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QUALITY FUNCTION DEPLOYMENT APPROACH TO EVALUATE SUPPLY CHAINS STRATEGIES IN TURKISH AUTOMOTIVE INDUSTRY

Abstract:

The main objective of this study is to analyze automotive industry, and to identify the important auto parts logistics requirements, and supply chain management (SCM) strategies. For product or service development, quality function deployment (QFD) is a useful approach to maximize customer satisfaction. The determination of the customer and logistics requirements, and supply chain management strategies are important issues during QFD processes for product or service design. For this reason, a QFD methodology is proposed in this study to determine these aspects and to improve the level of customer satisfaction. Qualitative information is converted firstly into quantitative parameters, and then this data is combined with other quantitative data to parameterize to determine appropriate supply chain management strategies.

Keywords:

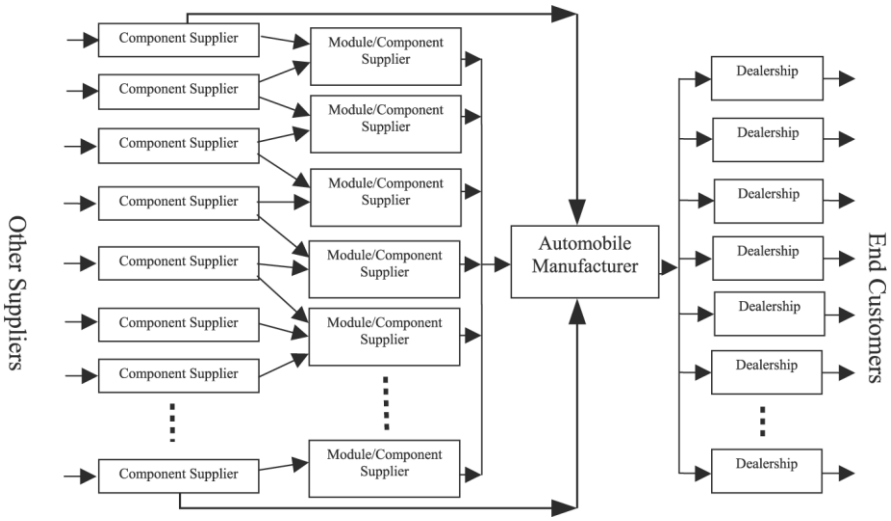
Quality function deployments, logistics requirements, supply chain management strategies.

JEL Classification: C44

INTRODUCTION AND RELATED RESEARCH

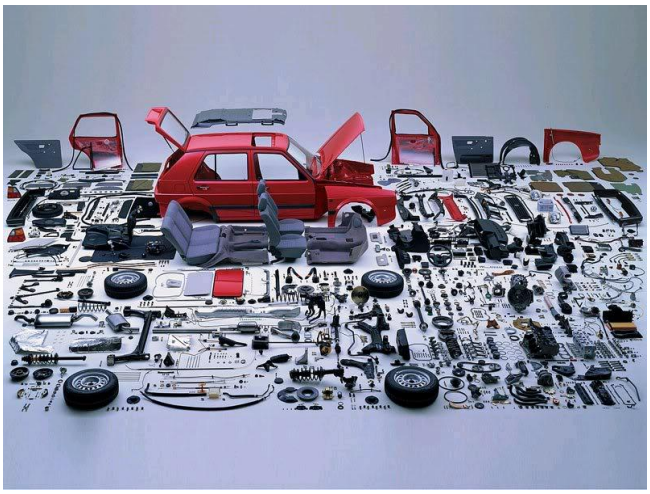
Today's automotive industry uses 15% of the world's steel, 40 % of the world's rubber and 25% of the world's glass. It also uses 40% of the world's annual oil output. From 1951 to 1972, there was a very high production growth rate of approximately 5.9% annually for the automotive industry (Suthikarnnarunai, 2008). On the other hand, a typical automotive supply chain includes several tiers of suppliers in the supply chain and the original equipment manufacturers (OEMs). An automotive component/module/part involves at least four different groups in a supply chain as seen in Figure 1, an example of the automotive supply chain (Gary et al., 2005).

FIGURE 1.THE EXAMPLE OF AN AUTOMOTIVE SUPPLY CHAIN



On the other hand, the automotive supply chain practice in today's business environment is still in a transition period. Its common practice in most of the automotive companies is that every chain is mainly tied each other through forecasting methods. The vehicle manufacturers must match supplies with demands from the first chain, raw material suppliers, to the last chain, buyers. The variation or uncertainty of demand due to forecasting is produced from chain to chain causing bullwhip effect. The new direction for automotive supply chain is still based in part, on the forecast and, in part, on the capable and responsive supply chain with a greater strategic emphasis, and subsequently, on the logistics operations (Suthikarnnarunai, 2008). Figure 2 also shows the various parts in an automotive supply chain.

