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Recommended Citation
Pi, Shih-Ming; Kwok, Ron; Huynh, Minh; and Lee, Jae-Nam, "An Empirical Study on Customer Value in Electronic Commerce" (2000). *PACIS 2000 Proceedings*. Paper 5.
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An Empirical Study on Customer Value in Electronic Commerce

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Abstract
As electronic commerce grows and develops day by day, more and more scholars advocate extending the concept of customer value to commercial transactions on the Internet. The study aims to analyze and discuss the value factors considered by consumers who shop on the Internet and to analyze how the characteristics of products influence customer value judgments. The research finding indicated that what consumers wish to buy on the Internet is comprised of tickets, software, books, tapes/CD, hardware, and so forth. The main reasons influencing the desires of consumers to shop on the Internet are savings in time, convenience, abundant information, and a complete list of merchandise that facilitates searching and price comparison. However, the main reasons hindering consumers to shop via the Internet are product quality, not having the habit to shop on the Internet, safety, returning or exchanging goods, the transaction procedure, and so forth. This study uses the Analytic Hierarchy Process (AHP) method to analyze how different products influence customer value judgments and finds that consumers have different criteria for book purchases compared to computer peripheral equipment purchases. We can classify the values that consumers consider when shopping online into several categories and find the relationships among them. At the same time, we can measure the value of products or services and find potential customers. We can collect information about customer's views through the construction value model. Using this model we can help enterprises intending to do business by the Internet decide their polices.

Keywords: electronic commerce, customer value, analytic hierarchy process.

1. Introduction

In the field of traditional marketing, we usually use the "value" concept to analyze the sale and purchase of products and think that customers pursue value maximization under limited search costs, knowledge, mobility, and income levels. Kotler et al. (1996) make a definition for customer value, "Customer delivered value is the difference between total customer value and total customer cost. And total customer value is the bundle of benefits customers expect from a given product or service." Because electronic commerce is becoming more popular, more and more researchers advocate extending the concept of customer value to Internet commercial activities (Keeney, 1992; Rayport and Sviokla, 1994; Keeney, 1999). Keeney

(1999) define the value proposition associated with Internet commerce as the net value of the benefits and cost of both a product and the processes of finding, ordering, and receiving it. Every customer has his own considerations about benefits and costs when appraising the net value of Internet purchases. These net values may include benefits and price of the product, benefits and costs of ordering the product, benefits and costs of receiving the product, possible benefits and costs to others (e.g., forced labor), and possible benefits and costs to the world (e.g., environmental impacts). In summary, there are still a lot of areas for us to explore in order to conduct a more complete research on the concept of customer value in electronic commerce.

Cornin (1994) has analyzed the relationship between the Internet and customers from the dimensions of network functions, company benefits, and competitive advantages in order to construct an Internet Value Chain. Keeney (1999) advocates taking into consideration the different factors that customers care about when shopping on the Internet and when shopping by the traditional market channel. In other words, even if a customer really knows what he wants to buy, if the price on the Internet has a significant difference with the traditional outlet, his purchasing decision would be influenced by the value factors that he considers. In the above conditions, the feasibility of online shopping would be greatly influenced by the premise of his value considerations. Therefore, for companies intending to establish cyberstores, online shopping can be a superior way of marketing as well as an inferior way. Accurately estimating and carefully studying customer values are the main ways to obtain superior marketing and to avoid missing out on profits by selling via the Internet.

This study aims to analyze and discuss the value factors considered by consumers who shop online and to analyze how product characteristics influence consumer value judgments in order to give companies intending to join electronic commerce a referential model of customer behavior. This paper begins by defining customer value in electronic commerce. Next, the research questions are presented, along with a preliminary research model. Section three; the method used for collecting data is described. Section four; the results are presented and discussed. Finally, the paper concludes with some implications and suggestions for further research.

