



# Using fuzzy TOPSIS method for evaluating the competitive advantages of shopping websites

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## ABSTRACT

Taking into consideration technology acceptance factors, website service quality and specific holdup cost factors, this research explores how shopping websites to establish their competitive advantages through these dimensions. We begin with an examination of the literature on shopping websites about its competitive advantages upon which we propose a conceptual framework. Then this research adopts the fuzzy TOPSIS as the analytical tool that determines the weights of each criterion. Fuzzy theory provides a proper tool to encounter with uncertainties and complex environment. The purpose of this paper is to use the fuzzy TOPSIS method based on fuzzy sets in solving MCDM problems. From our research results, the security and trust are the most important factors for improving the competitive advantage of shopping website. Moreover, the PCHome and Yahoo Taiwan rank the first two positions for shopping websites. This paper draws on the research results for implications of managerial practice, and then suggests some empirical tactics in order to enhance management performance for the website shopping industry.

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## 1. Introduction

Based on International Telecommunication Union (ITU) data, the worldwide online population was 870 million, which represents 14% of the universal population at the end of 2004 (ITU, 2005). The advent of the Internet over the last decade has meant radical changes for retail trading for many goods markets. The fact that e-commerce itself can be classified as a kind of information technology and that many business activities are done through the computer and Internet, including product transactions, advertising, selling services, etc., reveals the core issue of how Internet businesses can make themselves the customers' most trusted and shopped websites.

Previous studies have emphasized that the issue of consumer purchase process is important (i.e., Butler & Peppard, 1998; Dan, Ferrin, & Raghav, 2008; Rita & Henriette, 2004). Particularly, shaped during the online purchase process, consumers' attitudes and beliefs regarding convenience and security concerns have significant effects on their intention to purchase online (Limayem, Khalifa, & Frini, 2000). Shanker, Smith, and Rangaswamy (2000) also contended that service provided during and following the purchase is essential to e-consumers' repeat purchases.

On the other hand, while a number of studies have documented the significant role of website technology factors and service qual-

ity in influencing competitive advantage of online shopping website (i.e., Anderson & Srinivassn, 2003; Devaraj, Fan, & Kohli, 2002; Flavian, Guinaliu, & Gurrea, 2006; Ribbink, Riel, Liljander, & Streukens, 2004; Shih, 2004; Szymanski & Hise, 2000), little is so far known about the reflection of customer-related factors in the same regard. Hence, this research will move forward to another perspective and discuss how factors such as specific holdup cost or habit issue, together with external factors, affect the competitive advantage of online shopping website as a whole.

In the literature, there is no fuzzy logic method aimed at prioritizing the shopping websites. The main purpose of this paper is to provide practitioners with a fuzzy point of view to traditional research for dealing with imprecision and at obtaining the prioritization of criteria measurement dimensions. We take the shopping websites of Taiwan for pursuing our case purposes. This research invites 12 experts that evaluate different shopping websites via the proposed fuzzy TOPSIS method. The fuzzy TOPSIS is used to determine the weights of evaluation criterion and rank the alternatives of four shopping websites. This research looks forward to provide some empirical tactics in order to enhance management performance for the website shopping industry.

The reminder of this paper is as follows: Section 2 reviews the prior research that relates the advantage of shopping websites. Section 3 presents the methodology, fuzzy TOPSIS. Section 4 introduces the research design, which includes the research framework, research procedure, and empirical results. Section 5 presents some managerial implications and ways of improving efficiency. Limitation and future research direction are discussed in Section 6.

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## 2. What are competitive advantages for shopping website?

In this paper attention will be given mainly to online B2C transactions. This study begins by establishing a conceptual framework through a review of related theories and literature. There are three topics of conceptualization considered in this section: technology acceptance factors, website service quality and specific holdup cost.

### 2.1. Technology acceptance factor

Websites are essentially a type of information technology. Direct confrontation is an Internet transaction platform. Shopping websites allow customers to choose products based on their own needs and then provide businesses transaction platforms through interactive communications to fulfill the transactions. However, for the customer to easily consume online, he/she must first find the website useful and easy to use. This takes account of information search, Internet subscription, payment methods, etc.

A good number of previous studies adopt technology acceptance factors as a measure of willingness of customers to consume online. Davis (1989) proposed the technology acceptance model (TAM) to explain and predict user acceptance of information systems (IS) or information technology (IT). Davis (1989) defined PU as “the degree to which a person believes that using a particular system would enhance his or her job performance,” and defined PEOU as “the degree to which a person believes that using a particular system would be free of effort.” Within TAM, PU is a major factor, and PEOU is a secondary factor in determining system usage. Davis (1989) then also suggested that PEOU has a positive, indirect effect on system usage through PU.

