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Intelligent service quality management system based on analysis and forecast of VOC

Chong Un Pyon [a,1], Ji Young Woo [b,*], Sang Chan Park [c,2]

[a] Department of Industrial and Systems Engineering, Korea Advanced Institute of Science and Technology (KAIST), 373-1 Kusung-Dong, Yusong-Gu, Daejeon, Republic of Korea
[b] Eller College of Management, The University of Arizona, 1130 E. Helen Street, Tucson, AZ 85721, United States
[c] College of Business Administration, Kyung Hee University, 1 Hoegi-dong, Dongdaemun-gu, Seoul, Republic of Korea

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ABSTRACT

This study suggests the intelligent service quality management system to analyze the causes and effects of VOC (Voice of Customer) variation and to forecast its occurrence based on the former study in the service industry, especially insurance company. In the competitive business environments, where customers are considered as a key success factor of the company, our research will help the company achieve the pro-activeness towards VOC and improve the quality of customer service based on scientific grounds.

The proposed system is designed with three phases: the filtering phase to detect significant variations, the pattern detection phase to generate VOC occurrence patterns, and the VOC forecasting phase. In the filtering step, VOC is calculated and normalized to get rid of apparent exaggeration. In the pattern detection step, internal factors such as product or service qualities are used as sources for generating regular patterns and external factors like sales policy and customer inflow are used as sources for generation of irregular patterns. At the last phase, we forecast VOC based on the pre-defined pattern of VOC occurrence. We evaluate the proposed methodology by applying to the real VOC in a life insurance company.

1. Introduction

The service industry company offers intangible products and services to customers. Intangibility makes the quality of service changeable; service can be varied by agents, economical environments, and even customers themselves. In the service industry under these uncontrollable factors, customer complaints occur more frequently and more diversely than in the manufacturing industry. In today's challenging business environment, VOC is considered to be critical to the business in identifying problems and giving opportunities for all parts of companies. However, companies do not know how to achieve these goals and VOC managers are still locked in the tedious and time consuming data collection and reporting, which fails in improving problems.

In many insurance companies, we found that the studies on the occurrence and variation of VOC depend on the knowledge from experts' experiences not on systematic and scientific method. This extemporaneous approach may derive wrong results and even if the results are correct, these are mere personal know – how not the knowledge stored in the knowledgebase that can be transmitted in the company. Furthermore, they try to find what causes the VOC variation after it has occurred, so it is difficult to confront the VOC occurrence proactively and quickly. For preparing, resolving sudden VOC, and preventing VOC eventually, the company needs an intelligent system that indicates right improvement points and forecasts VOC variation beforehand. With this system, the company will reduce the cost of staffing in dealing VOC and will improve the service quality.

2. Literature review

2.1. Voice of Customer (VOC)

The beginning of researches on VOC has been originated from Paresureman's research. He mentioned that VOC can be collected from customer's recognition and customer surveys, and he emphasized the importance of the method of collecting VOC (Parasuraman, Zeithaml, & Berry, 1988). According to this research, it is important to listen VOC continuously in terms of customers, employees, and latent customers for improving service quality. After people realized the importance of VOC, many researches have been conducted on VOC in respect to reflect customer requirements from VOC to new product development or from the conceptual design to manufacturing. They proposed to use VOC as input to Quality Function Deployment (QFD) for formalizing the process of listening to the customer. (Chen & Bullington, 1993; Chen, Khoo, &

* Corresponding author. Tel.: +1 520 370 3309.
E-mail addresses: pcu@kaist.ac.kr (C.U. Pyon), jywoo@email.arizona.edu (J.Y. Woo), sangchan@khu.ac.kr (S.C. Park).
[1] Tel.: +82 42 350 5920.
[2] Tel.: +82 2 961 0494; fax: +82 2 961 0515.

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Yan, 2002; Cristiano, Liker, & White, 2000; Fornell & Wernerfelt, 1987; Griffin & Hauser, 1998; Haar, Kemp, & Omta, 2001; Hongen & Xianwei, 1996; Matzler & Hinterhuber, 1998; Mazur, 2003; Parasuraman et al., 1988) Griffin and Hauser (1998) has described common techniques used to identify, structure, and provide priorities for the customer needs with QFD approach. This paper defines VOC and examines characteristics of VOC.

Recently, the research focus has moved to on-line businesses. Cho, Im, Hiltz, and Fjermestad (2002) proposed that handling VOC, especially customer complaints should be included as a key component of e-CRM. Also, he analyzed common customer complaint types and suggested implications for e-business service centers. Coussement and Poel (2008) introduced a methodology to improve customer complaint-handling strategies through an automatic email-classification system that distinguishes complaints from non-complaints.

