

Development of Customer Value Model for Healthcare Services

Wan-I Lee¹ and Bih-Yaw Shih²

¹Department of Marketing and Distribution Management, National Kaohsiung First, University of Science and Technology, Taiwan, ROC, wile@ccms.nkfust.edu.tw

²Department of Computer Science, National PingTung University of Education, Taiwan, ROC, Byshih@mail.npue.edu.tw

Abstract

The economic and the living standard have been improved dramatically in Taiwan over the last decade. People become more health conscious and demand for high quality healthcare service consequentially. Due to the conduction of National Health Insurance and its improved policy of insurance payment, competition of healthcare service becomes fiercer day by day.

The purpose of the current study is to develop a customer value model which provides insight into the customer's value for healthcare institute managers.

Keywords: Customer Value Model, Healthcare Institute, Customer Value, Customer Attribute

1. Introduction

The economic and living quality of Taiwan has improved dramatically in last decade. People become more health conscious and demand high quality healthcare service consequentially. Due to the conduction of National Health Insurance (NHI) and its revised policy of insurance payment, competition of healthcare service becomes fiercer day by day.

Facing the competitive and complex healthcare environment, how to understand your customer has become a popular topic in related researches (Lorden, et al., 2008; Orzano, et al., 2008; Suter, et al., 2007; Ryan & Sysko, 2007; Weng, 2006; Zeithaml, et al., 2006; Corbin, et al., 2001; Kaldenberg, 2001). Every marketing professional in healthcare knows that the most influential form of advertising for physician and hospital services is word of mouth (Beckham, 2001). How do managers of healthcare institutes determine what patients want (of new products/services)? Why the patient chose to come rather than another? Managers should care not only medical effect but also customer value in order to meet his/her special needs to retain customers and earn their loyalty (Hippel & Katz, 2002). One way to attract and retain customers is to ensure customer satisfaction. The managers need to be more aggressive to set up a plan, which may stand by customer perspective in order to research customers' needs, attract customers and win contracts. Identifying and sustaining a customer's value to build a value model is one of the best ways to invest in valuable customers.

Calculating the expected future value of the customer base under alternative scenarios and selecting the scenario with the most risk/return profile can be used to evaluate a wide range of investment opportunities (Rust et. al., 2004). Therefore, how to arrange the resource in order to

construct a dynamic attribute value model for healthcare service is important. Yet, there is a dearth of research into the process by which practitioners identify customer's values of healthcare institutes. The purpose of the research is to develop a customer value model which provides insight into the customer's value for healthcare institute managers.

2. Literature Review

Customer value

Hilliard (1950) defined customer value as an interactive relativistic preference experience which refers to the evaluation of some objective by some customers. The objectives include any product, a service, a manufactured good, and a social cause and so on. Holbrook (1996) defined three key dimensions of consumer value: self-oriented, reactive and extrinsic. However, Oliver (1996) pointed out that Holbrook did not mentioned satisfaction in the typology and he noted six presentations of satisfaction and value. Oliver (1997) reported that quality is an important input issue to satisfaction through the comparison of performance to valued standards. Qualities enhance satisfaction and value, which provides additional satisfaction, the satisfaction deriving from quality and then from value as shown in Figure 1.

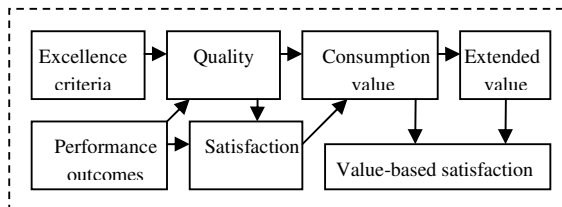


Figure 1 Value concepts in consumption

Zeithaml(1988) utilized five factors to model a positive value function as shown in equation (1), including quality, functionality(extrinsic attribute), pleasure(intrinsic attribute), personal values and perceived sacrifice (monetary outlays and non-monetary costs), where value is a positive function of what is received and a negative function of what is sacrificed.

$$\text{Value} = f(\text{Receipts/Sacrifices}) \dots\dots\dots (1)$$

Theoretical Customer Value Calculations

Keeney (1999, 2001) refers to his “how do you build model of values” by using qualitative method and classifies the qualitative modeling of values into four steps: Develop a list of values, Convert each value that obtains from customers to an objective, Structure objectives, Specifying measures for the objectives.