Shih (2004) argued that individual attitudes toward e-shopping are strongly and positively correlated with user acceptance. His empirical research results (2004) confirmed that perceived ease of use of trading online (PEOUT) and perceived usefulness (PU) significantly determine individual loyalty toward e-shopping. It also confirmed the significant effect of PEOU of the Web on PEOUT, which in turn affects PU as well. However, PU was not found to affect user acceptance significantly. Additionally, user satisfaction with the Internet/WWW and perceptions of information, system, and service were shown to affect user acceptance significantly. On the other hand, recent findings also suggested that customer satisfaction in the online environment is significantly higher than in traditional channels as a result of ease of use in acquiring information. Ease of use can also affect transaction costs when it pertains to information search (Shanker et al., 2000).

Based on above discussion, technology acceptance factor contains four criteria about the competitive advantage of shopping websites. There are Efficiency, Practical, Ease Use and Time-Saving. Efficiency means that the browse function in the shopping website can increase customers' shopping efficiency. Practical means that the credit function in the shopping website can raise customers' shopping efficiency. Ease Use means that the operations of the shopping website are easy to understand and convenient to use. Time-Saving means that the shopping website saves customers a lot of other related shopping time.

### 2.2. Website service quality

For Parasuraman, Zeithaml, and Berry (1985, 1988a), service quality (SERVQUAL) is measured in 10 phases: accessibility, communication, capability, courtesy, trustworthiness, reliability, responsiveness, safety, tangibility, and understanding with customers. Parasuraman et al. (1988a, 1988b) also reduced the 10 to 5: tangibility, reliability, responsiveness, assurance, and empathy.

In electronic commerce, service quality measures have been applied to assess the quality of search engines and factors associated with Web site success. However, consumers' perceptions of online service quality remain unexplored. There are indications that electronic commerce service issues go beyond product price and may be the reason for consumers' preference for the channel. Yang, Wu, and Wang (2009) used four dimensions of SERVQUAL, which include reliability, responsiveness, assurance, and empathy, to measure the users' cognition of SERVQUAL in online channel. Keeney (1999) developed a means-ends objectives network for Internet commerce. The means objectives represent aspects of the customer's desired e-service experience (e.g., assure system security, maximize product information, maximize ease of use) and are operationalized by e-service process attributes during the customer's interaction with the e-service.

Relevant to service dimensions of the website, Devaraj et al. (2002) reported results of a study that measured consumer satisfaction with the e-commerce channel through constructs prescribed by three established frameworks, namely technology acceptance model (TAM), transaction cost analysis (TCA), and SERVQUAL. The study found that TAM components – perceived ease of use and usefulness – are important in forming consumer attitudes and in strengthening the e-commerce channel. This study found empirical support for the assurance dimension of SERVQUAL as a determinant in e-commerce channel satisfaction.

On the other hand, when the customers perceive better website service quality such as special treatment benefits, they will have more e-satisfaction; when the customers feel e-satisfaction of the website, they will be more e-loyalty; when the website is responsiveness, it will influence directly the customers' e-loyalty (Lai, Chen, & Lin, 2007). Furthermore, based on data from an online questionnaire of customers of an e-banking service, Oliveira (2007) employed structural equation modelling to examine the link between website service quality and customer loyalty. His research found a strong and significant link between the two constructs, suggesting that this relationship also holds in e-service settings.

According to above discussion, website service quality contains four criteria about the competitive advantage of shopping websites. There are Communication, Confident, Security and Trust. Communication means that the same shopping website personnel or records would remember customers' related consumption habits when customers shopping again. Confident means that customers are confident in buying products in the shopping website. Security means that customers feel secure to buy products in the shopping website. Trust means that customers trust in the shopping website that can provide appropriate service to them.

### 2.3. Specific holdup cost

Chiu (2006) divided transaction cost into four parts: explicit unit benefit cost, information search cost, moral hazard cost, and specific holdup cost.

With regard to the implicit factors, this study mainly discusses the customer's inner mental perceptions when shopping online. Thus, we will not discuss what explicit unit benefits the shopping website can offer to customers, but will largely measure how much a specific holdup cost would affect customers' e-satisfaction and e-loyalty. It's also because that the issue of familiarity/habit has been overlooked in the study of e-commerce.

In general, specific holdup cost refers to the relative lack of transferability of assets intended for use in a given transaction to other uses. Highly specific assets represent sunk costs that have relatively little value beyond their use in the context of a specific

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