

Explore Expert Decision-Making Method on Evaluation an Optimal E-Commerce Platform: A Case Study

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Abstract - The purpose of this paper is to propose a case of using expert decision-making of analytical hierarchy process (AHP) method to finding the best e-commerce platform. This study to finding five important factors are shop fee, annual fee, publication costs, transaction costs and security by vendors, merchants and customers; after using expert questionnaires to choice four shopping platforms (yahoo auction, ruten auction, ihergo and PChome) in Taiwan. Thus, the study results to shows the best choice is ihergo on e-commerce platform. The study is to provide food industry a decision-support tool which to choice optimal platform on e-commerce.

Index Terms - Expert decision-making, e-commerce, AHP.

I. INTRODUCTION

The physical store is limited by many elements, such as working time, water and electricity fee, store range fee and so on. This makes physical shop work more difficult for keeping profits. In Taiwan, many institutions actively support those physical stores to transform their shop for a new way to prolong the business life [1].

Electronic commerce (E-commerce) innovating applications have posed novel, technical, organizational and commercial challenges [2]. The shopping will not be limited at the time and locale through e-commerce, so more and more people choose to purchase and browse on virtual store, instead by physical. In the past decade, e-commerce via the internet has substantially affected the business world and will continue to be important. According to MIT indicated Taiwan's 2008 of the e-commerce market make NT\$ 71,700 million; it is more than global growth rate [3]. The online shopping not only becomes the most beneficial business but also every company want to share this business, especially in Taiwan.

Based on the above, the physical market vendors need a new effective way to increase their efficiency. Thus, in this research is to choose an optimal e-commerce platform which makes tradition vendors to get rid of working time, area limitation and save the cost of water, electricity and renting fee. However, e-commerce platform for many kinds and uneven quality, and there are also different services and fees in Taiwan. So, how can choose the best platform is a major challenge of the store owners.

The analytical hierarchy process (AHP) is an expert decision-making method of comprehensive and logical. It can be used in both quantitative and qualitative multi-criteria decision making problems and it is widely accepted by the

decision making community, be they the academics or the practitioners [4]. Among those who have been researched of the AHP are Yu [5], Dong et al. [6].

As a result of this research using the AHP method to evaluation the required and consider factors of optimal e-commerce platform. The study not only selects an appropriate platform to be a place of developing the new sources but also promotes and improves for business performance.

II. LITERATURE REVIEW

A. E-commerce

E-commerce innovating applications have posed novel, technical, organizational and commercial challenges which important to rethink the value and opportunity provided by new e-commerce innovations, especially if the opportunity is congruent with current capabilities [2]. E-commerce provided extensive communication and dialogue between the members and helped them to improve, develop, and transfer knowledge. E-commerce helped establish a flexible, distinctive, and effective knowledge system [7].

According to Kalakota and Whinston [8] indicated the e-commerce is a business model of the modern enterprise, that can use the computer and the internet technology, collect the information of supported decision, and allow the enterprise to follow the improved products and the service quality. Efraim et al. [9] presented the e-commerce was divided into business to business e-commerce (B2B), business to consumer e-commerce (B2C), the consumers sale the products or services to the organizations by internet (C2B), and the consumer executes the interactive transactions of products or services with the other consumers directly (C2C).

In addition to, many researchers have been researched about the e-commerce; Doorenbos et al. [10] works are based on comparison-shopping agents, which query several sites to gather product-information and provide a virtual market place for the customers. Saini and Johnson [11] selected a wonderful e-commerce online shopping is to be a position of exhibiting and selling the products for the industry for the important issue certainly. Wang [7] explored knowledge management issues in e-commerce communities, and comprehend the way it is practiced. This study reports on a series of in-depth interviews, reviews academic and practical knowledge management cases to construct a model, and categorizes knowledge management activities in e-commerce communities in four different modes are include knowledge

dissemination, knowledge advancement, knowledge sharing deals, and knowledge generation.

