A hybrid fuzzy model for selecting and evaluating the e-book business model: A case study on Taiwan e-book firms

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ABSTRACT

This study evaluates an appropriate business model for e-book firms in Taiwan. We apply expert questionnaires to calculate the weights, which contain five criteria, namely, business strategy (BS), finance characteristics (FC), market characteristics (MC), quality measurements of product and service (QS) and implementation (IM) (BCCSM) for the capability of developing the firms' business. Then, a fuzzy analytic hierarchy process (FAHP) is adopted to explore the weights of indices, and the VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR), grey relation analysis (GRA), and the technique for order preference by similarity to ideal solution (TOPSIS) are utilized to rank the three alternatives. The results show that a single brand is the best e-book firms' business strategy that is simultaneously integrated by content, platforms, and devices, while the top two weights of the evaluation criteria are the business strategy and market characteristics to enable firms to develop an appropriate e-book business model.

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1. Introduction

The e-book is an electronic text, which can be read on portable devices such as an e-reader or tablet. In addition, the evolution of flat panel display (FPD) technology and the Internet have created a brand new e-book market in recent years. For example, Amazon promoted an e-book reader, the Kindle, in November 2007. The e-book has clearly already changed people's way of reading.

This phenomenon has led manufacturers to launch more kinds of e-readers or tablets such as the Nook of Barnes & Noble, the Reader of Sony, the iPad of Apple, the flyer of HTC, etc. and makes the content of the e-book become more diversified. For instance, in addition to the early literature, many magazines, newspapers and books already have their own digital versions of the e-book. According to quarterly U.S. e-book revenue, Fig. 1 shows that the revenue of e-books continued to increase from less than $20 million in Q1 of 2008 to $250 million in Q3 of 2011 [7].

The medium of the written word has gradually been transferred to digital format from physical paper or books in recent years. For instance, over 6.7 million customers used Amazon's Kindle or Kindle Fire for reading e-books by Q2, 2012. In addition, the e-reader has created an incredible experience for customers. It is easy to carry, and many e-books can be downloaded into one device, making our lives more convenient. On the other hand, because of the evolution of new display technology (e.g., E Ink of Amazon, Barnes and Noble, and SONY; Qualcomm's Mirsol), customers can read e-books outdoors even in strong sunlight. Therefore, we can predict that the e-book industry will have tremendous growth in the future.

As for the characteristics of Taiwan's e-book market, it has large quantities of Chinese books and magazines besides those with English content, and in Taiwan several firms are producing devices and providing digital content simultaneously. Yeh [25] points out that Taiwan's e-book industry can be divided into two parts, namely, devices and content. In terms of devices, it is composed of the e-paper, panel, and OEM firms that manufacture the e-reader, and firms' e-reader brands. For instance, firms producing the e-paper include E Ink Holding (E-Ink), Delta, and the Industrial Technology Research Institute (ITRI). Both E Ink and AU Optronics Corp. (AUO) produce the panels. The OEM firms producing the e-readers are Inventec Appliances Corp. (IAC), Qisda, and Foxconn. As for the firms' e-reader brands, these include Acer, HTC and Asus. In addition, the content is composed of content providers, e-book production, and e-book platforms. For instance, the content providers are Cite Media (Cite), Yuan-Liou Publishing (YLib), and Linking Publishing (Linking). The e-book production firms include YLib, Airiti Incorporation (Airiti), and Linking. Furthermore, the e-book platform firms are eBook Taiwan, Udn.com (udn), Cite, Hami, and Hyweb Technology (Hyweb). Thus, we can discover that the

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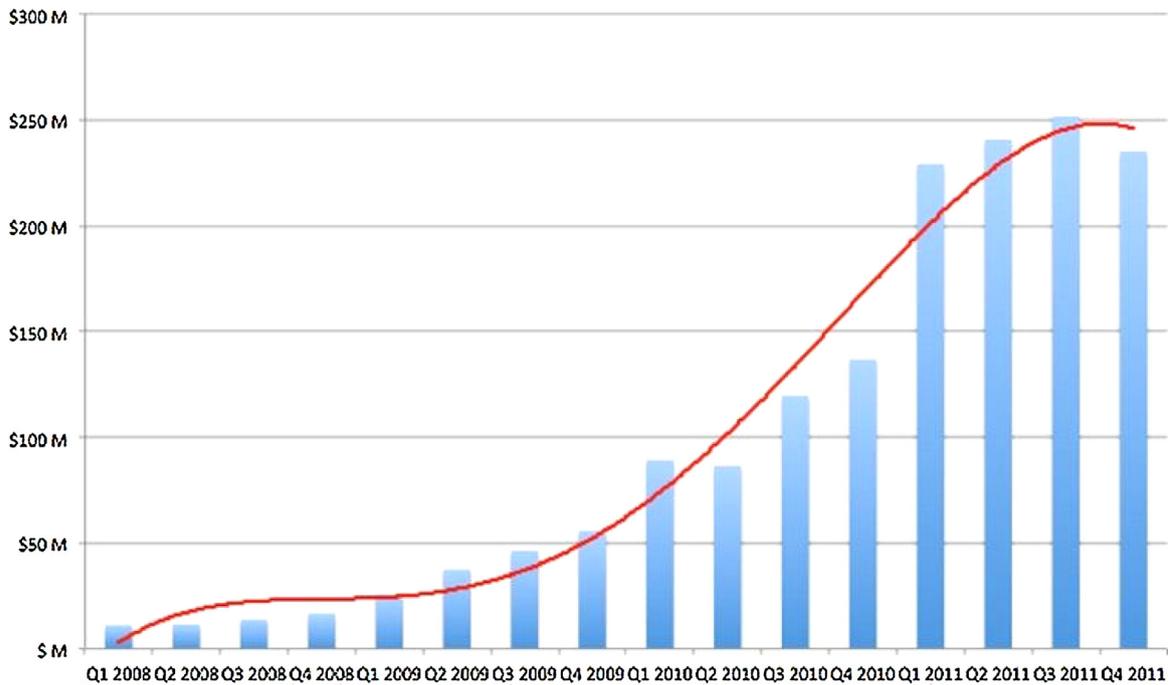
Fig. 1. Quarterly U.S. e-book revenue.   Sources: [7]