2. Literature review

Gale (1994) indicates that customer value analysis has become a starting point for an increasing amount of the marketing research. Although there were many companies making a lot of money doing very simplistic satisfaction studies, now many high-level managers have started to focus on customer value research and invested a lot of capital in analysis. Higgins (1998) indicates that enterprises can display customer value by the fishbone diagram. Then the compositions of product value and price can be extrapolated and customer value considerations can be pointed out for various products and services. Once the components of products and services are found, we can classify each component and figure out the influences on prices and benefits. For example the components for benefits include product values, service values, technical values, and commitment value. The components for costs include paid to supplier, internal costs, and so forth. The above analysis can help managers do suitable improvements according to cost and benefit analysis.

Keeney (1999) indicates that selling products and services over the Internet is touted to have massive potential sales. Since current Internet commerce is less than mail-order commerce, significant changes must occur to make the potentials for Internet commerce a reality. If

enterprises intend to sell merchandise on the Internet, they have to consider all the factors that consumers care about. Keeney (1992) uses concepts of value-focused thinking to attain the aim of creating customer value. Kim and Mauborne (1997) refer to this process as value innovation. It involves improving performance on objectives that customers care a lot about and perhaps reducing performance on objectives of lesser concern. Keeney (1999) thinks customer value factors can mainly be divided into the two categories of mean objectives and fundamental objectives. Therefore, we can construct a series of customer value factors. That is to say, when customers shop on the Internet, we can use a general measurement to express the value for each factor that they are concerned with. For example, we can use minutes as the unit to measure the factor of shopping-time. Keeney also develops an interrelationship between all values and attributes. Because each person assigns his own weight value toward each attribute, we can distinguish each product with different attributes by assigning a weight value to each factor in order to maximize product value according to the attributes that customers emphasize. Enterprises can use product value analysis to find out customers' needs and then customize a new product to obtain excess profits. Besides, Rayport and Sviokla (1994) also indicate that examining Internet commerce, the notion of the value proposition must be expanded.

Attracting consumers to buy goods online is the main goal of Internet marketers. In order to achieve sales, we have to understand what types of product customers who shop online are looking for. By knowing these products, we can make a suitable product line decision and marketing strategy. Enis and Roering (1980) classified products into four types. Because consumers and companies have different points of view, companies distinguish products into two dimensions, which are differences among products and differences among marketing compositions. According to consumers' notions, products can be divided into two dimensions, which are effort and risk. Convenience products are defined as lowest in terms of both effort and risk. That is, the consumer will not spend much money or time in purchasing these products, nor does he/she perceive significant levels of risk in making a selection. Preference products are slightly higher on the effort dimension and much higher on risk. Shopping products are defined as buyers are willing to spend a significant amount of time and money in searching for and evaluating these products. Consumers for these high involvement products also perceive increased levels of risk. Those products that are defined to be highest on both the risk and effort dimensions are called specialty products. After Murphy and Enis (1986) considered and integrated this theory on the preceding basis, they presented a better taxonomic structure to include more product types and product qualities. Basically, the new theory still follows the classification structure of convenience products, shopping products, specialty products, and preference products. They add the cost of consumers obtaining products and the extent of consumer involvement and define "product" as the composition of product benefits and classify consumer cost into efforts and risks.

From Enis and Roering's (1980) and Murphy and Enis' (1986) taxonomic structure as well as the Institute for Information Industry's research in March, 1999, we learn that the products online now are often preference and shopping products, including books, computer peripheral equipment, and software. Products having low risks are more prevalent on the Internet. Because the domestic traditional marketing channel of distribution is very prosperous for convenience products and consumers almost always pay by transfer and credit card through the Internet, it's much less attractive for them to buy convenience products through the Internet. In addition, specialty products are more expensive, so they increase the risks of consumption. Therefore, people seldom buy these goods through the Internet.