The former researches addressed the importance of VOC (Bougie, Pieters, & Zeelenberg, 2003; Tax & Brown, 1998; Tax, Brown, & Chandrashekaran, 1998) and applied VOC to product development and improvement. They built the cornerstone of VOC research, but they did not fulfill current requirements of companies, which are listening enormous VOC. Now, we need a research that introduces an intelligent decision support system which can handle raw data, analyze, and derive key improvement point from VOC. However, we hardly find research papers that satisfy these requirements. Bae, Ha, and Park (2005) proposed the model for analyzing VOC using conventional statistics and data mining techniques. Through the one-dimensional analysis, the model derives patterns of each complaint and discovers problematic areas where customer complaints occur. He suggested the two dimensional analysis that makes it possible to pinpoint relationships among problems. Pyon, Bae, Woo, and Park (2005) researched VOC as data source for Business Process Management in service industry. She suggested the VOC analysis model that consists of four phases; entity construction, summary, exception, and comparison. She adopted the Family of Measurements concept from USAA's case (McDermott, 1991) for VOC summary.

2.2. VOC forecasting

Most of researches on VOC forecasting have been performed to model call arriving and forecast incoming calls. These researches are data view not a quality view, so they focus on call arriving and forecasting its occurrence. Even though they have shortcomings in deriving the improvement points and implications for businesses, they enrich ideas on VOC analysis and forecast.

The reviews on some outstanding researches on VOC modeling and forecasting are followings. Many models use queuing–theoretic models such as M/M/N queue and Erlang-C. Shen and Huang (2005) used a singular vector decomposition (SVD) for analyzing and modeling call center arriving data. The proposed model extracts inter-day features and inter-day features and builds vector component in modeling. Also, they proposed a short term forecasting, which is multiplicative with a time-series component that depends on day of the week. It has a contribution that applies the matrix algebra method to call center newly, but they exclude other anomalies. The most prevailing method for call forecasting is ARIMA model, and researchers use this method to compare the accuracy of new models. Antipov and Meade (2002) proposed a forecasting model reflecting calendar effects, within the week and within the year. After the calendar effects have been estimated, they reflect advertising effects to call occurrences using multiplicative seasonal-ARMIA. This research has similarities to our research in respect that influencing factors are reflected on time-series forecasting. Tych, Pedregal, Young, and Davies (2002) proposed an unobserved components model based on an enhanced version of the Dynamic Harmonic Regression model. The model generates adaptive forecasts of hourly phone calls. Bianchi, Jarrett, and Hanumara (1993) suggested an additive and multiplicative version of Holt-Winters exponentially weighted moving average models to forecast calls in telemarketing centers. Avramidis, Deslauriers, and L'Ecuyer (2004) developed a stochastic model of time-dependent arrivals. The proposed model concerns with a variance larger than the mean, a time-varying arrival intensity.

In these researches, time-series models and cause and effect models are usually used. Cause and effect models consider mainly time dependence factor such as seasonal factor, inter-daily dependence, and intra-daily dependence. Regression models are also popular because they are built based on time-series and reflect cause and effect relationship. Recently, neural network models are considered to improve the forecasting accuracy, but they have shortcomings hardly to be understood.

Let alone the aforementioned time-dependent anomalies in the reviews, event-driven anomaly should be considered. Call center managers have a good sense of event-driven anomaly by their past experience, so we can utilize their knowledge on event effects when build the VOC forecasting model.

3. Intelligent VOC analysis and forecasting system

The voice of customer is what customers appeal to the company in forms of complement, proposal, consulting, complaint, and civil appeal. The civil appeal is delivered to the company from the external authority. Other kinds of VOC are collected through customer contact centers such as call centers, web sites, and direct channels. Among five VOCs, this research focuses on the complaint and civil appeal. To transform VOC which is live text or voice of customers into data and information, we need analysis dimensions, which can be customer information, product information, regional information, and the VOC code.

The VOC code addresses species of VOC and forms a hierarchy with three or four layers in general. For example, the service industry company can set the first level VOC code as service operation processes of Access, Registration, Diagnosis, Exploration, Maintenance, Payment, After Service, and Return to Community (see Fig. 1).

3.1. Causes of VOC increase/decrease

VOC can increase as the number of contracts increases. The second cause can be examined in other factors which defines VOC like the product, region or customer. In the case that the VOC increase in a product and the VOC increase in a region are related each other, they happen together or happen with a time gap. The second cause finds itself within a specific factor, but the third cause finds itself in other factors. These three causes are used to filter significant VOC variation.

After filtering the significant VOC variation, influencing factors of the VOC occurrence are derived to detect regular and irregular patterns. We consider only the two external factors which the insurance company can react to. Economics or government policies cannot be controlled for one company and also the service channel is hard to control. To detect the change on VOC occurrence by customers, we take contract variables as customer variables, which are set up when customers take a contract as customer behaviors. According to many researches, demographics or socioeconomics variables are not discriminate for customer needs, but behavioral preference are discriminate.

3.2. VOC analysis

The VOC analysis is unfolded according to the significance and complexness of VOC. The VOC analysis begins with the analysis