전자상거래에 있어서 보안성의 가치추정에 관한 연구

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요 약

본 연구는 전자상거래의 비시장 속성 중 보안성(security)에 대한 경제적 가치측정의 모형에 관한 연구이다. 본 연구에서는 크게 신속성, 보안성, 품질이라는 비시장속성으로 구분하여 분석하였다. 이를 위하여 속성요인들, 고객만족과 지불가치간의 관련성을 파악하는 모형을 제시하였고 이와 관련된 경제적 가치모형을 제시하였다. 여기서 가치분석 방안으로 제시한 측정기법은 원래 환경재의 가치측정에 관한 것으로서 지금까지 환경재의 경제적 가치추정에 머물렀던 조건부가치측정법을 보다 확장하여 전자상거래에서의 적용가능성을 모색하고자 하였다. 본 연구에서는 이러한 연구목적에 부합될 수 있도록 지불의사 액수를 추정하는 계량경제적 모델을 정립하여 제시하였다. 그러나 실제 설문지 분석시 나타날 수 있는 여러 문제점이 나타날 수 있으므로 이를 보완하는 작업이 차후에 뒤따라야 할 것이다.

A Study on Valuation of Security Property in Electronic Commerce

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ABSTRACT

This paper is a study on the model that measures economic values for the non-market properties of Electronic Commerce(EC). For development of this model, first of all, we reviewed the properties of EC service, and looked around the relation between customer satisfaction and/or payment value and EC properties. In addition, we checked the method to measure economic values of these properties. This measurement method is the contingent valuation method which is a method of measuring the value of the environmental product. We modified it to adapt to the EC. Finally, in this paper, we proposed an economic value model which measures the value of willingness to pay(WTP) to our objectives. However, there could be some restrictions at the time when surveying empirically. Therefore, the succeeding study should be done in order to improve these restrictions some day.

1. INTRODUCTION

Since Internet was born, it has been diffused fast and has became a main strategic means and/or a strategic weapon of the enterprise. That is to say, it has created a new economy of electronic commerce (EC), and became a new method of creating and adding a new value of the enterprise.

U. S., which has played the leading role in EC from the early days, is already showing a great progress in this area. And other advanced countries in Europe and Japan are busy to join in this new economy of EC. Especially, in Japan, because a recent big bang of the monetary system is being gone on seriously, the conservative financial world has driven the EC [1].

Therefore, the enterprise which is willing to conduct EC on Internet well, should improve services quality by means of continuous investment. Here, investment must be driven by evaluation means such as the cost-benefit analysis. Under these circumstances, this paper focuses on analyzing economic value of non-market properties[1] (especially, about value of security) of EC. In the paper,

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1) Non market property is the property that is not traded directly at the market. For instance, non-market properties which include the environmental goods such as clean air and nice scenery, are not dealt at the market.

we will limit the scope of our research to the electronic shopping mall within business-to-customer EC and analyze the economic value that is related to the shopping mall service.

For shopping mall, it is natural that a large amount of investment is required, and we believe that it is appropriate to decide the investment priority from the viewpoint of customers of electronic shopping mall and not from the viewpoint of enterprises. Of course, enterprisers can operate their shopping mall more effectively by deciding the priority of investment among several properties of EC service.

2. RESEARCH BACKGROUND

2.1 Defining Economic Commerce

There is a well-known definition of EC which defined by the U.S. Defense Ministry : "EC is doing business using electronic devices such as EDI, facsimile, electronic bulletin board, e-mail, electronic fund transfer and so on, not using paper [3].

So EC could be defined as a way of providing goods or services and settling money conversely by using telecommunication technology instead of traditional ways of commerce [12]. Therefore, all forms of business activities that advertise enterprise's goods or services, process the order from customers, settle the money, and deliver the ordered goods or services, are electronically processed in EC[1].

The type of EC can be classified by business subjects ; business-to-business EC, business-to-consumer EC, business-to-administration EC, and consumer-to-administration EC[6]. In this research, we will limit to the electronic commerce.

2.2 Properties of EC Service

The innovation of information technology and a great evolution of Internet is being a new form of business called EC. The electronic shopping mall among several type of EC is progressing most actively and this type of EC has been being great changes from physical goods or information goods even to the financial services.

