May. 2015. Vol. 6, No.1 ISSN 2305-1493
International Journal of Scientific Knowledge
Computing and Information Technology

www.ijsk.org/ijsk

REPURCHASE INTENTION PREDICTION MODEL BASED ON PWOM/NWOM EFFECT AND MECHANISTIC/ORGANIC RECOVERY CONSIDERATIONS BY USING BPNN TECHNIQUE

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ABSTRACT

The service failures occur because the service can not be delivered well as the customer's expectation, and it will lead customer's complaints. That is, the customer's complains will be happened along with the service failure. How to effectively rectify a service delivery failure via a service recovery will be an important consideration during the competitive and dynamic environment. The service recovery can be divided into mechanistic (e.g. the guidelines) and organic (e.g. favorable internal environment) service recovery. Besides, the intersection structure between the mechanistic and organic recovery will significantly exist and it will have effect on repurchase intention. And, customers' repurchase intention will be also affected via WOM effect, especial for positive WOM (PWOM) and Negative WOM (NWOM). Therefore, how to address the possible non-linear correlation among mechanistic/organic recovery and PWOM/NWOM effect and repurchase intention will be an important consideration to managers' decision-making. In this study, a modeling approach by using backpropagation neural networks (BPNN) technique is proposed to achieve such non-linear modeling. Besides, an illustrative example owing to leisure industry at Taiwan is applied to demonstrate the rationality and feasibility of the proposed approach.

Keywords: Service Recovery, PWOM/NWOM, Repurchase, Backpropagation Neural Networks (BPNN)

1. INTRODUCTION

As we known, a good customer's service should create a value proposition to exceed consumers' expectations. Meeting customers' expectations and needs had been viewed as the basic requirement for most enterprises. When the service was not delivered well as the customer's original plan or expectation, service failure will arises. Generally, most enterprises will make more efforts to intend to handle with those possible service failures. Service recovery became an important activity for most enterprises to handle the cutomers' service failures. Homburg & Furst (2005) had mentioned that the suitable mechanisms to deal with customers' complaints can be divided into the mechanistic and organic approach. Such logistic thinking can be extended to service recovery. Although customer service and service recovery are inseparable, they can be regarded as two sides of a coin for most enterprises (Sousa & Voss, 2009) and they will have effect on the repurchase intention evaluation. The importance of developing a mutually beneficial ongoing buyer-seller relationship has been emphasized in relating studies (Crosby, Evans & Cowles, 1990; Dwyer, Schurr & Oh, 1987; Gwinner, Gremler & Bitner, 1998; Gundlach, Achrol & Mentzer, 1995). When service is not delivered as consumer's expectations, the negative disconfirmation will prompt dissatisfied customers to exhibit multiple options, namely exit, voice, and loyalty (Hirschman, 1970). Complaints can offer service providers' chances to rectify the problems and complaints may positively influence subsequent consumer behavior (Colgate & Norris, 2001; Blodgett, Hill & Tax, 1997). The previous study had observed that if customers are satisfied with the complaints handling, dissatisfaction can be reduced and the probability of repurchase may be increased (Gilly, 1987). Furthermore, Tax et al. (1998) also mentioned the effective complaint handling may have a dramatic impact on customer retention rate, deflect the spread of negative word-of-mouth (NWOM), and improve profitability. Understanding the impact of each dimension of justice on post-complaint evaluations should allow enterprise's manager to develop more effective and cost-efficient methods of resolving conflicts. Then, higher levels of customer retention as well as higher profits can also be achieved (Blodgett et al., 1997). Service recovery can help enterprises developing a long-term relationship

with consumers. Except for the conventional mechanistic service recovery based on the organizational guidelines will be performed well, the organic service recovery based on the rewards or training system can enhance the service efficiency. The customer satisfaction and re-purchase intention can be enhanced or improved via taking the necessary and optimum service recovery and the evaluation of positive WOM (PWOM) and NWOM. Such process can be viewed as a learning model from the viewpoint of system. And, it denoted a dynamic characteristic during the competitive environment. From those previous relating studies, we can recognize that a possible relationship among the service recovery, re-purchase intention and WOM effect may exist (Lee, 2009; Kambiz & Ronak, 2010; Mohammad & Muslim, 2010). Hence, how to model the complicate correlations among the service recovery, the evaluation of PWOM/NWOM and the consumers' repurchase intention other worthy issue to be addressed, especially for the possible non-linear correlation consideration. Restated, it will be an important core action for the construction of the service dynamic learning model. Such model will aid the managers making the necessary decision about their service management during the dynamic and competitive environment.