Combining the attributes

A value model is defined as a function U, often just referred to as an objective function which assigns to each consequence x, a number U(x) for reflecting the relative desirability of that consequence. Therefore, different types of value models are appropriate for different decision contexts. Once the fundamental objectives and attributes are specified, the quantitative value model can be constructed by the following three steps: (1) combine the various attributes; (2) scale the relative value of different levels of each attribute and (3) determine the value tradeoffs between different levels of achievement on different objectives.

Three main independence concepts are used for developing value models in the research, including additive independence, preferential independence and utility independence. These concepts were used to derive multiplicative value model.

- *Additive value model*: If all combinations of attributes are additive independent, the utility function can be expressed as equation (2):

$$u(x_1, \dots, x_n) = \sum_{i=1}^n k_i u_i(x_i) \dots (2),$$

where u is the valuation function, x_i is the inference value and K_i is the positive scaling constants summing to one.

- *Multiplicative value model*: If each pair of attributes is preferentially independent of the others and if one attribute is utility independent of the others, then the utility function can be expressed as equation (3):

$$1 + ku(x_1, \dots, x_n) = \prod_{i=1}^n [1 + k_i u_i(x_i)] \dots (3),$$

where u is the valuation function, x_i is the inference value and k_i is the scaling constants and k is an additional scaling constant.

The multi-attribute decision model (Yoon & Hwang, 1981; Wolters & Mareschal, 1995) can be expressed as equation (4):

$$\varphi_r = \varphi(S_r) = \sum_{k=1}^m \omega_k \varphi_k(X_{rk}) \quad r=1, 2, 3, \dots, m \dots (4),$$

where $\varphi(S_r)$ is a value function of different S_r , ω_k and $\varphi_k(X_{rk})$ are weight and value function of attribute p_k , respectively. $S = \{S_1, S_2, \dots, S_m\}$: a direct set of m possible alternatives. $\omega = (\omega_1, \omega_2, \dots, \omega_m)^T$: the vector of the relative importance or weights on the attributes, where $\sum_{k=1}^m \omega_k = 1, \omega_k \geq 0, k = 1, 2, \dots, m$

Furthermore, the function for different S_r can be expressed as equation (5):

$$\varphi_r = \sum_{k=1}^m \omega_k a_{rk} \quad r=1, 2, 3, \dots, m \dots (5),$$

where a_{rk} is the comparing scale of X_{rk} after normalization.

Let $x(t) \in \mathfrak{R}^n$, $y(t) \in \mathfrak{R}^m$ denoted the states of the system. $u(t) \in \mathfrak{R}^p$ is the control inputs. Let $u = u(x, t)$ denote a solution for the initial boundary

value problem. Consider an initial value problem for the equation as expressed in equation (6). Based on additive multi-attribute value model, the structure of weighting-set can be replaced by initial value of equation because the weight of every attributes should be greater than zero (Ma, et. al., 2001).

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} \quad \text{in } \Omega \dots \dots \dots (6)$$

$u(x, 0) = f(x) \quad 0 \leq x \leq 1; \quad u(0, t) = u(1, t) = 0 \quad 0 \leq t \leq T$, where Ω denote the rectangle $[0,1] \times [0,T]$. If $f(x)$ is known then $u(x, T)$ can be computed for any positive value of T.

3. Methodology

The initial open-ended questionnaire survey was first conducted to select participants purposefully. Then, the method of qualitative in-depth interviews was applied in the research to explore and identify customers' (respondents') attitudes, behaviors and perspective of values. Qualitative in-depth interviews were an explore research technique with the ability of giving well-grounded, rich descriptions and explanations (Arksey & Knight, 1999; Gordon & Langmid, 1988). Indeed, these methods permit concepts and meaning to be explored in greater than questionnaires. Furthermore, the concept of partial differential equations is applied on explored attributes to build qualitative a dynamic attribute value model based on Keeney's (1999, 2001) and Ma, et al. (2001) approaches.

Interviews

Each of the interviews lasted from 20-30 minutes and was open-ended although structured by interview guides to ensure coverage of issues relevant to the researchers. During interviews, case study participants were encouraged to "think aloud" and provide why they selected specific values to be important and how it relates to other component that are linkages valued. According to the method of Schoenfeld, the researcher should interact with each subject by encouraging, guiding, questioning, and searching during interviews.

The interview situations included classification of the subject's meanings by the researcher and reflections from the subjects. The purpose was to help subjects express their ideas more clearly. The questions in identifying customer's values are presented as Table 1. All of these issues need to be considered in designing an objective from patients and developing a set of objectives to the relationship network for healthcare resources.

