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ABSTRACT

Although repurchase intention and customer satisfaction have attracted a lot of attention in service management research, relatively few studies have discussed the impact of waiting time on repurchase frequency. In this study, we investigate the effect of waiting time and other service quality factors on customer satisfaction and repurchase frequency. Using the Generalized Linear Model as a tool, a Return Frequency Model was developed to describe the relationship between number of return visits in certain time period and the waiting time and different service factors in the fast food service setting. Using Polytomous Logistic Regression, an Overall Satisfaction Model was developed to demonstrate the relationship between customer's overall satisfaction level, waiting time and service quality.

1. INTRODUCTION

Service quality has become a very popular topic among practitioners and academic researchers. Improving service quality has become one of the most important strategies for a service provider to differentiate themselves from their competitors and thus position them selves more effectively in the marketplace [4]. Rust & Oliver (1994) suggested that quality is one dimension on which satisfaction is based. Service quality is viewed as an antecedent to satisfaction.

In previous research, it was suggested that waiting time significantly influence customer satisfaction [7]. Customer waiting time for services typically represents the first interaction between customers and most service delivery processes, so the importance of properly managing waiting times is of significant interests to most service operations. Waiting for a service is a pervasive and often unavoidable experience for customers and appears to be a strong determinant of overall satisfaction with the service and customer loyalty [28] [32] [33] [12]. As the standard of living in many countries increases, the value of customers' time also increases; therefore, the speed of service has been shown to provide a firm with a competitive advantage in the marketplace.

In marketing literature, return or repurchase is a consequence of satisfaction. The importance of customer satisfaction in relation to return rates in the hospitality field has long been noted. Therefore, the link between satisfaction and the long-term retention of customers is typically formulated by marketing practitioners and scholars, and is treated as the starting point, rather than the core question of the analysis.

The phenomenon that has been discussed above is especially significant for fast food service operations. People who visit fast food outlets mainly do so because they are in a hurry for their meals. Therefore, their waiting time as well as some essential customer satisfaction factors such as

cleanliness of the restaurant and the staffs' attitude to service are believed to be important determinants as to whether the customers will revisit the restaurant or not. This will directly affect the profit of the operations. As a consequence, fast food service is a typical industry in which people are interested in investigating the determinants for overall customer satisfaction and repurchase behavior. A service manager needs to understand the form of these relationships, so that they can apply suitable methods for improvement.

In other previous research, statistical methods such as Linear Regression, Factor Analysis and LISREL have been used to identify the underlying service factors affecting customer satisfaction and customers' numbers of return visits. The important factors that have been found in fast food operations so far include cleanliness of the restaurants, freshness of the food, speed of service, service attitude employees, food price and convenience of location, etc.

Although many publications provide a theoretical basis for studying the waiting time, consumer satisfaction and return frequency, they have failed to investigate the relationship between waiting time and the return frequency directly for a defined length of period. The aim of this study is to investigate the impact of waiting time and other service quality factors on customer satisfaction and return frequency in the fast food industry. Using the Generalized Linear Model as a tool, a Return Frequency Model was build with data collected from students at the City University of Hong Kong. This model will describe the relationship between the number of return visits in certain time period, waiting time and other service quality factors. Using Polytomous Logistic Regression techniques, an Overall Satisfaction Model was also built. The model describes the Relationship between the customer's overall satisfaction level, the waiting time and other service quality factors.

2. THEORETICAL MODELS

2.1 Return Frequency Model

A generalized linear model (GLM) is used to study the relationship between the waiting time and the repurchase frequency in fast food operation. Ehrenberg (1998) suggested that the probability of a customer making r purchases with a long-run mean purchasing frequency μ in a given time-period is given by the Poisson distribution

$$f(r) = e^{-\mu}\mu^r / r! \qquad (2.1)$$

In a single period of time length T, the mean number of return visits μ is supposed to have the following inversely proportional relationship with the waiting time (w).

$$m = \frac{T}{aw + bX + c} \qquad (2.2)$$

where
a is the parameter of waiting time w
b is the parameters of other service factors vector X
c is the constant

As a result, the probability of the number of return visits r given the waiting time w in a period of length T is given by:

$$f(r/w) = e^{-(T/aw+bx+c)} [T/(aw+bx+c)]^r / r! \qquad (2.3)$$

Since this probability function is a member of exponential family, the concept of GLM is adopted in order to estimate the parameters and find the significant factors affecting the number of returns.