e-book supply chain in Taiwan is quite complete. It is our intention in this study to investigate or explore a widely suggested business model for firms in Taiwan's e-book industry, by identifying appropriate evaluation criteria.

There is so far no complete set of evaluation models of the e-book market for the reference of the e-book firms in their operations even though the e-book has rapidly been popularized. In this study, we consider a couple of criteria to assess the e-book, namely, quantitative indicators (i.e. profit, cost, and operation & maintenance fee) and qualitative indicators (i.e. positive image, firm experience, and competitive advantage). As a decision method, the analytic hierarchy process (AHP) or fuzzy AHP decomposes a complex multi-criteria decision-making (MCDM) problem into a hierarchy [20,3]. Therefore, this study addresses the concept of business strategy (BS), finance characteristic (FC), market characteristic (MC), quality measurements of product and service (QS), and implementation (IM) (BCCSM) to construct an alternative to the business model for e-book as well as selection models for e-book firms under fuzzy AHP hierarchical forms.

In the literature, there are few MCDM theories aimed at evaluating the strategy of e-book business model. This study provides the following three MCDM methods, namely, FAHP-VlseKriterijumska Optimizacija I Kompromisno (FAHP-VIKOR), FAHP-technique for order performance by similarity to ideal solution (FAHP-TOPSIS), and FAHP-grey relational analysis (FAHP-GRA) for constructing the e-book business strategy evaluation model. Based on the five perspectives of the BCCSM research framework, FAHP is first used to obtain the weights of the indexes. Then, the three MCDM analytical tools, VIKOR, TOPSIS, and GRA, are respectively used to evaluate and select the business model rankings based on the weight of each index. The empirical results reveal that the Model 1 has the highest value and that the Model 2 follows among the three business models in all three MCDM models.

The remainder of this study is organized as follows. The hybrid fuzzy MCDM model is introduced in Section 2. The empirical application and discussions are presented in Section 3. The final section concludes.
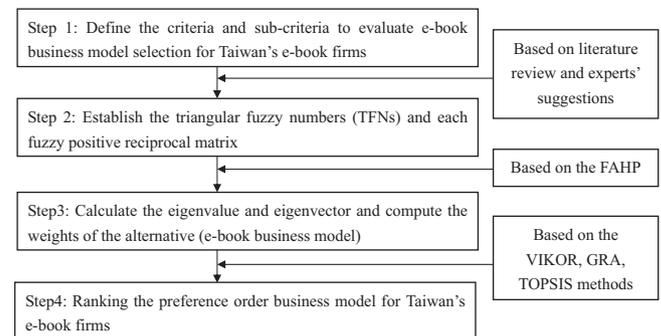

Fig. 2. E-book business model evaluation framework of the research.

2. A hybrid fuzzy MCDM model

This section discusses three hybrid fuzzy MCDM models with FAHP-VIKOR, FAHP-GRA, and FAHP-TOPSIS, while FAHP is used for determining the criteria weights in the VIKOR, GRA, and TOPSIS process. As shown in Fig. 2, throughout the analytical structure, we employ an FAHP approach to calculate the relative weights of the evaluation indices while VIKOR, GRA, and TOPSIS are used for ranking the e-book business model selection.[1] The concepts of the fuzzy MCDM and details of the analytical methods are explained in the following subsections.

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[1] The VIKOR, GRA, and TOPSIS are the three methods that are easy to apply in ranking alternatives in a MCDM environment. The VIKOR and TOPSIS methods are different in terms of the calculation procedures in normalization, aggregation steps, and ranking operation [24]. The feature of the GRA approach is that both qualitative and quantitative relationships can be identified among complex factors in a system, when the approach can examine the extent of the connections between two alternatives by using a distance measurement [12].