2. LITERATURE REVIEW

2.1 Service failure

Almost enterprises should aim to offer zero defects service, but some service failures are inevitable. When the service was not delivered well as the customer's original plan or expectation, service failure will arises. And then, the customer's complains will be also happened along with the service failures. Bitner et al. (1990) had used the critical incident technique to identify a service failure classification model which has been widely adopted by other researchers (Kelley et al., 1993; Hoffman et al., 1995; Hoffman & Kelley, 2000). Understanding the type of service failure that has occurred can be reviewed as an important activity to choose an appropriate recovery strategy and to develop future policies. When service failures arise from employee actions and personnel behavior, the appropriate service recovery might be the focus on to those first-line managers.

2.2 Service recovery

Service recovery can be defined as those actions taken by an organization in response to a service failure (Grönroos, 1990). The aim of service recovery is to change customers' dissatisfaction to satisfaction (Bell, 1994) and keep the customers' retention (Miller et al., 2000). Management should support service recovery in the organization, since poor or ineffective service recovery implies that the customer is let down for a second time. And it will result in customers spreading negative word-of-mouth communication, defecting from the organization for a competitor (Lewis & McCann, 2004), or rating organizations lower than they would have immediately after experiencing the failure (Maxham, 2001). Despite the possible consequences of a service failure, the outcome does not necessarily have to be negative. Magnini, Ford, Markowski and Honeycutt (2007) and Ngai, Heung, Wong and Chan (2007) suggest that an effective service recovery could result in a win–win situation for the customer and the organization. Torres and Kline (2006) explain that well-executed service recovery could enhance customer satisfaction and loyalty; may have a direct influence on whether dissatisfied customers remain with or defect from an organisation (Yuksel, Kilinc & Yuksel, 2006); and could also lead to a higher level of satisfaction than the customer would have experienced if the service failure had not occurred (Schoefer, 2008).

A number of strategies that organizations can implement to achieve successful service recovery including to recover the service failure immediately or offer customers alternative options that will meet their requirements; communicate with customers who are experiencing service failures, e.g. providing feedback and offering an explanation for the reasons for the service failure; and ensure that service recovery personnel are professional in their actions (La & Kandampully, 2004). Organizations should also provide an apology for the service failure and consider presenting customers with some form of tangible compensation, for example, e.g., offering discounts or vouchers (Mattila & Cranage, 2005). Since the success of the service recovery will largely rest on the actions, decision-making skills and judgement of employees, Magnini et al. (2007) recommend that employees must be trained and empowered to deal with the service failure effectively. Magnini and Ford (2004) suggest that service recovery training should include that assuring customers who have experienced a service failure; managing employees' emotional response to these

customers; employee empowerment; and paying attention to how employee satisfaction can be enhanced through effective service recovery.

2.3 Mechanistic and Organic Recovery

Homburg & Furst (2005) had mentioned that the suitable mechanisms to deal with customers' complaints can be divided into the mechanistic and organic approach. Herein, the mechanistic approach denotes that the employee will deal with the customers' complaints depending on guidlines for efficiently and rapidly completing the necessary tasks. And, the organic approach will create a favourable internal environment via the rewards mechanism or organizational supports to aid dealing with the customers' complaints. Although Homburg & Furst (2005) is originally focused on customers' complaints, it can be also extended to the issues about the service recovery. Smith et al. (2010) pointed out that a formal service recovery, including the relating guidelines or strategies followed by the frontline employee, can aid employee to efficiently deal with the service failures. Chong & Ma (2010) also mentioned that the suitable behaviors and outcome guidelines can enhance the employees' self-efficacy. Gonzalez et al. (2010) found out that the recovery efficacy can be enhanced well since the service recovery mechanism providing the guidelines under dealing with the service failures. Hence, the service recovery will be constructed including the procedure, behavior and the replenishment guideline since service failures happened. If the service recovery can work well, the customers' satisfaction degree can be kept and the repurchase intention can be enhanced.