In this study, the log likelihood function of the response variable (number of return visits) with Poisson distribution is

$$l(m, y) = \Sigma(y_i \log m_i - m_i) \quad \text{for } y=0,1,2\ldots. \qquad (2.4)$$

Alternatively, b_j can be found by minimizing the deviance function

$$D(y ; m) = 2l (y , y)-2l (m,y)$$
$$= 2 S \{ y_i \log (y_i / m_i) – (y_i - m_i) \} \qquad (2.5)$$

where $\mu_i = \exp \eta_i = \exp \sum_{j=1}^{p} \beta_j x_{ij}$

2.2 Overall Satisfaction Model

Polytomous logistic regression (PLR) is used to quantify the categorical measurement of overall satisfaction.

Logistic regression is frequently used to model the relationship between a dichotomous response variable and a set of predictor variables. It is common that the response variable may have more than two levels. PLR is a method that can examine the relationship between a nominal level dependent variable with multiple categories and independent variables that are dichotomous or continuous.

For a response variable with T+1 categories, denote by d (d=0, …, T) the category and by $x' = (x_1, \ldots x_p)$ the vector of covariates (x' denotes the transpose of x). Let Z_{di} be an indicator variable which equals to 1 if the ith case is in the dth category and 0 otherwise, i=1,…,n where n is the sample size. Denote by P_{di} the conditional probability
$P_{di}=P[Z_{di}=1|x_i], \quad d=0,\ldots T$

Therefore,

$$P_{di}=\exp(x_i'\beta_d) / \{\sum_{t=0}^{T} \exp(x'_i\beta_t)\} \qquad (2.6)$$

where β_t are vectors of unknown parameters. For uniqueness, it is common to define β_o=0. This category is referred to as the baseline or reference category. Thus, according to the equation.

$$\log(P_{di}/P_{oi})=x'_i\beta_d \qquad (2.7)$$

The maximum likelihood estimate $\hat{\beta} = (\hat{\beta}_1', \ldots, \hat{\beta}_T')$ are obtained by solving pxT nonlinear equations.

The set of nonlinear equations can then be solved numerically by the Newton Raphson Method.

In order to interpret the results for the PLR, the proportional odds model is used. Moreover, it is easier to investigate by focusing on the *Cumulative Logit*.

Log [prob (Y≤k)/ prob (Y>k)] =
$a_{k=1} + b_{k=2} + c_{k=3} + \ldots\ldots + \alpha A + \beta B + \gamma C + \delta D \ldots$ (2.8)

where
Y = the response variable
k = number of levels of the dependent variable
a, b, c, α, β, γ, δ ...= parameters of the independent variables
A, B, C, D= the level of each independent variables where they are converted to 0-1 indicator variables

3. RESULTS AND CONCLUSIONS

A two-phase survey was carried out to test the return frequency model and the customer satisfaction model show above. The results indicate that waiting time and other service factors such as the staffs' attitude, price of food, seat availability and quality of food significantly influence the customers' return frequency. Results also show that waiting time, the staffs' attitude, food quality, variety of food and the environment of the fast food outlets significantly affect customer satisfaction. However, the significance of the relationship depends on the time period of the visits.

These models help managers to identify the significant factor that influence customer's satisfaction and return frequency in the fast food industry. Managers should try to improve the customer satisfaction by focusing on the factors identified.

This paper makes significant contribution to the service management literature by formulating and validating the Return Frequency Model and the Overall Satisfaction Model.

(Note: References and full papers are available from the authors upon request)