In the e-commerce the industry of online shopping platform act as a seller role of presenting the services and the businessman act as a buyer role. The seller presents the reasonable prices and services, so that can finish the trading mechanism by bilateral negotiation [12]. The e-marketplaces create more values; it not only earns the transactions returns, but also receives the expenses by presenting value-added of the information services. For instance integrating the computer information systems of seller and buyer give consulting services to change [13]. As the eBay's shopping platform will receive the publication costs of product, transaction costs, advertisement costs...etc. from the sellers [14]. Moreover, there were researchers to illustrate effect factors about choose e-commerce platform of buyers and sellers. Wolfinbarger and Gilly [15] to present the security of e-commerce could affect the customer satisfaction. Qu et al. [16] to indicate the barriers to entry builds too high it could create the adverse effect of limited attraction for buyers.

Thus, this research according to the literatures about consider five factors of buyers and sellers (costs, security...etc.), which will be evaluation on four famously e-commerce platforms in Taiwan (Table I).

B. Analytical hierarchy process (AHP)

The analytic hierarchy process (AHP) approach developed by Saaty [17]. The AHP is as a multi-criteria decision-making method that used to measure the relative importance weighting for each location requirement. AHP is a powerful tool that can be used to decision-making in situations involving multiple objectives [18]. AHP results of verifiable by a rigorous mathematical theory with judgments consistency ratio capacity [19].

In recent years, most researchers have used traditional AHP to solve and decision-making the problems in various disciplines such as Kwong et al. [20] combined AHP and Quality Function Deployment (QFD) to fined consumers critical needs of the digital camera. Vidal et al. [21] achieved by evaluating how AHP can support the drug production planning process from a French hospital. Based on the results, AHP is an optimal decision-making method when decision-makers need judgments multi-criteria.

III. METHODS

AHP method would be a useful tool to assist the location planning process to make an optimal location decision by assessing the relative suitability among candidate alternatives. The AHP technique will be discussed to show how it helps the location decision. Suppose that there are m objectives, the AHP technique performs the multi-objective decision by the following steps [19].

1) Complete the following pairwise comparison matrix \mathbf{A} for m objectives.

$$\mathbf{A} = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{pmatrix} \quad (1)$$

Where, a_{ij} indicates how much more important the i th location requirement is than the j th location requirement for constructing the column vector of importance weighting of location requirements. For all i and j , it is necessary that $a_{ii} = 1$ and $a_{ij} = 1/a_{ji}$.

2) Divide each entry in column i of \mathbf{A} by the sum of the entries in column i . This yields a new matrix \mathbf{A}_w , in which the sum of the entries in each column is (2).

$$\mathbf{A}_w = \begin{pmatrix} \frac{a_{11}}{\sum_{i=1}^m a_{i1}} & \cdots & \frac{a_{1m}}{\sum_{i=1}^m a_{im}} \\ \vdots & \ddots & \vdots \\ \frac{a_{m1}}{\sum_{i=1}^m a_{i1}} & \cdots & \frac{a_{mm}}{\sum_{i=1}^m a_{im}} \end{pmatrix} \quad (2)$$

3) Compute c_i as the average of the entries in row i of \mathbf{A}_w to yield column vector \mathbf{C} .

$$\mathbf{C} = \begin{bmatrix} c_1 \\ \vdots \\ c_m \end{bmatrix} = \begin{pmatrix} \frac{\frac{a_{11}}{\sum_{i=1}^m a_{i1}} + \frac{a_{11}}{\sum_{i=1}^m a_{i2}} + \cdots + \frac{a_{1n}}{\sum_{i=1}^m a_{im}}}{m} \\ \vdots \\ \frac{\frac{a_{m1}}{\sum_{i=1}^m a_{i1}} + \frac{a_{m1}}{\sum_{i=1}^m a_{i2}} + \cdots + \frac{a_{mn}}{\sum_{i=1}^m a_{im}}}{m} \end{pmatrix} \quad (3)$$

Where, c_i represents the relative degree of importance for the i th location requirement in the column vector of importance weighting of location requirement.

c_i represents the evaluating score that the i th candidate location is assessed for a particular location criterion for making the optimal location decision.

4) To check for consistency in a pairwise comparison matrix, the substeps are performed as follows.