On the other hand, we can classify consumer characteristics online according to their generality and particularity. We can arrange them in a continuous spectrum from more general variables such as demographic characteristics, social class, personality, life style, perceptions, preference and intention, to more particular variables like purchase and consumption (Schiffman and Kanuk, 1994). In fact, these classifications also make a distinction between description and prediction. For example, intention is closest to purchase, afterwards comes preference. Therefore, it is more accurate to predict a purchase behavior by intention rather than by preference. Life style is more important than personality for purchase decisions (Lesser and Marie, 1986). But it's more difficult to observe and measure intention and preference objectively, yet description variables like demographic statistics and social class help marketers get consumers' information about career, age, sex, residence, education, income and so on.

3. Research method

The study aims to analyze and discuss the value factors considered by consumers who shop on the Internet and to analyze whether different products influence customer value judgments. Based on Keeney (1999), we conduct an empirical study for exploring customer value in electronic commerce. The research framework can be referred in Fig. 1.

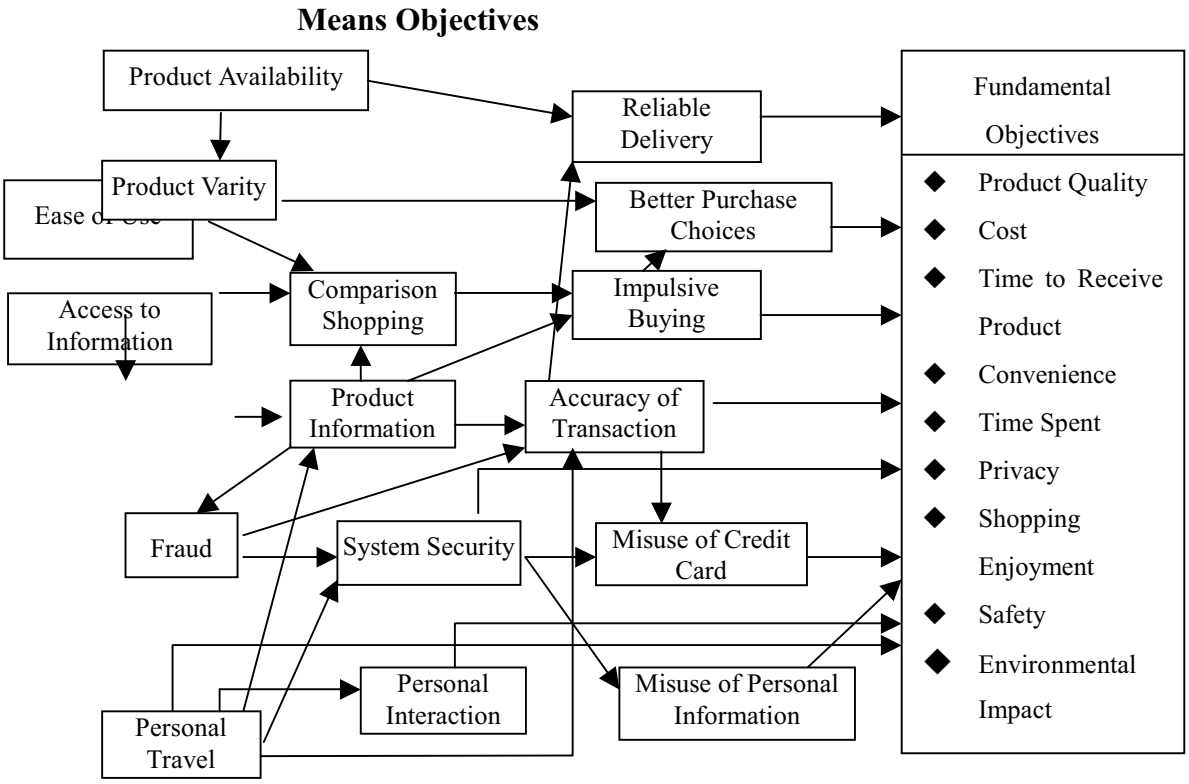

Figure 1. Customer Value Model (Adapted from Keeney, 1999)

In our research framework, we use customer value as dependent variable, and we use product category as independent variable. To measure customer value, we adopt Keeney's (1999) research findings. He results in nine factors which customers care about in an electronic

commerce environment: product quality, cost, time to receive product, convenience, time spent, privacy, shopping enjoyment, safety, and environmental impact. To measure product characteristics, we adopt the investigation result from the Institute for Information Industry in March, 1999. They indicate the products online now are often books, computer peripheral equipment, and software. According to Murphy and Enis' (1986) taxonomic structure, these goods are preference products and shopping products. In this study, we choose books and computer peripheral equipment as our research objects.