Although the mechanistic service recovery can improve the problem-solving efficiency for those employee based on organizational guideline (e.g. SOP), the service recovery procedure still exist uncontrolled variation. In order to reduce the possible effect from those variations among the service recovery, the operating attitude and the reactive capability of the frontline employee will be an important consideration. Besides, the SOP of the mechanistic recovery can not cover all detailed recovery process. It still needs the organic service recovery to construct the favorable internal environment. And it will ensure the service recovery to be efficiently implemented. Herein, the organic service recovery can be divided into reward and training systems. The reward system can enhance the employees' job motivation and the training system can improve the employees' problem-solving capability. After reviewing those relating literatures, the complicate relationship between the mechanistic and organic recovery significantly exist. And, it will have the directly affection to repurchase intention of customers. Therefore, incorporating the intersection between mechanistic and organic service recovery into the intention analysis will be a worthy issue to be studied.

2.4 PWOM/NWOM

Word of mouth (WOM) can be divided into positive WOM (PWOM) and negative WOM (NWOM). Evidence that negative information has more impact on attitude or belief than positive information (Anderson 1965, Arndt 1967, Fiske 1980, Mittal, Ross and Baldasare 1998, Mizerski 1982). Fiske (1980) showed that negative information could have more effect on attention time than positive information. Arndt showed more effect of NWOM than PWOM on brand purchase. Arndt's research involved a new brand in a frequently purchased food category; he found that NWOM reduced sales of the food product more than twice as much as PWOM increased the sales of the product. Ahluwalia (2002) has questioned the strong effect of NWOM on brand decisions. Alhuwalia's method is to measure the attitudinal changes of people exposed to positive and negative information under experimental conditions. Herr et al. (1991) and Laczniak et al. (2001) also use attitudinal measures in their experiments. Such experiments show how information is processed but do not tell us whether these processes have an effect on choice behaviour in everyday settings. After reviewing those literatures, PWOM and NWPM had recognized to have significantly effect on purchase evaluation and they should be incorporates during performing the purchase intention modelling.

2.5 Backpropagation neural networks (BPNN)

A neural network is known as a computational algorithm which consists of a number of simple, highly interconnected processing elements (PE) (NeuralWare, 1990). It had been employed into many applications (Rumelhart et al., 1986; Ko et al., 1998; Sanjay et al., 2005; Mandal & Roy, 2006; Chen et al., 2007; Vassilopoulos et al., 2007; Barletta et al., 2007; Hsieh, 2009; Hsieh, 2010), especially for the modeling issue about non-linear relationship between

input and output for a complicate system. The perceptron, backpropagation neural network (BPNN), learning vector quantization (LVQ), counter propagation network (CPN) has regarded as the conventional supervised learning neural models (Ko et al., 1998; Neural Ware, 1990; Hsieh, 2001; Hsieh, 2006). Basically, a BPNN consists of three or more layers, including an input layer, one or more hidden layers, and an output layer. The backpropagation learning algorithm employs a gradient- or steepest-heuristic (Rumelhart, Hinton and Williams, 1986) that enables a network to self organize in such ways that improve its performance over time. In training this type of network, an input pattern is presented and the network adjusts the set of weights in all the connecting links such that the desired output is obtained at the output node. The output generated by the network is compared to the known target value. If there is no difference, no learning takes place. If a difference exists, the resulting error term is propagated back through the network, using a gradient- or steepest- descent heuristic to minimize the error term by adjusting the connection weights. The overall training process for the network using the gradient descent technique can be referred to the relating literatures (Rumelhart, Hinton and Williams, 1986; NeuralWare, 1990).

