A fuzzy AHP to prioritize enabling factors for strategic management of university business incubators: Resource-based view

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A B S T R A C T

University business incubators (UBIs) are organizations designed to accelerate national economic development by assisting start-up firms, particularly new technology-based firms during their growth and development phase. The purposes of this study are to identify the enabling factors influencing the success of UBIs with respect to specific internal resources, and to explore the priority of these factors, using evidence from Thailand, an emerging market country. Two research questions were addressed: (i) whether resource-based enabling factors are applicable to Thai UBIs; and (ii) how varying the relative importance of these factors affects performance. A questionnaire survey and in-depth interviews with key stakeholders were conducted to determine the applicability of these factors. Resource-based view was used to identify enabling factors in four categories: human, technological, financial, and organizational resources. Thereafter, fourteen applicable enabling factors were prioritized using fuzzy analytic hierarchy process. Finally, based on the findings, managerial and policy recommendations were provided to enable more effective strategic decision making for promoting UBIs.

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1. Introduction

New technology-based firms (NTBFs) play a significant role in economic development through the creation of jobs, generation of profits [1–3], developing new markets, and facilitating technological development [4]. However, start-up firms are characterized by newness and resource poverty [5]. They often lack technical and marketing capabilities, and have limited access to financial supports [6]. These can lead to failure of many start-up firms [6,7].

University business incubators (UBIs) are organizations designed to accelerate national economic development by assisting start-up firms, particularly NTBFs during their growth and development phase [8–10]. UBIs provide start-up firms with physical facilities and a variety of resources and services to help them increase their survival rate. Mostly UBIs

are created in the hope of spurring economic growth in their region, but they only have a potential role in contributing to economic growth if they are successful in providing the necessary support to start-up firms.

However, not all UBIs are successful. To promote the UBIs' success, incubator managers and policy makers need to understand what enabling factors will help them achieve success. Even if all the factors are known, it is not always feasible for UBIs to devote their efforts and resources to all factors, especially in cases where they lack sufficient resources to support all factors simultaneously. In order to be able to consolidate their efforts and resources on the most significant factors, the prioritization of enabling factors, therefore, need to be made explicit. This effort could be used to develop an improvement strategy for UBIs' resource provision and to increase efficiency in the resource allocation decisions.

Since the 1980s, many studies have dealt with the determination of enabling factors related to support UBIs. As a result, there are several different enabling factors identified, but there are limited studies to draw conclusions about

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which enabling factors should receive the most attention. In many emerging countries including Thailand, the issue of enabling factor identification has been hardly studied. For determining the relative weights of enabling factors based on subjective judgment, analytic hierarchy process (AHP) [11] can be applied. Although traditional AHP using crisp values may elicit the expert's knowledge, but it cannot fully reflect the expert's knowledge or human thinking [12]. A fuzzy AHP approach using linguistic values is, therefore, more appropriate to include the vagueness associated with experts in the decision making process [13–16].

In this study, the resource-based view (RBV) of the firm is needed, not just to identify enabling factors which influence the UBIs' success, but also to develop a theoretical framework for exploring the most significant enabling factors.

The remainder of this paper is organized as follows. The next section reviews the relevant literature on UBIs, the RBV theory, and fuzzy AHP. Section 3 describes the research methodology. Section 4 presents an application of an integrated fuzzy AHP model to UBIs. Section 5 presents the results and discussion. The last section presents conclusions, implications, limitations and future research directions.

2. Literature review

2.1. University business incubator

The basic concept of the business incubator is to provide start-up firms with a range of resources and services related to inaugurating the firms [17,18]. In this study, based on Thailand, the government has initiated many assistance schemes to help reduce the failure rate and to foster success for start-ups and early-stage small and medium enterprises (SMEs) since the economic crisis of 1997 [21]. One of the government's policy blueprint in assisting start-ups' and early-stage SMEs' development and survival is "business incubation". This project was initiated in 2004. The majority of key business incubators in Thailand are public universities [21]. The start-up businesses in UBIs will be nurtured by providing a variety of resources and support services with the advantages of an academic environment until they become strong enough to spin off as SMEs [22]. UBIs are a mechanism, in the Thai universities, that brings the research outputs including inventions and innovations to the commercialization and success through building up new businesses [22].

At present, Thailand has fifty-six UBIs [23] under the office of the Higher Education Commission (OHEC), Ministry of Education. In Thailand, UBIs are in an early stage of development, and so incubators and policy makers are important actors in the development process. In addition, UBIs in Thailand are relatively new when compared to UBIs in the United States and European countries.

2.2. The resource-based view

In strategic management research, RBV theory has emerged as one of the theoretical perspectives used to explain persistency in inter-firm performance differences [24,25]. According to RBV theory, firms are collections of unique resources and capabilities that are valuable, rare, inimitable and non-substitutable (VRIN) and which provide the firms with sustainable competitive advantage [26]. Resources are the tangible and intangible assets that are either owned or controlled by a firm, whereas capabilities refer to its ability to exploit and combine resources through organizational routines in order to achieve its aims [27].

When applying RBV to UBIs, the achievement of sustainable competitive advantage is considered in a wider and rudimentary sense by focusing on competing businesses. Therefore, the securing of survival and the encouragement of growth of the incubatees (tenant firms) are the competitive advantage of a UBI [5]. In this context, RBV theory can be applied as a means of explaining how the UBI's resources and capabilities enable start-ups, a sponsoring university, a community or even an incubator itself, to gain competitive advantage and superior performance, and to explain what resource-based factors influence the success of UBIs.

After reviewing the literature on business incubators through the lens of RVB perspective, we found that resources could be classified into four categories: human, financial, technological and organizational resources [28]. The four categories used are almost the same as those found in Barney and Hesterly's [29] study, except that in this study, a category of technological resources is used instead of physical resources. However, the definition of technological resources is quite similar to definition of physical resources in Barney and Hesterly's [29] study. The four resource categories are defined as follows. "Human resources" refer to attributes of the founding team, a business incubator's management team and staff by which their unique talents and skills are vital to the success of the business incubator. "Technological resources" refer to the firm-specific products and (physical) technology [30], equipments/laboratories, highly specialized skill sets, and technological capabilities [31].

"Financial resources" refer to all financial and in-kind support that firms can use. "Organizational resources" refer to capabilities associated with formal and informal planning, controlling and coordinating [26] and also refer to systems, routines and relationships embedded in the firm [32].

From the literature study, 14 enabling factors extracted from the RBV perspective were identified as summarized in Table 1.

2.3. Fuzzy AHP

AHP is widely used across industries for dealing with multiple criteria decision-making problems involving subjective judgment [13]. However, AHP is often criticized for its inability to adequately accommodate the inherent uncertainty and imprecision associated with mapping decision-maker perceptions to an exact number [42,43].

Since a multiple criteria decision-making problem is subjective and qualitative in nature, it is very difficult for the decision-maker to express the strength of the preferences using exact numerical values [43–45]. Therefore, fuzzy AHP method, which combines traditional AHP with fuzzy set theory, was developed for coping with uncertain judgments [46–48] and to express preferences as fuzzy sets or fuzzy numbers which reflect the vagueness of human thinking [49,50]. The basic idea of fuzzy set theory is that an element has a degree of membership in a fuzzy set [51].

The membership function $\mu_A(x)$ of a fuzzy set operates over the range of real numbers [0, 1]. In this study, triangular