To test our research framework, an empirical study was conducted. Two products, books and computer peripheral equipment were chosen to assess the customer value. A questionnaire was designed to collect information 140 subjects who were familiar with Internet (i.e., potential customer for electronic markets). There are three parts to the questionnaire. Part one investigates background information about consumers, and parts two and three measure the weight of customer value factors of consumers in terms of books and computer peripheral equipment. The data were then analyzed to evaluate the model.

4. Data analysis and results

4.1 Sample

This study sent out 140 questionnaires and received back 133. The receiving rate was 95%. Males (54.9%) were more than females (44.1%). Table 1 shows the top five goods consumers want to buy on the Internet. The research finding indicated that what consumers' preferential sequence wish to buy on the Internet is comprised of tickets (67.7%), software (51.1%), books (35.3%), tapes/CD (29.3%), hardware (19.5%), and so forth.

Table 1. The most popular goods consumers want to buy on the Internet

Item	Number	Percentage
Tickets	90	67.7%
Software	68	51.1%
Books	47	35.3%
Tapes/CD	39	29.3%
Hardware	26	19.5%

In this study, the percentage of persons who have Internet shopping experience is 18%. The reasons why people shop online are: (1) to save time and convenience (79.2%) (2) abundant information provided (50%) (3) full products to search for and ability to compare prices (20.8%). (See Table 2) However, the reasons why people don't shop on the Internet are: (1) product quality (68.8%) (2) not having the habit to shop on the Internet (67.9%) (3) concerns about Internet safety (54.1%) (4) concerns about returning or changing goods (47.7%) (5) Dealer fees (36.7%). (See Table 3)

Table 2. The reasons why people shop on the Internet

Reason	Percentage
Save time and convenience	79.2%
Abundant information provided	50.0%
Full products to research and ability to compare prices	20.8%

Table 3. The reasons why people don't shop on the Internet

Reason	Percentage
Product quality	68.8%
Not having the habit to shop on the Internet	67.9%
Concerns about Internet safety	54.1%
Concerns about return or change goods	47.7%
Dealer fees	36.7%

4.2 The analytic hierarchy process for customer value

AHP is a systematic procedure for representing the elements of any problem hierarchically. The essential steps in the application of the AHP involve decomposing a general decision problem in a hierarchical fashion into sub problems that can be easily comprehended and evaluated. Determining the priorities of the elements at each level of the decision hierarchy and synthesizing the priorities to determine the overall priorities of the decision alternatives. For the AHP theory, see Dodd et al. (1995), Mobolurin and Bryson (1993), Saaty (1980, 1996) and Wedley et al. (1993).

4.2.1 Structure a hierarchy

A hierarchy is based on dividing the elements that influence the system into several groups. Each group is further divided into corresponding subgroups that are separated into many different levels. Saaty (1980) suggested that a level's factors should not exceed seven and that excessive factors can integrated into some other level.

4.2.2 Calculating the elements in each level

(1) Establish a pair-wise comparison matrix

After structuring a hierarchy, we must compare the elements in every pair level. This means that an element in a level is used as a foundation for the assessing principle and compared with the other element in the pair. Numerical values used in the AHP process are 1 to 9. The meaning of these numbers is given in Table 4. In AHP, each pairwise comparison represents an estimate of the ratio of the priorities or weights of compared elements.

