The use of a hybrid fuzzy-Delphi-AHP approach to develop global business intelligence for information service firms

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ABSTRACT

Due to globalization and saturated domestic markets, information service firms, upon growing to a certain size, gradually focus their business efforts on reaching global markets. In order to reduce business risk in developing international markets, using the alliance model is a key strategy for information service firms. On the other hand, firms should handle more accurate business information to support their business intelligence (BI) system to make better business decisions. This research uses a hybrid fuzzy-Delphi-AHP approach to propose a more comprehensive framework with specific business elements, and also points out six performance indices for firms to adjust business strategy. Results of this study could have considerable value for the information services industry to develop international markets.

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1. Introduction

Despite the financial meltdown's strong impact on the global economy in 2008, Gartner Dataquest research reported that the information service industry worldwide has exhibited a Compound Annual Growth Rate (CAGR) of 3.43% from 2007 to 2013, and that total production value of the global information service industry market reached US$744 billion in 2007 and was up to US$806 billion in 2008. In Asia, the CAGR is predicted to grow at a rate of 4.45% in the future. Hence, the information service industry is considered a developable sector. However, information service firms responding to saturation in domestic markets and the tendency of internationalization have focused on core competencies and operative strategies to ensure their firm's survival. The development of Taiwan's information service industry is one example in which CAGR of production value has 12.11% and export value is up to 10.9% from 2005 to 2009. Apparently, Taiwan's information service industry in the global market is growing steadily. According to the statistics from the Department of Statistics Ministry of Economic Affairs in Taiwan in 2009, the production value of the information service industry was NT$239 billion (2008, NT$225.8B; 2007, NT$211.2B) and export value was NT$35.0 billion (2008, NT$33.5B; 2007, NT$31.3B). From the standpoint of economic development potential, Taiwan has an important geographic loca-

tion in Asia's major economic region, and Taiwan has already developed numerous software systems for the manufacturing industry. Therefore, Taiwan should assess information service sectors having growth potential, and determine the best software service solutions for penetrating the global market.

On the other hand, the internationalization of information service firms introduces complex issues different from those faced by firms targeting only domestic markets and these issues affect the types of business models adopted. For instance, internationalized firms should comprehend global market characteristics, product core competencies, and global customer needs. In order to reduce business risk, firms need enough capital to develop international markets – particularly in countries whose domestic market is limited, such as Taiwan and Finland. For this reason, in recent years, Taiwan's Industrial Development Bureau of the Ministry of Economic Affairs (MOEAIDB) has promoted an "information services flagship-program" (also called the "BEST-Program") (Industrial Development Bureau of Ministry of Economic Affairs (MOEAIDB), 2004) which main purpose of BEST-program is to improve the development of individual firms and push the backbone firms to activate the cooperated firms to form a strategically cooperative way for opening international target markets. Each project (called "*title*-**flagship-project**") in this program should select a large-scale information service ("Flagship") having both competitive ability and large growth potential to collaborate with more than three software companies ("Partners") with complementary core abilities to form an alliance ("Fleet") to develop target international markets. Apparently, the alliance, or collaborative, model is a safer strategy for SEM firms entering the global market. Additionally, in order to expand effectively and quickly adjust to developing

global market conditions, information service firms should monitor business information using key performance indicators related to critical activities of their business. Briefly, useful information is necessary to business intelligence (BI) upon which information service firms builds better business strategies (Wang, 2005).

Therefore, in light of the importance of BI to alliance strategy for developing global markets, this research, based on the framework of Chen and Wang (2010), further integrates BI-based research to propose a more comprehensive framework built on specific business operation factors, and lists performance indicators through a hybrid-fuzzy-Delphi-AHP approach. The results are valuable for firms or governments planning related strategies in entering international markets.

2. Literature review

Hoch, Roeding, Purkert, Lindner, and Müller (2000) has divided software firms into package mass-market firms, enterprise solution firms, and professional service firms. Software product programs include working solutions (in pre-sales) and services such as implementation, training, hosting and product upgrades. That is, software implementation is always combined with service contents (Burgel & Murray, 2000; Ganek & Kloeckner, 2007). In Taiwan, the information service industry may be categorized into package, customization, and project industries (MIC, 2009). The business dimensions of information service firms are closely linked with the enterprise or strategic business models (Leidecker & Bruno, 1984). However, compared to physical products, software products are generally expensive to produce, but very cheap to reproduce (Chen, Wang, Chen, & Wang, 2007; Krishnamurthy, 2003; Nambisan, 2001; Westerlund, Rajala, & Svahn 2007). In addition, the information service industry is a knowledge-intensive industry (Rajala & Westerlund, 2007a; Rajala & Westerlund, 2007b), and provides a wide range of products and services to meet customer needs. Compared with other traditional industries, information services industries are "information-oriented" and provide "intangible goods". Therefore, the business models of information service firms are different from other industries (Bonaccorsi, Giannangeli, & Rossi, 2006; Chen, Wang, & Chio, 2009; Hedman & Kalling, 2003; Lee, 2008; Magretta, 2002; Rajala, Rossi, & Tuunainen, 2003).