There could be many views and theoretical backgrounds on the EC strategy, but to activate more and more and diffuse EC, the following strategic factors of EC should

be verified and considered [5].

First, the products that are sold through EC should have the competitive power of price, and this has to do with the reduction on the logistics cost of products. Secondly, reliable and safe electronic payment methods should be guaranteed. That is, electronic payment systems such as electronic money or electronic purse must be secure. Especially, if the activities such as accumulating, managing, using, and providing the customer's personal informations and transaction informations are not properly controlled, the development of EC could be hindered. Finally, for the satisfaction of the user's requirements as well as the expansion of EC demand, the effort of all the enterprises is strongly needed. This includes to innovate the past practice of mail-order sales providers and to improve higher in quality of products and services.

These three strategic factors are properties of EC services which actually activates EC and requires a lot of investment. Therefore, it will be very meaningful to judge the economic values of these properties and analyze the priority of investment based on these values.

2.3 The adapt scheme of economic value analysis

The economic value model that is used in this research is originally a model about the value measurement of environmental goods. Usually, environmental goods has the characteristics of which it cannot be dealt through the price mechanism of the market. Therefore, it is not easy to measure the improvement level of the economic welfare caused by the improvement of the quality of water or the air quality and anti-pollution activities.

To overcome this problem, many researchers in this area have been making efforts. Consequently, several methods such as the benefit measuring method were developed. The contingent valuation method (CVM), one of them, is accepting its appropriateness and usefulness. CVM use technique that people set directly value on some environmental goods for giving value for the new environmental goods. In this case, questionnaire is used for gathering data like other methods. In the questionnaire, subject answers the amount he or she is willing to pay for the goods. First, this method set up hypothetical situation, and calculates the willingness-to-pay (WTP) of respondents under the situation by the questionnaire. Then, eco-

nomic value of environmental goods is estimated by direct calculation and statistical analysis of data.

This analytic technique is usually used for estimating economic value of environmental goods, but recently it is being adapted to other field [11]. In this research, we will also research a possibility of adaption for estimating economic value of the EC properties. CVM is the economic concept which is based on the 'Hicksian compensation surplus' [7].

The concept of the Hicksian compensation surplus is theorized on the process estimating the benefit of increasing the safety of piped water through improvement water quality [8]. The concept of the Hicksian compensation surplus could convert that how much part of one's income be equal to the incremental safety of piped water under the given utility level.

The function of Hicksian compensation surplus (CS) is expressed as equation of (1) : p is the price vector of private goods, q is the quality of piped water, U is the utility level and Q is the quality of other environment. And compensation surplus (CS) of increasing the piped water's safety from the present level q^0 to q^1 is as follows.

$$CS = E(p^0, q^0, Q^0, U^0) - E(p^0, q^1, Q^0, U^0) \qquad (1)$$

The first expense function of the equation (1) is Y^0 which is the respondent's present income, and given P^0, Q^0, q^1 the second expense function is income level(Y^1) which is to reach U^0. Here, the WTP(Willing to pay) is the gap between Y^0 and Y^1. When using WTP as a measurement value of benefit, income compensation function considered as a WTP function which is expressed as function of (2).

$$WTP(q^1) = f(p^0, q^1, q^0, Y^0) \qquad (2)$$

The equation (2) is a basic structure of the value function. The value function expresses the change of economic welfare that occur by the change of q^0 by currency value.

The following (Figure 1) presents the conception of Hicksian compensation surplus on quality (quantity) variation.

Since the economic value analysis method can mea-

sure non-market properties, we will propose a model that adapt this method to value measurement of EC properties.
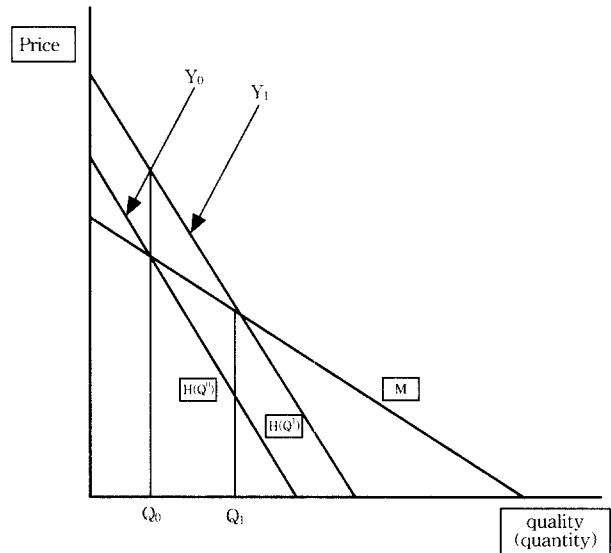
M : demand curve
$H(Q^0)$: compensation demand curve under U^0 utility level
$H(Q^1)$: compensation demand curve under U^1 utility level

