



## Voice of the customer: Customer satisfaction ratio based analysis

Celestine C. Aguwa\*, Leslie Monplaisir, Ozgu Turgut

Wayne State University, Industrial and Systems Engineering Department, Detroit, MI 48201, United States

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### ABSTRACT

Voice of the customer (VOC) is a critical analysis procedure that provides precise information regarding customer input requirements for a product/service output. The ability to conduct a voice of the customer analysis, which could be gained through direct and indirect questioning, will enable engineers and other decision makers to successfully understand customer needs, wants, perceptions, and preferences. The information obtained from the customers is then translated into critical targets that will be used to ultimately satisfy the customer requirements. During this research project, different forms of customer input, including qualitative and quantitative data, were transformed to a common data format to develop a correlation between design input requirements and product/service outputs. We have developed a new method for measuring customer satisfaction ratio (CSR) by considering the following: mining both textual and quantitative data, multiple design parameters, mapping output on a scale of 0–1, and a decision template for means of measure. Previous measures of CSR fail to incorporate the cost implication of fixing customer complaints/issues; however, we include this important and unique measure in our research. The implication of this research will reduce Things Gone Wrong (TGW's) and engineering development time and will achieve improvements in JD Power ratings, quality perception, marketing tools, and customer satisfaction.

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### 1. Introduction

Increasing competition in global markets has imposed a great deal of pressure on manufacturing and service product designers. Electronic customer management systems have allowed for detailed submission information of customer feedback on services and products. Analysing qualitative customer input to improve design and delivery of services requires a structured robust system. Voice of the customer (VOC) analysis challenges can be attributed to lack of intelligent systems that can interpret and provide conclusive data that empowers leaders to take action. Manufacturing is a sector that can greatly benefit from a detailed VOC analysis. Capturing the needs of customers is a difficult task since customer input is subjective. However, if subjective claims have a high frequency of repetition, this is an issue that needs to be addressed. The methodology developed to analyse customer comments will provide decision makers with a crisp value that can be further evaluated based on the range spectrum under which it falls through use of data mining software and project architecture while taking into account cost parameters.

The objective of this research is to provide an accurate understanding/interpretation of the customer input. Besides, developing a correlation between project output/performance measures to the

design input (customer satisfaction ratio) is another aim of the study while mapping different design parameters for a product/service to voice of the customer. To achieve these goals, it is important to consolidate different forms of customer input (qualitative and quantitative data) into a common crisp data format. In the end, the methodology proposed in this study provides a tool to enable design/service decision makers to achieve the company's desired quality metric outcomes, which is also a good marketing tool.

Fig. 1 shows where the proposed methodology fits in this general design architecture.

Steps and detailed explanation of the entire procedure is presented in the methodology section.

To be competitive in the market, it is imperative that a firm meets its customer's expectations. Poor understanding of customer requirements may have significant negative implications on product design and manufacturing in terms of quality, lead time, and cost-customer satisfaction management (Jiao, 2006). Inconsistencies and miscommunication between the customer needs and design inputs create a wide variety of quality problems, which leads to dissatisfied customers. Customer expectations need to be recognizable in the final product or service features. It is important for companies to have an accurate understanding of customer input requirements and to develop a correlation between their product outputs and precise design inputs obtained from their customers. With the use of VOC analysis, it is possible to prioritize the product outputs that are most important to customers. The

\* Corresponding author. Tel.: +1 248 789 8209; fax: +1 313 577 8833.

E-mail address: [celestine.aguwa@wayne.edu](mailto:celestine.aguwa@wayne.edu) (C.C. Aguwa).