Some researchers have pointed out different aspects of the influence of internationalization, such as pricing (Jain & Kannan, 2002; Sainio & Marjakoski, 2009) and product offerings (Bell, 1997; Ruokonen, 2008), customization (Burgel & Murray, 2000; McNaughton, 1996), intangible assets (Bieberstein, Bose, Walker, & Lynch, 2005). Rajala et al. proposed a reference model with four operative dimensions: product strategy, revenue logic, distribution model, and service and implementation model. Based on Ojala and Tyrväinen (2007), Rajala et al. (2003) proposed to analyze the entry model for software firms to enter the Japanese market. They also pointed out that product strategy is a key for software internationalization. Other researches quote the framework proposed in Rajala et al. (2003). Ojala and Tyrväinen (2006) used individual case studies to summarize and analyze the relationship between a business operation model and a market entry model based on the operation model framework provided by Rajala (2003). They also based on Rajala's (2003) framework for fulfilling requirements in internationalization, suggested including the strategic technique of marketing regional or global products as a primary factor; most other studies also took Rajala (2003) research as a reference.

However, Rajala et al. (2003), Rajala and Westerlund (2007) emphasized the concerns of individual firm businesses, but they fail to consider other key dimensions for entering the global market, e.g. market size and culture (Griffith, 2010; Ojala &

Tyrväinen, 2006), outsourcing (Tiwana, 2004; Willcocks & Choi, 1995; Winkler, Dibbern, & Heinzl, 2008), service and consulting (Ganek & Kloeckner, 2007), domain knowledge (Rajala & Westerlund, 2007a; Rajala & Westerlund, 2007b; Tiwana, 2004), partnership (Coviello & Munro, 1997; Wild, Wild, & Han, 2008), and manpower (Barcus & Montibeller, 2008; Bieberstein et al., 2005). In order to propose a more comprehensive framework, taking careful consideration of other dimensions for information service industry alliances in developing international markets, Chen and Wang (2010) applied a cross case study method (Gable, 1994; Yin, 1994) to offer definitions of each factor, and proposed a business model framework for firms to develop target international markets; Chen and Wang (2010) also used an AHP approach to mark out weights of business elements, including market segment, strategic partners, service/implementation, product competition, distribution/channel model, and revenue efficiency. In addition, they also reported 20 critical factors (see Appendix A). Chen and Wang (2010) have contributed key insights in this framework for allied firms to develop international markets.

However, the most important aim of information service firms desiring to expand their market is effective development of new markets. Therefore, firms should allocate capital and resources in a manner optimal for developing various markets. Thus, a BI system is an important tool for alliance performance when developing new markets. Several studies have suggested the benefit of BI for business performance. However, BI systems cover a wide range of tools and have broad scope. The most commonly mentioned BI applications are data warehouses, data mining, OLAP, decision support systems (DSS), and balance scorecards (BSC). The purpose of BI is to provide users with the best possible assistance in the process of decision-making (Eckerson Wayne, 2005 (chap. 3); Wang, 2005). Up to this point, however, there are few studies of performance indicators for alliances of information service firms to expand into the global market.

Based on the above review, the chief aim in this article is to contribute the following: (a) to provide a more comprehensive framework with specific business elements, (b) to report performance indicators for alliances of information service firms, and (c) to determine weights of business elements

Therefore, based on the literature review and in reference to the former studies, such as Rajala and Westerlund (2007a), Chen and Wang (2010), this study proposes a business strategic architecture in opening global market through a hybrid fuzzy-Delphi-AHP approach. Both Delphi and FAHP (fuzzy analytic hierarchy process) are useful for business strategic planning. The Delphi method is used to effectively create a consensus or conclusion about an issue through insight and knowledge of experts, and it is a qualitative contents; FAHP approach is quantitative approach for the enterprise to use for optimal decision making strategy in business (Basligil, 2005; Chan & Kumar, 2007; Chang, 1996). Due to the current business strategic architecture is still an immature model, there is need to use qualitative research with quantitative research. With this in mind, this study adopts the two methods with fuzzy theory.

This article concludes with implications for theory, research, and practice; results of this research could increase success of the information services industry in developing global markets.

3. Research methodology

3.1. Research architecture

The research architecture of this article is structured as shown in Fig. 1. Firstly, the author, based on the model proposed by Chen and Wang (2010), determines the final dimensions (and subcriteria) through fuzzy-modified-Delphi method. Secondly, this study reports the performance indicators through modified Delphi