Qualitative Value Modeling

The modeling process includes a detail discussion for the model by recognizing relevant data and making them as objectives. Then, processes for congregating objectives as an objective function are described. An extension of Keeney's concepts of value-focused thinking would be a more comprehensive manner to develop objectives from patients' point of value in healthcare services. To build a qualitative model of value was based on the following four steps:

Identifying customer values, Compare each value that obtains from customers' perceptions to an objective, Identify design objective, and Develop the relationship network. The researchers asked "Why is this important?" (Glaser & Strauss, 1967) Each answer is subjected to the same question, continuing this process until a value is extracted. A customer's answer of questionnaires, the customer values can be classified into different objectives. The ground for a qualitative dynamic attribute value model is based on the basic objectives and each corresponding attributes.

Table 1 Summary open-ended questions in identifying customer's values

<p>Encouragement: <i>I believe you can do this question.</i></p> <ol style="list-style-type: none"> 1. Explain, in your own words, what is a definition of value. You did a good job on the previous one. 2. What is your concern about the healthcare service? Why? 3. How do you feel about the healthcare service? 4. What image or characteristic comes to your mind when you choose a hospital? 5. What is the specific value that hospital can offer? 6. How can hospital managers redesign existing product (or strategy) to improve the services? 7. How can the current healthcare marketing system surmount the obstacles? <p>Guidance:</p> <ol style="list-style-type: none"> 1. What is wrong or right with your hospital? 2. Is there any problem in current healthcare service? Give me an example. 3. What needs to be improved? Is this enough to guarantee that the situation becomes well? What do you really mean by this? <p>Questioning:</p> <ol style="list-style-type: none"> 1. What are your ambitions? 2. What limitations are placed upon you? 3. What specific service do customers want? <p>Searching:</p> <ol style="list-style-type: none"> 1. What values do you have for your customers and your employees? 2. Why is the value important? 3. What do you mean by this value? 4. How valuable are certain demographic profile and diagnosis history to a customer?
--

4. Data Collection and Analysis

Sampling

A total of 427 questionnaires were delivered and 419 returned resulting in a 98 percent responses rate in the initial survey. Of those returned, data from 406 respondents were deemed usable for the study. Based on the results of initial survey, 19 participants were selected and they were willing to be interviewed. After identifying subjects' attributes of customer values, 16 different subjects including 4

physicians and 12 patients, were interviewed during the two weeks after treatment.

Category Development and Reliability

These figures are respectably high according to 9 categories which are shown in Table2.

Table 2 Value with healthcare service from the customers' point of view

Item	Categories	Components of objective
W1	Cost	1. Low price. 2. Low co-payment if illness can be cured. 3. Handled in an acceptable manner.
W2	Equipment	1. High qualify of medical supplies. 2. Modern equipment. 3. Software (SOP training). 4. Hardware (e.g. location, decoration).
W3	Physician Background	1. Physicians' expertise. 2. Physician's technological skill. 3. Outstanding physician.
W4	Physician Care	1. Courtesy of physician. 2. Amount of time the physician spent with patient. 3. Communication skill (e.g. languages barriers).
W5	Environment	1. Good surrounding. 2. Patients' recreation room on ward (e.g. library, coffee room).
W6	Timing Arrangement	1. Equitable diagnosis timing to each customer. 2. Equitable treatment timing to each customer. 3. Timing of patient's discharge from hospital. 4. Time for talking about patient's feeling or worries.
W7	Relationship	1. Guidance and support patients. 2. Trust (e.g. empathy, sympathy, word of mouth). 3. Commitment (e.g. complaint feedback--care center/e-mail/1-800 numbers).
W8	Brand Image	1. LOGO. 2. Brand identifies (e.g. free medical treatment/ oral hygiene guidance). 3. Brand awareness.
W9	Additional value (Differentiate)	1. Professional management (e.g. internal customer--experience inherits/specific labor division/occupational training). 2. Clinic different characteristics (e.g. health insurance).

Findings

The proposed customer value model is proper to hospital managers and offers a fitting way of conceptualizing the relationships among the core

elements (e.g. customer satisfaction, customer relationship, loyalty, health service performance). According to categories hierarchy of Table 2, the

objective network of healthcare services is developed as shown in figure 2.