3. THE PROPOSED APPROACH

From previous literature reviewing, the complicated relationship must exist among those considered factors including the evaluation of PWOM/NWOM, the evaluation of mechanistic and organic service recoveries and the repurchase intention. Such relationship can not be described well by taking the viewpoint of linear structure. That is, the non-linear modelling should be taken into consideration. As we known, the BPNN with the capabilities of parallel computation and the feature of fault tolerance had been used to resolve non-linear modeling problems under many real applications, e.g. the manufacturing process, quality optimization and economic prediction and so on. Figure 1 is the architecture of the proposed prediction model by using BPNN technique. The detailed procedure will be given as follows:

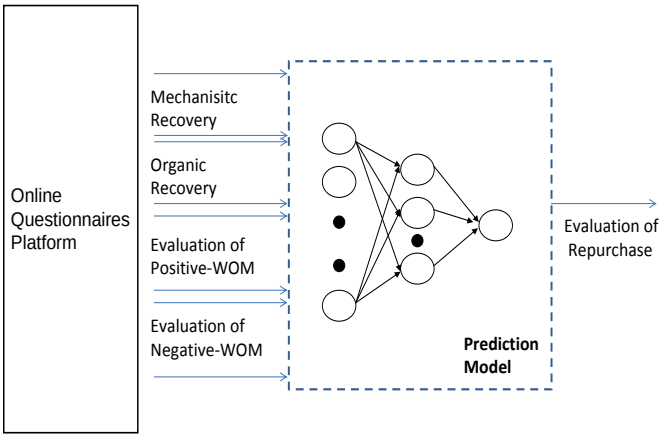

Figure 1. The architecture diagram for the proposed model.

Step 1. Collect the data via an on-line questionnaire platform.

Four primary parts will be designed in the questionnaire including (1) the evaluation of PWOM and NWOM effect, (2) the evaluation of mechanistic service recovery, (3) the evaluation of organic service recovery, (4) the evaluation of repurchase. Herein, there are sixteen items to be considered to denote the evaluation of mechanistic service recovery, and ten items are considered to denote the evaluation of organic service recovery. As for the evaluation of PWOM/NWOM, we separately take four items to evaluate it. The Likert five scale (i.e., the larger value denote a higher expectation or higher evaluation) will be used to achieve the evaluation.

Step 2. Constructing the predicted model of service recovery.

1-1 Randomly take around one-fourth from the experimental data or historical data to form the testing set of BPNN. The remaining parts of the experimental data forms the training set of BPNN.

1-2 The evaluation of mechanistic service failure, the evaluation of organic service failure, the evaluation of PWOM, the evaluation NWOM/the evaluation of repurchase intention will be taken as the input/output of the first BPNN. Those signals can obtain from the questionnaire platform.

1-3 Test several different architectures (e.g., the number of PEs in the input layer-the hidden layer-output layer, the learning rate, the learning rule, the

momentum, etc) of BPNN by using the training set and testing set chosen in Step 1-1. The root mean square error (RMSE) (NeuralWare, 1990; Su and Miao, 1998) of the training and testing data for each architecture can be utilized as the criterion in determining the best BPNN architecture. A pre-determined training epoch can be regarded as the stopping criteria of training process (NeuralWare, 1990). The best architecture can simultaneously minimize the RMSEs of the training set and testing set in Step 1-1.

1-4 Combine the training set and testing set chosen in Step 1-1 into a final training set. Restated, assign all historical manufacturing data as the training set. Retrain the best BPNN chosen from Step 1-3 until the best BPNN's architecture reaches the pre-determined training epoch.