Table 4. Saaty's intensity of importance scale

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	An activity is strongly favored and its dominance demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate value between the two adjacent judgments	When compromise is needed

The pair-wise comparison matrix A form is as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} & . & . & . & a_{1n} \\ a_{21} & a_{22} & . & . & . & a_{2n} \\ . & & & & & . \\ . & & & & & . \\ a_{n1} & a_{n2} & . & . & . & a_{nn} \end{bmatrix}$$

We denote a_{ij} by the number indicating the strength of A_i when compared with A_j. Thus, for a decision-maker, $a_{ii}=1$ and $a_{ij}=1/a_{ji}$, the matrix A is reciprocal. Having recorded the quantified judgments on pairs (A_i, A_j) as numerical entities a_{ij} in the matrix A, a set of numerical weights $w_1, w_2, \ldots\ldots, w_n$ reflects the recorded judgments. Assume the quantified vector W is:

$$W = \begin{bmatrix} W_1 \\ W_2 \\ . \\ . \\ W_n \end{bmatrix}$$

Wi means i items of quantified value. Assume that the judgments are merely the result of precise physical measurements. According to $a_{ij} = w_i / w_j$, matrix A times W is as follows :

$$A \cdot W = \begin{bmatrix} W_1/W_1 & W_1/W_2 & \cdots & W_1/W_n \\ W_2/W_1 & W_2/W_2 & \cdots & W_2/W_n \\ . & . & \cdots & . \\ . & . & \cdots & . \\ W_n/W_1 & W_n/W_2 & \cdots & W_n/W_n \end{bmatrix} \begin{bmatrix} W_1 \\ W_2 \\ . \\ . \\ W_n \end{bmatrix} = n \cdot \begin{bmatrix} W_1 \\ W_2 \\ . \\ . \\ W_n \end{bmatrix} = n \cdot W$$

N is the number of judgments. When we make the above equation simpler, it will become $AW=\lambda W$. λ is an eigen value of A. W is an eigen vector of A.

(2) Consistency Test

In most practical cases human judgments make the measurements inconsistent with matrix A. This means $a_{ij} \neq w_i/w_j$. Basically each person interviewed has different judgments. So, we denote the real observed value $\hat{A}$ of Matrix A and approximate the eigen vector $\hat{W}$ into the equation. The result is as follows:

$$\hat{A}\hat{W} = \lambda_{max}\hat{W} \qquad (\hat{A} - \lambda_{max}I)\hat{W} = 0, \quad \lambda_{max} \geq n$$

λ_{max} is the maximum eigen value of $\hat{A}$. Use $(\hat{A} - \lambda_{max}I) = 0$ to get the answer λ_{max}, then put the answer into the equation above and obtain the approximate eigen vector $\hat{W}$. When λ_{max} and n are not equal, the deviation represents the degree of the inconsistency. C.I. (consistency index) $= \frac{\lambda max - n}{n-1}$ is used to represent the degree of the inconsistency. The ratio of C.I. is higher and the degree of inconsistency is larger. Furthermore, in 1980 Satay used a consistency index of a randomly generated reciprocal matrix from the scale 1 to 9 called R.I. (Random index). The ratio of C.I. to the average R.I. for the same order matrix is called the C.R. (consistency ratio) $= \frac{C.I.}{R.I.}$. A consistency ratio of 0.1 or less is considered acceptable.

4.2.3 The measurement of the elements in each level

After determining the measurement of weights in each level, we can continue to count the quantified value of a hierarchy. This research uses the AHP method to estimate the corresponding importance of customers' value. Then we can use the results to understand customer values.

4.3 Results

The software EXPERT CHOICE is used here to estimate the weight of customer value factors. The more weight an factor has, the more important that factor is to customers. The software EXPERT CHOICE offers such functions as (a) a factor hierarchy chart (b) a weight calculator (c) setting criteria qualities and (d) setting estimation programs. First, make a factor hierarchy chart for customer value factors. Then input the comparison of these factors that results from the questionnaire. Finally, estimate the weight among customer value factors. (See Table 5)