FIGURE 2.PARTS IN AN AUTOMOTIVE SUPPLY CHAIN
(http://blogpool4tool.com/2012/09/04/challenges-to-the-automotive-supply-chain/)



In literature, recently many articles have been published on supply chain management (SCM), its theory, concepts and so on (Closs and Mollenkopf, 2004). Many of these research studies are based on practical studies, analysis and evidence related to automotive supply network (Küchlin and Sinz, 2000; Choi and Hong, 2002; Hines et al., 2002; Fredrikson and Gadde, 2005; Holweg et al., 2005a, b). A generic supply chain (SC) can be assumed like an organization of relatively enduring inter-firm, cooperative and collaborative entities, using resources from participants with consistent interests (Lee, 2004). Under such a paradigm the members of a SC share equitable risks, expenses and benefits to accomplish shared information and strategic quality systems whose goals are independent for each one of them (Ketchen and Giunnipero, 2004).

Quality Function Deployment (QFD) is a comprehensive quality system aimed at satisfying the customer. The intents of applying QFD are to incorporate the voice of the customer into the various phases of the product, process or system development cycle and to assume the achievement of customer required quality. Yoji Akao regarded as the father of QFD whose work has led to its first implementation at the Mitsubishi Heavy Industries Kobe Shipyard in 1972. The interest in QFD in the West was motivated by reports of the achievements made by Toyota through its application between 1977 and 1984. The achievements included a decrease in the development cycle by one third, a reduction in product development costs by 61%, and the virtual elimination of rust related warranty problems (Sullivan, 1986).

The aim of this paper is to propose a methodology using QFD to determine the most suitable customer needs, logistics requirements, and supply chain management (SCM) strategies in an automotive supply chain environment.

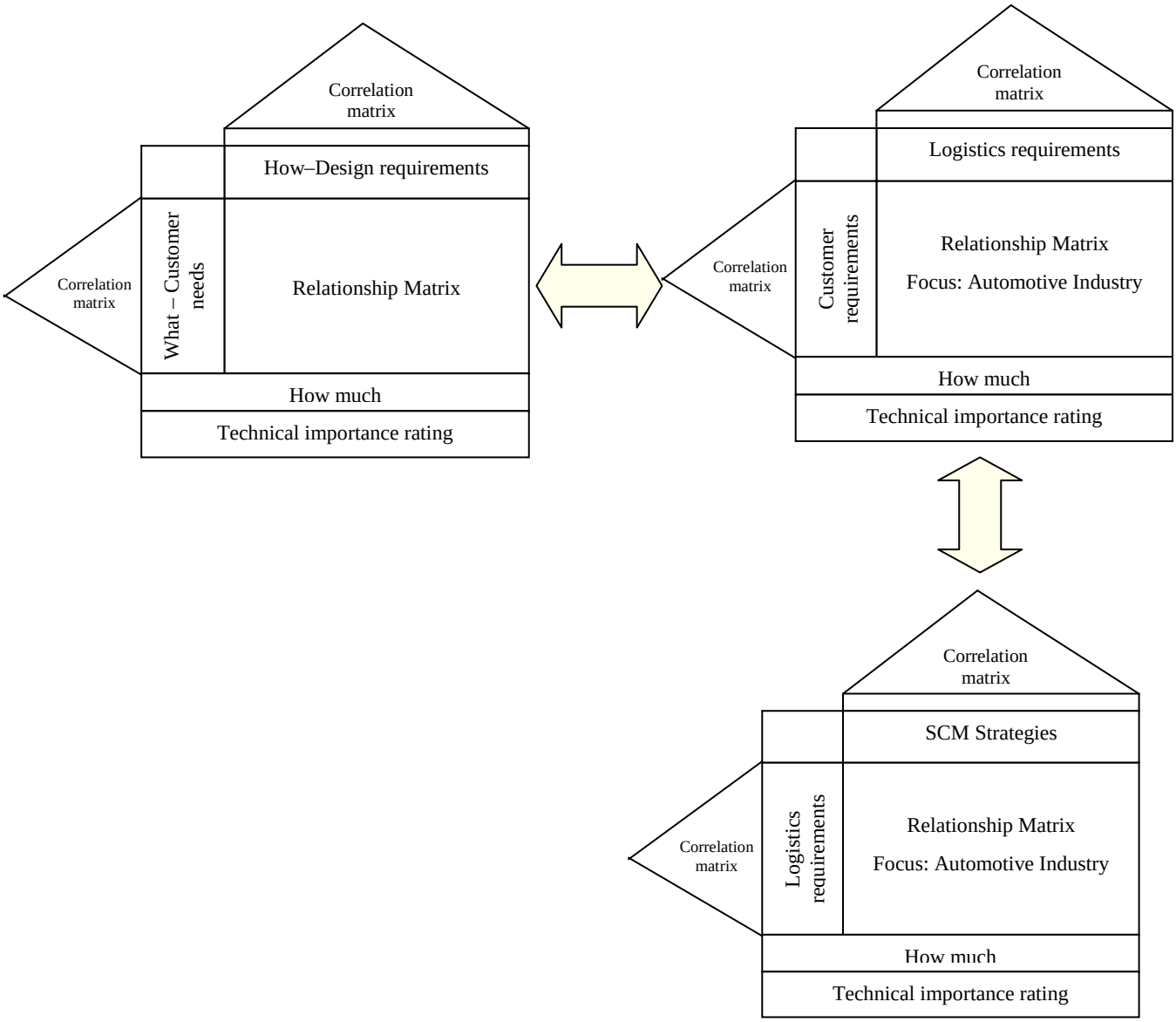
THE PROPOSED QFD METHODOLOGY

The proposed QFD methodology has the following three different steps: customer/ logistics requirements and supply chain strategies in an automotive industry. QFD is a comprehensive quality tool specifically aimed at satisfying customers' requirements. QFD is defined as a method and technique used for developing a design quality aimed at satisfying the consumer and then translating the