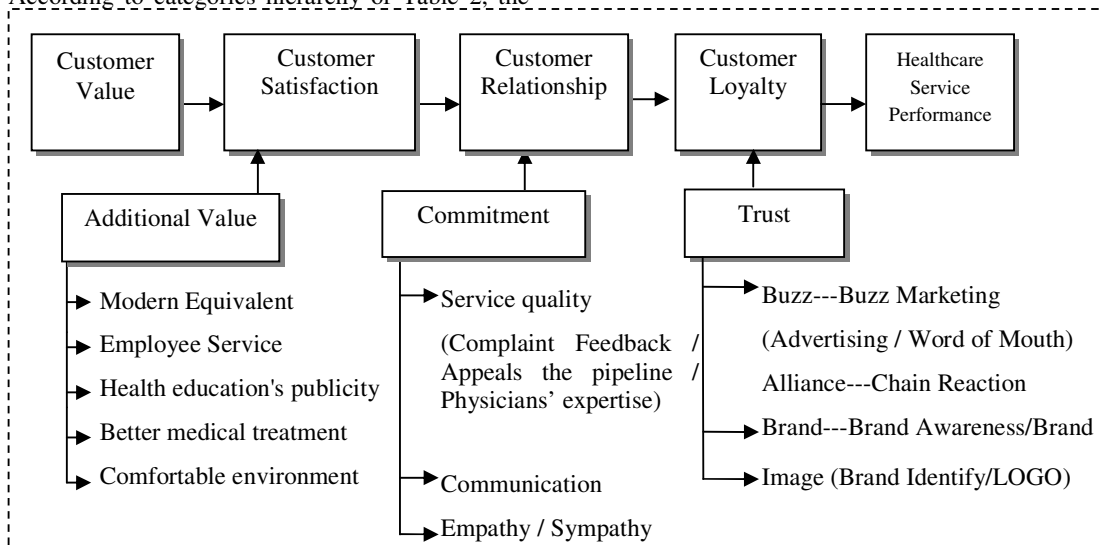


Figure 2 Major values of healthcare services

5. Value modelling

Combining the Attributes

A primary function of qualitative dynamic attribute value model is to contribute directly and powerfully to the decision situation. Upon building up the respective value model, it was based on customers' perspectives, including their particular needs or in-depth satisfaction/dissatisfaction (Table 2) that will eventually provide a perfect service.

Definition 1. A boundary number B is defined on $\mathfrak{R} (-\infty, +\infty)$ to be a number.

Consider an initial value problem for equation (6) and $f(x)$ represents a given function of x .: Let the value of $u(x, t)$ at the time be denoted by $g(x)=u(x, t)$ where the $g(x)$ denotes the dynamic attribute value model. Then $g(x)$ is related to f by

$$g(x) = \sum_{n=1}^{\infty} f_n \sin(n \Pi x) \exp[-(n \Pi)^2 T] \quad T > 0, n=1,2, \dots(7)$$

Therefore, different customer value can be calculated according to different period of time (T). The series for $g(x)$ converges uniformly on $[0, 1]$ to $g(x)$ by Weierstrass M – test

$$|\sum_{n=1}^m f_n \sin(n \Pi x) \exp[-(n \Pi)^2 T]| \leq \sum_{n=1}^m f_n \exp[-(n \Pi)^2 T]$$

Moreover, for every integer m, the series $\sum_{n=1}^m f_n \sin(n \Pi x) \exp[-(n \Pi)^2 T]$ converges uniformly on $[0, 1]$ to $g^{(m)}(x)$. Therefore, $g(x)$ must be a C^∞ function independent of how smooth $f(x)$ is. The value $g(x)=u(x, T)$ depends continuously on the initial time. Individual customer may show distinguish attributes. According to categories as shown in Table 3, a weighting function w_k is defined to represent the nine categories for adjustment on customer value model. The weighting function W_k is expressed as

$$W_k = \begin{cases} 1, & \text{if the category exists} \\ 0, & \text{Otherwise} \end{cases}$$

The overall dynamic customer value of healthcare service can be rewritten as

$$G_r = \sum_{i=1}^9 w_k g_r(x), \quad r=1, 2, \dots, m, \text{ where } r \text{ represents each individual customer.}$$

6. Conclusions

Nine categories of value with healthcare service from the customers' point of view were developed in the research. Meanwhile, the objective network of these categories hierarchy for customer value with healthcare service was constructed. Based on the above findings, the qualitative dynamic attribute value model is successfully. The customer value of the current instance can be used to traverse the original customer attributes via the model. Meanwhile, the model of the same clearly identified types of customers can be used on different department for service share. Eventually, decisions are made quickly for providing satisfied service and improving customer loyalty.