Table 5. Analysis of the hierarchy

Factor / Product	Books	Computer peripheral equipment
Cost	0.0705(8)	0.1430(2)
Convenience	0.1130(4)	0.0899(6)
Privacy	0.1093(6)	0.0947(5)
Safety	0.1305(2)	0.1313(3)
Product quality	0.1913(1)	0.2218(1)
Time Spent	0.0977(7)	0.0814(8)
Shopping enjoyment	0.1098(5)	0.0824(7)
Environmental impact	0.0633(9)	0.0586(9)
Time to receive product	0.1146(3)	0.0996(4)

According to Table 5, we learn that for books the rank of factor importance for consumers is: product quality (0.1913), safety (0.1305), time to receive product (0.1146), convenience (0.1130), shopping enjoyment (0.1098), privacy (0.1093), time spent (0.0977), cost (0.0705), and environmental impact (0.0633). For computer peripheral equipment the rank of importance is: product quality (0.2218), cost (0.1430), safety (0.1313), time to receive product (0.0996), privacy (0.0940), convenience (0.0899), shopping enjoyment (0.0824), time spent (0.0814), and environmental impact (0.0586). The research finding indicated that consumers value the weight of different factors when shopping for different product types.

This study uses the AHP model to analyze how different products influence customer value judgments and finds that consumers have different criteria for book purchases compared to computer peripheral equipment purchases. We can classify the values that consumers consider when shopping online into several categories and find the relationships among them. At the same time, we can measure the value of products and services and find potential customers. We can collect information about customer's views through the construction value model. Using this model we can help enterprises intending to do business by the Internet decide their polices.

5. Conclusions and Suggestions

Though there is more shopping now by mail orders than online, in the future online shopping will greatly affect the real world as information technology rapidly evolves, and customers will begin to change their shopping habits. Questioning customers is the most direct way to find out what is important to customers. Different consumers have different values. Therefore, we should not make broad generalizations about consumers' values. But we can use the method of customer value analysis.

Here the method of customer value analysis is used to find the factors that a customer values while shopping online, and also to find out how product types influence customers' values. The ranking of goods from most popular to less popular that consumers want to buy online is tickets, software, books, tapes/CD, and hardware. The main reasons that attract consumers to shop online are saving time and convenience, adequate information provided, and many products to be searched for and compared. However, the main reasons that prevent consumers shopping online are product quality, not having the habit of shopping online, concerns about Internet security, product exchange and replacement concerns, deal processes, and so on. As to how different products affect consumers' value judgements, we learn from this study that for books, the rank of factor importance for consumers is product quality, safety, time to receive product, convenience, shopping enjoyment, privacy, time spent, cost, and environmental impact. As for computer peripheral equipment, the rank of factor importance is product quality, cost, safety, time to receive product, privacy, convenience, shopping enjoyment, time spent, and environmental impact. The research finding is conforming to marketing scholars' viewpoint. That is, when we purchase shopping products (e.g., computer peripheral equipment), we are willing to spend a significant amount of time and money in search for and evaluating these products, and we will face more perceived risk. On the other hand, when we purchase preference products (e.g., book), we are more emphasis on other factors (e.g. convenience) than cost.

In regards to implications for practice, this paper shows that the values consumers care about can be classified into a few basic categories. We can express the relations among these objects and also stress that every kind of product and service can be considered according to values in order to identify potential consumer groups. By using this value model, we efficiently gather the value information of customers and offer a model to the enterprises that want to have commerce online. We hope our research findings are applicable to designing an Internet commerce system for a business, creating and resigning products and increasing value to customers. Besides, we can collect empirical data about customer's views through the construction value model. Using this model we can help enterprises intending to do business by the Internet decide their polices. We believe that Internet commerce has the potential to offer customers a better deal and service compared to purchases by conventional methods in many situations. In further study, we hope to analyze customer values concerning other products (e.g., convenience products, preference products, shopping products, and specialty products), studying different consumers' characteristics (especially lifestyle values) and webs' categories (e.g., store, specialty shop, and mall). Besides, we want to test our propositions that are concerning the relationships between customer values and lifestyle values. Due to our sample area limits our research, we can try to expand it to cover additional areas. We hope to collect more samples from different sources, such as conducting an on-line survey, and establishing contact with cyberstores' members.

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