(i) Compute $\mathbf{A} \cdot \mathbf{C}$:

$$\mathbf{A} \cdot \mathbf{C} = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{pmatrix} \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_m \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_m \end{bmatrix} \quad (4)$$

TABLE I Comparison e-commerce platform

(Unit:NT\$)

E-commerce platform	Shop fee	Annual fee	Publication costs	Transaction costs	Security
Yahoo Auction	No	No	3/ Item	3%	low
Ruten Auction	No	No	No	1.5%	low
ihergo	No	No	No	No	Middle
PChome	30000	3000	No	2%	High

TABLE II RI for different numbers of m

m	2	3	4	5
RI	0	0.58	0.90	1.12

Source: Saaty (1988)

TABLE III Compares weight for e-commerce platforms

Shopping platform	Values
Yahoo Auction	0.099
Ruten Auction	0.203
ihergo	0.462
PChome	0.061
Inconsistency=0.09	

(ii) Compute δ :

$$\delta = \frac{1}{m} \sum_{i=1}^m \frac{\text{ith entry in } A \cdot C}{\text{ith entry in } C} = \frac{1}{m} \sum_{i=1}^m \frac{x_i}{c_i} \quad (5)$$

(iii) Compute the consistency index (CI) as follows:

$$CI = \frac{\delta - m}{m - 1} \quad (6)$$

(iv) Compare CI to the random index (RI) for the appropriate value of m to determine if the degree of consistency is satisfactory. If CI is sufficiently small, the decision-maker's comparisons are probably consistent enough to give useful estimates of the weights for the objective function. If $CI/RI \leq 0.10$, the degree of consistency is satisfactory. The reference values of the RI for different numbers of m are shown as Table II [17].

IV. A CASE STUDY

This case is a food retailer in central Taiwan. The case founded in 1980 that started a bus mainly on selling pork products, always adhere to the principle of "Quality First". However, consumer's lifestyle changes, fresh supermarkets and virtual stores development. The store owner is urgent need of improve method and reproduce high-quality features and create new value for physical store.

Hence, this study will use AHP methods to choose an optimal e-commerce platform for the traditional market retailers. According to Chuang [19] mentioned that the AHP steps conducted experts and decision-maker questionnaire survey before construction a hierarchy structure of each individual by the factors.

This study distributed a total of the 25 questionnaire survey, 20 valid questionnaires were analyzed, with 63% being man, and the age distribution as follows: 24% is below 25 years old, 32% aged 26-30 years old, 16% aged 31-40 years old and 28% is over 41 years old. And then 12% is below 10 years old, 36% 11-20 years old, and 52% 21-30 years old of the company is formed. The results shows the food retailers are established more than 20 years old in this

questionnaire. In this study, professional commercial software, Expert Choice, developed by Expert Choice, Inc. [22], is available on the market which simplifies the implementation of the AHP's steps and automates many of its computations.

Expert Choice software to show the CR by Inconsistency Ratio (IR) value, when $IR=0.09$ ($CR \leq 0.1$) that compliance with the CR. And then, the study is to compare weight for six e-commerce platforms (Table III).

Hence, according the Table III to show that using AHP method make a comparison between the six e-commerce platform and open an online store must evaluation factors, shop fee, publication costs and security...etc.. The results showed that ihergo (0.462) is highest of appropriate degree in all e-commerce platforms. Thus, the ihergo is the optimal platform for the food retailers in this case.

V. CONCLUSIONS

An optimal e-commerce platform should be made from a requirement perspective to satisfy the overall requirements. AHP method is an expert systematic approach to the alternative selection and justification problem. Hence, this study proposes an approach that AHP to help the food industries decision to select an optimal e-commerce.

First, based on literature review to select shop fee, annual fee, publication costs, transaction costs and security six factors evaluate criteria through e-commerce platform vendors, merchants and customers. The second is using expert-questionnaires and six factors to judgment the six e-commerce platform in Taiwan. Finally, AHP implementation and evaluation steps will be simplified by using the "Expert Choice" [19]. The result selected one of the best online e-commerce platform "ihergo" for the food retailer in this case.

The proposed approach can provide food industries with an objective method for making an optimal e-commerce decision to satisfy the overall requirements. The method can be applied to another industry. In further researches that can consider website hits or government policy factors and so on.

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