(Figure 1) Compensation surplus on quality(quantity)

3. DESIGN OF RESEARCH MODEL

The first property of EC is the competitive power of the price through the cutdown of costs. However, nobody regard the low price as the non-market property. The main source of price competitive power include the reduction of logistics cost by means of improvement of the logistics system. And improved logistics system can deliver the ordered product quickly by low cost. So, we can replace the low cost by quick delivery of the ordered product as the main source of price competitive power. Therefore, in this study we would like to include quickness as the first non-market property.

The second property is the reliability on the payment system. Most (about 90%) of Korean EC service enterprises are using both credit card and on-line receipt electronically as the payment mechanisms [5]. However, in the case of credit card, because Internet is not secure enough, individual's transaction information such as credit card number, personal identification number (PIN) and account number can be stolen. So this can work as a barrier to the activation of EC. In the case of on-line

receipt, because it is impossible to trade immediately and it is not convenient for user to pay for the purchase, this payment system can also hinder the activation of EC. Therefore the security of Internet is a necessary property as well as a very important factor.

The third property has to do with providing the high quality products. Since EC customers are buying goods or services without direct contact, very often the customer cancel orders for products. The reason why customers cancel orders is that the quality of product is low. To reduce this problem, the provider of EC service needs to get high quality products.

These properties are especially non-market properties which are not traded to the markets, so the market value are not given. Because of this, it is not easy to choose or decide on the priority of investment among properties and it might cause ineffective investment.

Therefore, we will suggest a model that can estimate the market value of non-market priorities. For the objective of this study, first we will analyze the relation between the properties of EC service and the satisfaction as well as the payment value[2] of the electronic shopping mall customers (see Figure 1).
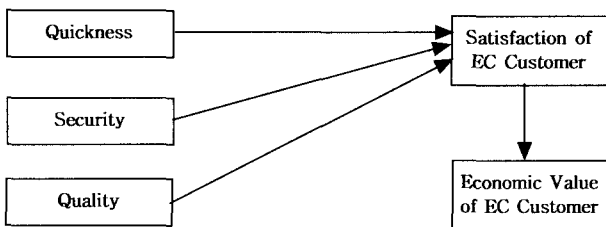
(Figure 2) Relation of Properties of EC, Satisfaction of EC Customer, and Economic Value

(Figure 2) shows the hypotheses that properties of EC affects the EC customer satisfaction and the EC customer's satisfaction effects the EC customer's economic value. On the these hypotheses, we suggest a econometrics model that estimate the economic value for non-market properties of EC (quickness, security, and quality).

WTP of customers not only get affected by the their

environmental and economic situations but also by the individual characteristics and/or preference, so this must reflected to the WTP function.

$$WTP(q^1) = f(p^0, q^1, q^0, Q^0, Y^0, T) \qquad (3)$$

In this equation (3), P^0 is the price of private goods, q^1 and q^0 are the quality level of EC's properties(0 is the present quality level and 1 is the highest quality level), Y^0 the income, and T is the vector toward the respondent's preference or characteristics. For example, when asking the WTP to the improvement of EC's security, we define q^0 as the security level of present, q^1 as the security level after improved. Also, P^0, Q^0, q^0, given equally to all the respondents.

The above equation is a basic structure of assuming the value function which presents the change of economic welfare occur by the change of q into current value. Therefore, since these economic value analysis's non-market property measurement is possible, in this research we apply this economic value analysis to value measurement of security.

Especially, in this research when considering the specific situation of EC, the concept WTP means the total amount (this is equal to sales of enterprises) that when perfect security is guaranteed, customers of EC are willing to pay for additional orders. This amount is estimated that multiply the ordering amount per time by the number of ordering time of each Internet shopping mall customer. In this research, the equation that estimates the amount of WTP is as follows.

