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New Product Development through QFD Methodology – A Short Survey

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***Abstract*-This paper presents a literature review of quality function deployment (QFD). The introduction and history of survey in QFD is accounted first, followed by methodology of Quality Function Deployment. Then a categorical analysis is conducted about QFD's functional fields, applied industries and methodological development. It is hope that this paper be full of short review about QFD can serve the needs of researchers and practitioners for easy references of QFD studies with respective applicationsand hence promote future development in quality deployment.**

Keywords- QFD, House of quality, Voice of the customer, Customer satisfaction.

I.INTRODUCTION

Quality Function Deployment (QFD) is a quality tool that helps to translate the Voice of the Customer (VOC) into new products that truly satisfy their needs. In this paper, QFD will be reviewed in order to understand how it works, to highlight its strengths and weaknesses and to discuss its practical applications. The first part of the paper will present an overview of QFD and explain the methodology. QFD will be defined and explained by means of an example and a number of benefits and implementation problems will be revealed [1], QFD is used to translate customer requirements to engineering specifications. It is a link between customers - design engineers - competitors - manufacturing. It provides an insight into the whole design and manufacturing operation from concept to manufacture and it can dramatically improve the efficiency as production problems which are resolved early in the design phase. It is very powerful as it incorporates the voice of the customer in the designs - hence it is likely that the final product will be better designed to satisfy the customer's needs. The QFD technique is based on the analysis of the clients' requirements, which are normally expressed in qualitative terms, such as: "easy to use", "safe","comfortable", "luxurious" etc.

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II. HISTORY OF SURVEY

Some literature survey about quality function deployment has been made from recent research articles and the some of the observations are listed in this section.

In 2016 Hamidullah, R. Akbar, S. Noor, W. Shah &Inayatullah discuss about the quality function deployment as a tool for improvement for cash dashboard. This paper shows how QFD improves the car dashboard development process by focusing on customer needs and expectations. Two important developments in the car dashboard are that, the forced exhaust system and the multipurpose cup holder are made according to the customer's expectations. For the product development the customer needs are identified by market survey. 'Voice of the Customer' from market survey is converted into customer requirements (WHATs). Product characteristics are developed to achieve the customer needs in technical descriptions (HOWs). House of quality is built by developing the relationship between WHATS and HOWS. The result of house of quality is used in concept generation.

In 2014 D.Premkumar,M.Balamurugandisuss about implementation of QFD in pump industry. Finally he comes to the conclusion that the design of the drive impeller, the design of the external body and the design of the cabling mechanism consecutively achieved their priorities as external design parameters. This also means that it gives the evaluators an idea that a separate study (survey, interview, etc.) can be implemented to decide on the manufacturing of new product. By designing the products based on the identified customer requirements, customer will get satisfied.

In 2009, Joel SoaresAnjos discuss about "GenchiGenbutsu" a successful tool for quality improvement during the product development process. The author projected that genchigenbutsu is a key tool to find the root cause of any problem which is the key to a lasting solution and a successful product development. Additionally he describes some

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successful steps to apply the genchigenbutsu during the automotive product development.

In 2009, Itzhak Ben-Levy make a review on reducing development cycle time by using QFD. This paper illustrates how QFD practices are implemented during the development process andthe same practice leads to a reduction in development cycle time.

In 2008 MohdFairuz Bin Suliman pointed out that in his research that, car wiper is chosen as a case study to find out the solution of having to rise up the wiper while parking in direct sunlight. Customer requirements are gathered through feedback from questionnaires. The survey results are then applied into the house of quality and the proposed product characteristics are revealed. They suggested a solution to this problem by designing a special wiper stand holder that can upholds the car wiper hanging the windscreen. The design of uphold device help the customers to overcome this problem efficiently.

In 2008 Carnevalli and Miguel have mentioned literature survey on quality function deployment produced between 2002 and 2006. They done conceptual and empirical research, they found difficulties in its application like interpreting the customer voice, correlations between quality demand and quality characteristics. Here they added about affinity diagram and tree diagram which permits hierarchical groupings and organizing information on the scope of the studies, definitions, benefits, difficulties, recommendations and prerequisites on the use of QFD. QFD method use technique like fuzzy logic, analytic hierarchy process, and analytic network process. Thus the author concluded that the most quality matrix problem solving analysis and priority issues are performed by fuzzy logic techniques produces good results.

In 2007, Lelis Tetsuo Murakami discusses about Product Quality and Software Quality in QFD, the objective of this paper is to convince the industries that the desired quality in products depends on more and more of IT resources and because of it, is strategically important an adequate monitoring of IT quality, based in corporative governance.

In 2005, John A. Fitch discuss about a Decision Network Framework for Vehicle System Engineering this paper provide an overview of a decision-centric approach to Systems Engineering built around Decision Networks. Lessons learned through the use of Decision Networks in vehicle industries can be extrapolated for use in vehicle Systems Engineering.

In 2005, Ciro Batista Rosa says about Practical Application of FMDA and QFD to improve product quality. This article describes a structured approach where Quality Function Deployment (QFD) and Failure Mode and Effects Analysis (FMEA) are used in combination to improve product quality. Its advantages and drawbacks are investigated. At the end, certain recommendations are listed for a successful application of the tools.