7. Acknowledgement

This work partially supported by the National Science Council, Taiwan, R.O.C. under Grant NSC96-2221-E-327-009.

8. References

- [1]. Arksey, H. & Knight, P. (1999). *Interviewing for Social Scientists*, London: Sage.
- [2]. Beckham, J. D.(2002). 20 years of health care marketing, *Health Forum Journal*, July, 37-40.
- [3]. Corbin, C. L., Kelley, S. W., & Schwartz, R. W. (2001). *Concepts in service marketing for*

- healthcare professionals, *The American Journal of Surgery*, 181, 1-7.
- [4]. Glaser, B. G. & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine.
- [5]. Gordon, W. & Langmaid, R. (1988). *Qualitative Marketer Research*, Aldershot: Gower.
- [6]. Hilliard, A. L. (1950). *The Forms of Value: The Extension of Hedonistic Axiology*. New York: Columbia University Press, pp. 42.
- [7]. Hippel, E. and Katz, R. (2002). Shifting innovation to users via toolkits. *Management Science*, 48, 821-833.
- [8]. Holbrook, M. B. (1996). Customer value-A framework for analysis and research. in K. P. Corfman and J. G. Lynch, Jr. (eds.) *Advances in Consumer Research*, 23, Provo, UT: Association for Consumer Research, 138-142.
- [9]. Keeney, R. L. (1999). The value of internet commerce to the customer. *Management Science*, 45 (4), 533-542.
- [10]. Keeney, R. L. (2001). Modeling values for telecommunications management. *IEEE Transactions on Engineering Management*, 48 (3), 370-379.
- [11]. Kaldenberg, D. O. (2001). Patient satisfaction and health status. *Health Marketing Quarterly*, 18, 81-101.
- [12]. Lorden, A., Coustasse, A. & Singh, K. P. (2008). The balanced scorecard framework-A case study of patient and employee satisfaction: What happens when it does not work as planned?. *Health Care Management Review*, 33(2), 145-155.
- [13]. Ma, J., Fan, Z. and Wei, Q. (2001). Existence and construction of weight-set for satisfying preference orders of alternatives based on additive multi-attribute value model. *IEEE Transactions on Systems, Man and Cybernetics*, 31 (1), 66-72.
- [14]. Oliver, R. L. (1996). Varieties of Value in the Consumption Satisfaction Response. in K. P. Corfman and J.G. Lynch, Jr. (eds.) *Advances in Consumer Research*, 23, Provo, UT: Association for Consumer Research, pp. 143-147.
- [15]. Oliver, R. L. (1997). *Satisfaction: A Behavioral Perspective on the Consumer*, New York: Irwin/McGraw-Hill.
- [16]. Orzano, A. J., McInerney, C. R., Tallia, A. F., Scharf, D. & Crabtree, B. F. (2008). Family medicine practice performance and knowledge management. *Health Care Management Review*, 33(1), 21-28.
- [17]. Rust, R. T.; Lemon, K. N.; Zeithaml, V. A. (2004). Return on Marketing: Using Customer Equity to Focus Marketing Strategy. *Journal of Marketing*, 68(1), 109-127.
- [18]. Ryan, J. and Sysko, J. (2007). The contingency of patient preferences for involvement in health decision making. *Health Care Management Review*, 32(1), 30-36.
- [19]. Schodnfeld, A. H. (1983). Episodes in mathematical problem solving. In R. Lesh & M. Landau (Eds.), *Acquisition of Mathematics Concepts and Processes*, New York: Academic Press, 345-395.
- [20]. Suter, E., Hyman, M. & Oelke, N. (2007). Measuring key integration outcomes: A case study of a large urban health center. *Health Care Management Review*, 32(3), 226-235.
- [21]. Weng, H. (2006). Consumer Empowerment Behavior and Hospital Choice. *Health Care Management Review*, 31(3), 197-204
- [22]. Zeithaml, V. A. (1988). Consumer perceptions of price, quality and value: A mean-end model and synthesis of evidence. *Journal of Marketing*, 52 (July), 2-22.
- [23]. Zeithaml, V. A., Bolton, R. N., Deighton, J., Keiningham, T. L., Lemon, K. N. & Petersen, J. A. (2006). "Forward-Looking Focus: Can Firms Have Adaptive Foresight?. *Journal of Service Research*, 9(2), 168-183.

Copyright © 2008 by the International Business Information Management Association. All rights reserved. No part or all of this work should be copied or reproduced in digital, hard, or any other format for commercial use without written permission. To purchase reprints of this article please e-mail: admin@ibima.org