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Dynamics in business models: An empirical analysis of medical biotechnology firms in the Netherlands

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Abstract

In this paper, business models of Dutch dedicated biotechnology firms (DBFs) that are active in the field of medical biotechnology are examined. The focus is on the dynamics in business models within the Dutch population and the mechanisms that generate these dynamics. Furthermore, we propose a value-added sequence of the business model of a firm over time and examine if this sequence is found in the population of the Dutch DBFs. We focus on the business models at founding and the shifts that occurred in these business models afterwards. Therefore, data on a survey completed by 80 Dutch DBFs was used together with longitudinal data on shifts in business models of four case studies.

We show that both the generation of new firms, due to shifts in the dominating business model at founding over time, and shifts in business models after founding contribute to the dynamics in business models within this population.

Keywords: Biotechnology firms; Business model dynamics; Value-added sequence

1. Introduction

The term 'business model' is an abstract term. Some authors that studied biotechnology firms, for example Lim (2003) and Pavlou and Belsey (2005), discerned different types of business models but did not define the general term. Chesbrough and Rosenbloom (2002) did develop a useful definition of the business model, although not specific for biotechnology firms. According to them, the business model describes how the firm *plans* to make money and specifies the position of the firm in the value chain (Chesbrough and Rosenbloom, 2002). This definition implies that the activities a firm is engaged in are embedded in its business model. This portfolio of activities is, by definition, broader than just the main revenue generating activities of a firm. The business model of a firm does, however, provide an indication of the expected main revenue generating activities of the firm in the future. The choice for a specific business model is an important strategic choice, as firms can use it to position themselves within an industry.

In this paper, we study business models in medical biotechnology. Recent examples of studies on this subject include those by Mangematin et al. (2003), Nosella et al. (2005), and Bigliardi et al. (2005). Based on variables like the business strategy and the positioning of the firm Mangematin et al. (2003) clustered French biotechnology firms into two groups with distinct business models. It was concluded that these two types of firms required different resources for their development. Bigliardi et al. (2005) carried out a cluster analysis of Italian biotechnology firms, based on the previous research of Nosella et al. (2005). They found three types of business models, namely 'service companies', 'small research companies', and 'integrated companies'. Most of the research considers business models as a static characteristic of an individual firm. In order to contribute to the literature on business models, we focus on business model dynamics of the population of Dutch dedicated medical biotechnology firms (DBFs). We propose that the dynamics in business models within the population of medical biotechnology firms can originate from two sources. On the one hand, the generation of new

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firms can contribute to these dynamics, as the dominance of different business models at founding can change over time. On the other hand, shifts in business models of firms after founding can also generate dynamics within the population of firms. We therefore examine the shifts that have occurred in these business models after founding. Business model dynamics within firms is conceptualized as a sequence in the development of a business model of a DBF over time. Our aim is to examine how both of these mechanisms, dynamics due to founding and dynamics due to shifts, have contributed to the distribution of business models in the population of medical biotechnology firms. Unlike the authors mentioned above, we conduct our analysis using a predefined subdivision of business models that is specified to the context of medical biotechnology. Furthermore, we relate business models to profit generating activities, in order to clarify their distinctiveness.

2. Business models in Dutch medical biotechnology

2.1. Types of business models

In modern biotechnology, the activities of firms range from offering services to carrying out the whole drug development process. Here, we discern the following types of business models: service firm, platform firm, hybrid firm, early stage drug developer and advanced stage drug developer (Scarlett, 1999; Whittle, 2002; Lim, 2003; Ernst & Young, 2004; Pavlou and Belsey, 2005).

A service firm is a firm that provides services or carries out contract research (Ernst & Young, 2004; Bigliardi et al., 2005). This includes for example firms that carry out cloning or sequencing for other firms (Bigliardi et al., 2005). In general, the capital required for running a service firm is relatively low compared to the other business models (Bigliardi et al., 2005). The specific advantage of service firms is that they have the ability, the instruments and trained personnel to apply specific methods in an effective way (Luukkonen, 2005). This is often based on tacit knowledge of employees and informal contacts with university researchers (Luukkonen, 2005). Platform firms are firms that have developed an enabling technology or technologies that tackle a specific bottleneck in the drug-discovery process (Whittle, 2002). These firms are focused on out-licensing their technology to other pharmaceutical or biotechnology firms. According to Casper (2000) an advantage of platform firms is that the technologies they developed are very stable and cumulative. This means that the technologies are mostly broadly applicable, and that the number of application areas can be extended over time by areas that are related.

Product firms are firms that have drug development as their principal activity. Product firms can be divided into early and advanced stage drug developers, depending on the stage of development of their products. Early drug developers have products up to Phase I/II of the clinical trials, and advanced stage drug developers have products in at least Phase III of clinical trials. It is important to note that these firms that aim at product development often do not have any products on the market yet. Therefore, we expect that they will need additional sources of revenue generation. We will provide insight into this subject in our results section.

A hybrid model is a business model in which a combination of activities (service, platform or product development related) is carried out (Hu and Mosmuller, 2003). Possible models are therefore, a hybrid service & product model, a hybrid platform and product model or a hybrid service and platform model. Data on German biotechnology firms show an increasing importance of these hybrid business models (Ernst & Young, 2004). The use of a hybrid business model enables a DBF to have a relatively steady income originating from either offering services or out-licensing a platform technology and later on to diversifying its business by engaging in drug development. This relatively steady income does not solve the need for attracting external capital for medicinal product development, as the investments required to engage in this activity are generally too high.

2.2. Business model dynamics

As was already explained, we propose that dynamics in business models can originate from two sources. First of all, the predominant business model applied by newly founded firms can change over time. Secondly, firms can shift from one business model to another. Such shifts are proposed to be triggered by the emergence of new profit generating opportunities that need to be utilized to enable firm growth. This notion of shifting business models is related to more general stage-of-growth models of firms, as described by Poole and Ven (2004). We contribute to these models by providing a sequence of firm development based on the evolution of activities unfolded by a firm. Fig. 1 shows what we propose is a logical sequence of business model development in medical biotechnology over time. This sequence is depicted as a value-added chain that is shaped by the limited resources available to biotechnology firms (Woiceshyn and Hartel, 1996). In Europe, the financial climate (government funding as well as venture capital) for young biotechnology firms is not very favourable compared to the US (Casper, 2000; Prevezer, 2001). Casper (2000) shows that German firms therefore often start as platform firms, while the majority of the US firms starts as product firms, developing therapeutics. Therefore, when the evolution of the activities of DBFs is concerned, value-added progress (Woiceshyn and Hartel, 1996) is a key issue. It implies that firms start their business with conducting relatively less resource intensive activities that lead to a relatively low level of economic value, and then over time set up more resource intensive activities that result in an increase in the economic value of the firm (Smith and Fleck, 1988). Prior research has shown the relative prevalence of different business models in German