4. ILLUSTRATIVE EXAMPLE

In order to verify the rationality and feasibility of proposed model, we take an illustrative example owing to the leisure industry at Taiwan to demonstrate it. In this study, a leisure enterprise manager would like to obtain the relating information about the customers' repurchase intention to aid enhancing their service quality. Hence, a project team including several senior managers was assigned and the proposed procedure will be used to deal with such problem. The detailed procedure of model construction will be described well as follows:

Step 1. The data were collected via an on-line questionnaire platform from 2014/07 to 2014/12. About one hundred and sixty respondents had collected from the on-line questionnaire platform. Screening out the collected respondents' information, the age range is about 18~64 years old, the income range is about NT 25000~90000 for one month, the ratio of man/women is about 92/68.

Step 2. In order to construct the service recovery estimation model, sixteen evaluations of the mechanistic service recovery, the ten evaluations of the organic service recovery, the four evaluation of PWOM, the four evaluations of NWOM and the one evaluation of repurchase intention will be taken as the input/output of the BPNN model. Herein, the learning rule is set as delta-bar-delta rule, earning rate is set as 0.1, the momentum is set as 0.8, the learning epochs are set as 10000 according to the previous random trails. Next, the root of mean square error (RMSE) of training and testing will be regarded as the criteria to determine the optimum BPNN architecture (with the minimum training and testing RMSE values), i.e. the number of PEs in the hidden layer. Forty respondents are randomly selected as the testing samples. It will lead the ratio of testing samples/training samples to be close to 1/4 (NeuralWare, 1990; Hsieh, 2009; Hsieh, 2010). Depending on different architectures of BPNN, the optimum architecture with the minimum training RMSE value and testing RMSE value at the same time can be determined as 34-21-1 in Table 1.

Table 1. The comparison results of the training/testing RMSE for the estimation model.

Architecture	Training RMSE	Testing RMSE	decision
34-12-1	0.3687	0.4895	
34-15-1	0.3122	0.4276	
34-18-1	0.2783	0.3628	
34-21-1	0.2136	0.3014	*
34-24-1	0.1845	0.3389	
34-27-1	0.1692	0.3918	

After constructing the repurchase prediction model, an innovative web service is provided to leisure managers. The frontline mangers can login the platform to obtain the relating information about the customers' repurchase prediction. For example, one traveling member made a complaint about the service failure for waiter service during their traveling tours; the frontline employee had chosen the suitable service recovery to him. The manager also asked customer to login the questionnaire platform to perform the evaluation. Then, the manager can send the customer's information about the PWOM/NWOM and mechanistic/organic to the constructed prediction model. The predicted repurchase intention can be then obtained as 3.85. According to the obtained result, the expected evaluation of repurchase significantly exceeds 3. The manager can make the necessary discussion with the frontline employee for the issue about choice of the service recovery. And, it can be recorded as a successful case about customer's service recovery.

5. CONCLUDING REMARKS

To the possible service failures at service contact point during the customer-centric competitive environment, most consumers will lead to complains. The enterprises will choose service recovery to those failures. The satisfaction, repurchase intention of consumers will be significantly affected by the choice

of mechanistic and organic service recoveries, the effect of PWOM and NWOM. If the enterprise's manager chooses an optimum or suitable service recovery and the repurchase of consumers can be kept or enhanced. The repurchase intention may be reduced when enterprise's manager chooses an unsuitable service recovery. The complaints handling (or service recovery) can be viewed as the second marketing activity for enterprises. How to effectively and efficiently choose the service recovery will be an important work to those managers. Restated, if the managers can obtain the recommended possibility for service recoveries, it will aid managers into making their decision about complaints handling. Including those characteristics into the model will be the first purpose of this study. Two contributions to management implication can be summarized as follows:

(1) The complicate non-linear correlations among mechanistic and organic service recovery, repurchase and PWOM/NWOM effect will be modeled well. Managers can apply it into obtaining the estimation about consumer's repurchase intentions. That is, a learning characteristic during competitive environment can be mentioned.

(2) The retraining capability of BPNN will lead those managers to dynamically adjust the BPNN architecture depend on their real requirements. Because the records will be gradually increased, managers can update and remodel BPNN to be a robust architecture depending on their real requirements. That is, a dynamic characteristic during competitive environment can be mentioned.

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