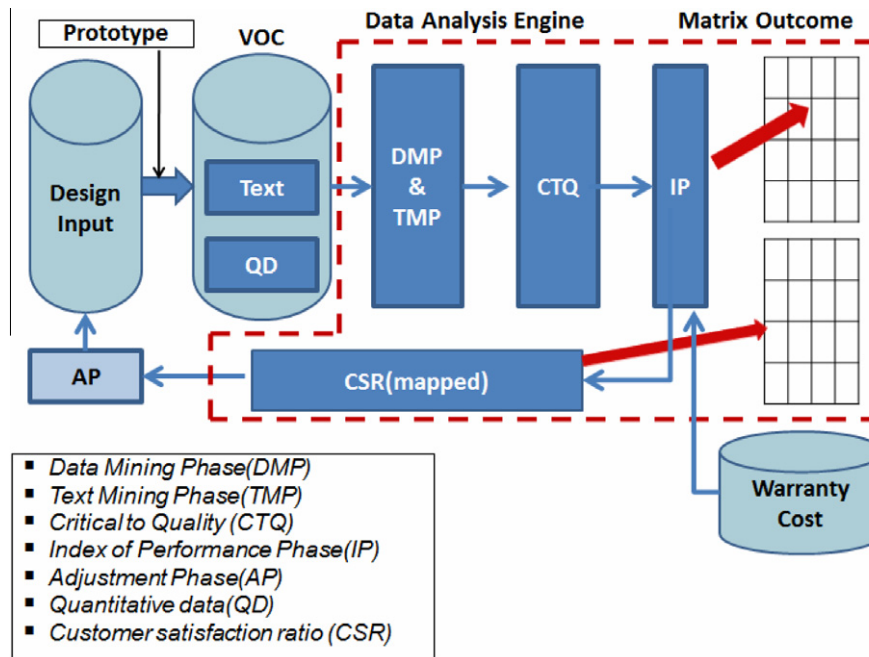


Fig. 1. Project architecture.

decision to provide improved product features depends upon the cost and the feasibility of fulfilling those needs and the importance of those needs to the customer. Once customer requirements are achieved, customer satisfaction and loyalty are attained. Several studies observe and discuss the strong connection between customer satisfaction and loyalty (Boulding, Kalra, Staelin, & Zeithaml, 1993; Sullivan, Anderson, & Mary, 1993).

This research provides a tool that will enable management or design engineers to achieve the desired company quality metric outcomes. In addition, it assists design engineers in identifying product or service design inputs that need further investigation to fully meet and/or exceed customer expectations. To achieve this, we determine a correlation between the customer outputs to the design input, thus the customer satisfaction ratio (CSR) index. The CSR is a measure based on strategic decision making that satisfies both original equipment manufacturer (OEM) and customer wants and is able to evaluate every single design input of the product or service. CSR values are then used to distinguish design inputs of the product that will need further assessment from the design engineers so as to satisfy the customers. Each design input has its own CSR value that ranges from 0 to 1 based on strength of the relationship with the customer's comments. Design inputs equal to 1 will require further investigation while design inputs equal to 0 might need further investigation by the design engineers.

This paper is organized as follows. Section 2 includes related literature about the study. Section 3 explains the methodology in detail and how this research was conducted and developed. Section 4 provides applications of the methodology using data collected from the JD Powers web site as well as VOC analysis results of sample customer data. Finally, Section 5 presents concluding observations and expected future work to expand and improve this research project.

## 2. Literature review

The key idea of capturing and analysing the voice of the customer is to be able to provide vital information for the product development process and understand how the product develop-

ment process works so that the best approach for capturing and analysing the voice of the customer can be accomplished (Yang, 2007). The beginning of research on VOC originated from Parasuraman's research. He mentioned that VOC can be collected from customer's recognition and customer surveys. Since it highly affects the analysis phase he emphasized the importance of the method of collecting VOC (Parasuraman, Zaithaml, & Barry, 1988). Customer feedback is not only vital for design engineers, but also for marketing experts to make targeted interventions to pricing policies (Bradlow, 2010). The Quality Function Deployment (QFD) is a total-quality-management process in which VOC is organized throughout the engineering and manufacturing stages of the product development. For instance, customer wants and needs are linked to design attributes thus encouraging the combined consideration of marketing and engineering concerns (Griffin & De Mast, 1993). The House of Quality (HOQ) is one of the matrices of the QFD. The HOQ is often utilized to understand customer requirements and translate those requirements into the voice of the engineer (Temponi, Yen, & Tiao, 1999). Cooper and Kleinschmidt (1994) explained that building the VOC, as a customer-focused and market-oriented new product effort, was the strong driver of on-time and fast paced product development projects.

Several applications, other than new product design and development in manufacturing, also exist. Chen and Bullington (1993) developed strategic plans for departmental research activities through quality function deployment (QFD), which listened to the VOC and assigned responsibilities to organization members in order to respond effectively to customer needs. Xie (1998) proposed a hybrid system incorporating the QFD, analytic hierarchy process, and fuzzy set theory for the decoding, prioritizing, and inferring of qualitative, vague, or imprecise VOC.

As (Bradlow, 2010) says, it is essential for marketing experts and data mining scientists to collaborate in understanding and responding to VOC data. Two important studies, which combine data mining and VOC analysis, are worth mentioning. First, (Bae, Ha, & Park, 2005) underline the necessity for distilling all kinds of customer comments by organizing them into 5W1H format (who, when, where, what, why, and how). Two types of analysis are proposed by the authors; the first one is one-dimensional

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