop theoretical-concepts work, reviews of the literature, simulations or theoretical modeling were considered to be conceptual. Empirical research included articles that had the goal of undertaking surveys, case studies, research-action or experimental research. The affiliation of the researchers, the average number of authors per article and the existence of financial support were also verified to discover sources of support for QFD research.

The approach of the articles was also classified as "quantitative" or "qualitative" following ref. Martín et al., 1999. In the case of empirical studies the following were studied—the coverage of the study ("regional," "national, or "international"); the unit of analysis ("persons", "groups", "organizational unit," "companies"); the method of data collection ("questionnaire", "interviews", "document analysis," "public data," "press information," and "bibliographical"), and the period analyzed only for case studies according to Voss et al., 2002 ("retrospective", "contemporary", and "longitudinal"). For the conceptual research group, the indirect method of data collection used (e.g., "public data", "information published in the press", and "bibliographical") was also studied. The classification of the articles was coded as shown in Table 1 and Appendix A, to facilitate the visualization of the results.

Affinity diagrams and tree diagrams were used to organize and group data of interest from the articles in a hierarchical form, classifying them according to: the scope of the study, QFD definitions; difficulties with applications; difficulties due to not meeting the prerequisites of the method; benefits of use; prerequisites for use of the model and finally, recommendations for the application of QFD. The affinity diagram is a method developed to

Table 1

Top 10 periodicals that published most articles on QFD in the period studied

Journals	2000	2001	2002	2003	2004	2005	2006	Total
International Journal of Quality & Reliability Management		2	3	11	8	7	2	33
International Journal of Production Economics	3	1	1	1	1		1	8
CE-Concurrent Engineering: Research and Applications						3	3	6
European Journal of Operational Research	1		2				3	6
Computers & Industrial Engineering			2	1	1	1		5
Quality Progress	1	1		1		2		5
Benchmarking: An International Journal	2					1	1	4
Industrial Management & Data Systems		1		1	1	1		4
Journal of Intelligent Manufacturing	1	2	1					4
Managerial Auditing Journal	2		2					4
Total	10	7	11	15	11	15	10	79

Table A1

QFD article classifications codes (T1–T8)

<i>T1: Kind of study</i>		<i>T4: Analysis period</i>		<i>T7: Analytic unit</i>	
A	Modeling	LO	Longitudinal	PE	Persons
B	Theoretical-conceptual	RET	Retrospective	GR	Groups
C	Literature review	AT	Contemporary	O	Organizational unit
D	Simulation	<i>T5: Approach</i>		EMP	Companies
E	Survey	a	Quantitative	<i>T8: Documentation</i>	
F	Case study			1	Questionnaire
G	Action-research			2	Interview
H	Experimental	b	Qualitative	3	Document analysis
<i>T2: Affiliation</i>		c	Descriptive	4	Public data
UN	University	d	Predictive	5	Press information
CP	Research institution	<i>T6: Geographic scope</i>		6	Bibliography
EP	Company	RE	Regional		
<i>T3: Financial support</i>		NA	National		
AF		IN	International		

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