In 2002 Chan and Wu have mentioned that QFD is a technique employed to translate customer voice into technical requirement. They conducted analysis on QFD's functional fields, applied industries and methodological development. Fuzzy logic method is used to deal with subjectivity and ambiguity of evaluation on “WHAT’s” and “HOW’s”. They suggested quantitative methods to use in QFD to improve its reliability and objectiveness. Thus these authors have extensively survived the literature and appraised that many more such survey are necessary to update the knowledge on QFD.

Martins and Aspinwall in 2001 identified many QFD implementation problems among the companies surveyed. The results shown that there was a problem in western companies associated with working in teams. Problems in maintaining a commitment to the methodology and an unsuitable organizational culture were also highlighted. Other aspects like time consuming and complexity of the methodology which are commonly mentioned.

In 2001 Govers has mentioned that QFD is a method of continuous product improvement emphasizing the impact of organizational learning on innovation. A company that struggles with the quality performance at the aimed level has to stress basic quality techniques. Policy deployment and process management these process together create the transparency, focus and cohesion required to motivate concerted effort. For starting QFD the scope of project has to establish and they should be communicated and that has to approve by management. The general resistances to implement QFD approach are lack of time, short term thinking, and lack of support are discussed. Thus the author concluded that firms need sound evaluation and open minded communication, within the organization to stimulate organizational learning.

In 1996 Govers declared that most of the problems that companies have to untangle, in order to implement QFD, are related to organizational circumstances like project definition and project management as well as team selection and team building. A critical factor concerning project definition is the “Voice of the Customer” while with respect to project management and team selection, it is essential to have the support of top management and the integration of a team with receptive open-minded members who are willing to challenge established practices.

III. METHODOLOGY USED

Hamidullah, R. Akbar, S. Noor, W. Shah &Inayatullah (2016) according to them two surveys were conducted. Survey 1 was conducted to find out functions in the car

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dashboard which needs improvement. The results of the first survey results forced exhaust system and multipurpose cup holder are preferable. Survey 2 was conducted to know the 'Voice of the Customer' (VOC) about the functions (forced exhaust system and multipurpose cup holder) which were the result of the first survey. Data's collected from the surveys were interpreted in terms of customer needs. Customer needs were organized according to their relative importance. The ranking was carried out on the basis of customer feedback obtained from the customer survey.

D.Premkumar and M.balamurugan in 2014 said that the QFD methodology is based on the development of a series of matrices called "House of Quality". By contrast, Quality Function Deployment (QFD) uses a matrix format to capture a number of issues that are vital to the planning process. The House of Quality Matrix is the most recognized and widely used form of this method. It translates customer requirements, based on marketing research and benchmarking data, into an appropriate number of engineering targets to be met by a new product design. Basically, it is the nerve center and the engine that drives the entire QFD process. They registered according to Hauser and Clausing, it is "a kind of conceptual map that provides the means for inter functional planning and communication".

P.S.Rajeswaran and R.Gandhinathan in 2012 concluded that the project has started by studying the literature on Quality function deployment. Based on this literature collection, lead time analysis for product has been analyzed. According to this methodology the project work has been done. This product have more customer complaint like overloading problem, impeller rust, coil burning, impeller damage etc. these kind of problems can be solved by developing the QFD.

MohdFairuz and Bin Suliman in 2010 stated, the research started by him is done by identifying the problem statement, specifying the objectives and designing the scopes of work. In order to achieve the objectives of the research, design questionnaire is required. The questionnaire form is distributed to the targeted groups and then collected. The targeted groups of this survey were car drivers and car owners which consists students, lecturers, factory workers and engineers. Data gathering was carried out through survey, questionnaire distribution and structured interview. The questionnaire and the interview did not only deal on the past implementation, but it also focus on the future developments and opportunities. The data collected is analyzed using SPC. Using the survey output and results from the structured questionnaire and some interview, several technical characteristics were listed in the HOQ chart as in the 'How' and 'What' column. The technical characteristics of the product were chosen based on the feedback and advice from expert. Finally discussions, recommendations and conclusions were made by including the expert view.

Biren Prasad in 1998 discussed about a new concept called concurrent function deployment. CFD is based on parallel deployment of several lifecycle like "value plans" in addition to the "quality plan" used in QFD. CFD thus gives rise to integrated templates, called house of values (HOV), which are compared to EHOQ templates. The differences and similarities between QFD and CFD are discussed in his paper.

IV. CONCLUSION

From two to three decade many industries began to formalize the QFD .Due to its effectiveness in product development and quality management, many QFD applications and studies have been reported. Through searching various sources, we have established an admittedly incomplete but hopefully useful QFD reference bank based on which a QFD literature review is conducted in this paper. In particular, we present a short review of QFDs historical development and a categorical analysis of QFDs functional fields, applied industries and methodological development to facilitate the reference needs of QFD researchers and practitioners. We intend to update this literature review in both completeness of coverage and appropriateness of categorization in the future to better serve the QFD field, and hence any provision of QFD related information with the authors would be much welcome and highly appreciated.

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