consumer's demands into design targets and major quality assurance points to be used throughout the production stage (Akao, 1990).

In this study, customer needs are treated as the voice of the customer (WHAT), as these are the requirements of an improved logistics process. All logistics practices that affect each customer need must be identified as the HOWs in a QFD matrix. Following this procedure, a house of quality focus on automotive industry can be built, containing WHATs and HOWs, and their correlations. This generic QFD matrix in Figure 3 allows automotive organizations to assess how effective their current logistics practices are, how they can improve them, and to what levels they can improve.

FIGURE 3.GENERAL VIEW OF THE PROPOSED APPROACH



Through review of literature, face to face meeting with automotive industry's industrial customers, 17 customer (automaker) requirements, 16 logistics requirements and 18 supply chain management strategies are identified through review of literature, and our expertise and validation of the case company logistics managers (Table 1, 2, and 3). On the issue of the interaction of customer requirements and logistics, providing logistics service which meets customer expectations is a continuous process, which can be summarized in the following steps: understanding the customer's voice, that is requirements and expectations in terms of relevant logistics performances; assessing customer's service perception; if a gap between perception and requirements occurs, identifying viable steps that can be implemented to improve customer satisfaction; identifying costs and benefits related to each step; and implementing the most efficient actions for customer satisfaction by means of a cost/benefit analysis.

TABLE 1
CUSTOMER (AUTOMAKER) REQUIREMENTS FOR AUTOMOTIVE INDUSTRY

Code	Definition
C1	Product Quality
C2	Product Cost
C3	Different Payment Options
C4	Package Quality
C5	Become a Leader Brand
C6	Selling Volume
C7	Variety of Product
C8	Lead Time
C9	Delivering on Time
C10	Meeting the Orders Regularly
C11	Design and Engineering Capability
C12	Supplier Reliability
C13	Meeting the Orders Correctly
C14	Picking the Return Products
C15	Consolidation of Orders
C16	Efficiency of Barcode System
C17	Efficient Performance Management

TABLE 2
LOGISTICS REQUIREMENTS FOR AUTOMOTIVE INDUSTRY

Code	Definition
L1	Qualified Employement and Traning
L2	Usage of Information Technologies and Decision Support Systems
L3	CRM, Getting Orders with Customer Representative and Hiring a Representative
L4	Inventory Stock and Management
L5	Automation of Manufacturing Processes and Warehouse Processes
L6	Usage of Outsourcing Company
L7	Real Time Following Trucks with Satellite
L8	Usage Demand Forecasting System for Correct Demand Forecast
L9	Having Quality Certification and Suppliers Pool with Quality Certifications
L10	Effective Reverse Logistics
L11	Picking Orders Fastly and Loading Trucks in the Warehouse
L12	Usage Distribution Network Effectively
L13	Analyzing of Work Processes and Continous Improvement
L14	High Financial Power
L15	Planning
L16	Structure of Consumers

TABLE 3
SCM STRATEGIES FOR AUTOMOTIVE INDUSTRY

Code	Definition
S1	Market Segmentation
S2	E-Marketing
S3	3PL/4PL Logistics Service Providers
S4	Cross-Docking
S5	Direct Store Delivery
S6	Efficient Consumer Response (ECR)
S7	Collaborative Planning Forecasting and Replenishment (CPRF)
S8	Postponement
S9	Total Cost Management
S10	Electronic Data Interchange (EDI)
S11	Radio Frequency Identification System (RFID)
S12	Pay by Touch

S13	Just-In-Time (JIT) Delivery
S14	Freight Consolidation
S15	Integration of Inbound and Distribution Logistics
S16	Fixed/Master Routes and Variable /Dynamic Routes
S17	Distribution Center Consolidation vs. Decentralization
S18	Private Fleet vs. For-Hire Fleet

CONCLUSION

In this study, to maximize customer (automaker) satisfaction, a QFD-based approach is presented to analyze automotive supply chain, and also identified customer needs, logistics requirements and SCM strategies. The QFD method has been very useful approach for product or service development to maximize customer satisfaction and used in practice based on the current literature. Capturing the customer and logistics requirements, and supply chain management strategies using QFD for automotive supply chain are very critical for most automakers. For the future study, a fuzzy logic can be integrated with QFD to model the vagueness of the decision makers.

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