WTP = a_0 + a_1ATT + a_2COS + a_3TRY + a_4NAC + a_5AGE
　　　+ a_6EDU + a_7YRS + a_8INC + U

WTP : The number of additional order and average amount per ordering time when perfect **security** is done.
ATT : The attitude of the respondent's about the **security** level of present EC.
COS : cost spent for EC system usage
EFF : Efforts made for the security of EC
NAG : Subjective number of accidents occurring in 5 years related to security when the enterprise is doing nothing to improve security
AGE : The age of respondents
EDU : The educational level of the respondents
YRS : The period(years) of using EC
INC : Average income per year
U : Error entry

Now, we can get WTP amount per person with the

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2) Here, payment value is calculated by multiplying the number of customer's usage by the average amount of purchase per time.

model, but this numerical value is not the average cost of payment on EC security per person. Therefore, we must compute a genuine WTP with this value. When security level of EC system is increased, customers will use electronic shopping mall more and more and enterprises will be get more profit than before. Because the cost for increasing security level will be justified by profit, a genuine WTP can compute from this additional profit arisen at the time when security level is increased.

Similarly, we can adapt the same method to other properties(that is, quickness and product quality) and estimate the amount of WTP. And finally we can decide on the priority among properties. Also, if the cost for improving the properties can compute, then we can check on the appropriateness of EC investment through the benefit-cost analysis.

When analyzing the above equation, the perfect property must be clearly defined in order to let the respondent understand easily, and the accuracy of analysis should be upgraded. For example, in the case of EC security, the perfect security could be defined as "You'll never experience any accidents related to security for a lifetime." Also, when estimating the amount of WTP, it is necessary to set the range of the amount of payment.

4. CONCLUSION

This research is a study on the model of the economic value measurement of EC properties. We limited the analysis range to the electronic shopping mall service within business-to-customer EC and we focused on the model to analyze the economic value of the non-market properties of the shopping mall service.

In this research, we classified the non-market properties by quickness, security, and product quality, presented a conceptual model that shows the relation between property factors, customer satisfaction and payment value. Then we presented the econometrics model for analyzing the economic value of security. The study can contribute to decide the priority of investment among several EC properties and justify the cost for improving EC elements.

Future research agenda includes (1) the practical survey of WTP of EC properties, and (2) the practical availability of the proposed model. Especially, many problems will occur in the process of the empirical analysis, so additional works should be done in the future.

REFERENCE

[1] Cho, NamJae and KyooSung Noh, "Management Information System," Sae Young Company, 1998.

[2] Coy, Peter, "You Ain't Seen Nothin' Yet," Business Week, June, 1998.

[3] Gaffin, A. "Electronic Commerce for New Payment Systems Using the Internet," Journal of Computer Communication, Vol.1, No.3, 1995.

[4] Hof, Robert D., Gray McWilliams, and Gabrielle Saveri, "The CLICK HERE Economy," Business Week, June, 1998.

[5] Hwang, KyungTae, NamJae Cho, JungDuk Kim, "A Research on Strategic Establishment of Improving the Economic Commerce Competition in Domesticity," Korea Information Technology Application Institution Autumn Academy Convent Cooperation Collection of Thesis., Nov. 1998.

[6] Kalakota, Ravi and Andrew B. Whinston, Electronic Commerce, Addison-Wesley, 1996.

[7] Kwak, S. J. and C. S. Russell, 'Contingent Valuation in Korean Environmental Planning : A Pilot Application to the Protection of Drinking Water Quality in Seoul', Environmental and Resource Economics Vol.14, 1991.

[8] Kwak, SeungJun and YoungSeob Jeon, "Economic Value of the Environment," HakHyunSa, 1995.

[9] NII., "A Framework for Electronic Commerce in the NII," (httP : //www. nextvision. com/content/whitepaper/ecommerce/body.html), 1996.

[10] Oh, SangYoung and YoungKi, Kim, "A Research on the Payment System at Electronic Commerce," '98 Korea Information Technology Application Institution Autumn Academy Convention Cooperation Collection of Thesis., Nov. 1998.

[11] Shin, SeungShik, "Thesis on the Value Assuming Method of Environmental Goods : Communication Industry External Effect Assumption of CVM and Hedonic Application No.3," Korea University, 1998.

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