

Business models in Italian biotechnology industry: a quantitative analysis

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Abstract

The aim of this research is to study the business models of the Italian biotechnological firms through a statistical analysis, using the data base made up in the previous work by the same authors of this paper. The results of the study show the existence of four clusters grouping biotechnological firms: 'service companies', 'small research companies' (NBFs), 'Traditional integrated firms', 'Industrialized Integrated firms'. We then analyse the patterns of the development of biotechnological firms in Italy.

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1. Introduction

Biotechnologies represent one of the most significant emerging technologies, whose different applications can be used for the growth of knowledge-based industry. The business of biotechnologies has taken place in Italy later than in other countries (i.e. the United States and other European countries), and this consideration has led some experts to maintain that Italy has already missed the 'train of biotechnologies' (OPES, 2001). However, by a previous research made by the same authors of this paper, it turned out that recently there have been signals of development, especially in the pharmaceutical industry (Nosella et al., 2004).

The objectives of the previous study can be explained as follow:

- to undertake a census of Italian biotechnological companies, after having defined them as companies which are innovative and carry out R&D or at least industrial development;
- to identify and to describe their strategic profile and innovative processes;

- to identify the business models adopted by these companies.

The aim of the present study is to examine in more details the previous research and to go on with it. From the previous study it resulted that the companies analyzed were positioned in different competitive segments; in other words, it turned out that these companies were different according to the type of product/service sold out on the market and to their innovative processes. In particular, it emerged that, due to the different competitive factors, these companies could be classified based on the predominant business model they use in five categories, described below:

- companies (usually pharmaceutical) with an high level of scientific knowledge that operate predominantly in the applied research (NBFs): NBFs are typically young small companies that sell their product (research output) or set up partnership with larger companies able to produce and commercialize their products;
- vertically integrated companies, that are established companies which have the resources and the capabilities needed from research through to commercialization. Both established companies (with their own inner department dedicated to the development of biotechnological products) and companies that are born and have been working only in the biotechnological industry belong to this business model.

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These companies not only develop new products/processes internally, but also establish permanent collaborative relationships with other companies such as small research firms, with the purpose to share the risk of the failure on various projects and, most of all, to widen their own knowledge base;

- companies whose major areas of business are industrial development, production and commercialization: they are generally manufacturing companies that ‘buy research’ carried out by other companies, usually by the small firms previously mentioned. The number of these companies (prevalently operating in pharmaceutical industry), is quite small. The challenges that these companies have to face with are, generally, further improvements of the production processes (in order to obtain higher standards of quality), and the manufacture of products in the respect of strict technical safety-oriented specifications, established by regulatory Bodies (Pisano and Wheelwright, 1995);
- companies that produce and sell services, that are companies of recent constitution that provide research (e.g. chemical synthesis, cloning and sequencing) to other companies. Generally, the capital required to start up this type of entrepreneurial mission is lower than the capital required by other companies previously described;
- integrated companies that sell their products to other companies: these are firms focused on the use of biotechnologies in the development of production processes (e.g. production of monoclonal antibodies, cells and proteins), often in collaboration with the customer, and that end their role with the supply of the product (Cockburn et al., 1999). In Italy, this type of business has not yet been adopted by a large number of companies, due to the fact that biotechnologies have been applied prevalently in research processes rather than in the new product development.

The five categories described above resulted by a close review of the literature and, additionally, by an empirical survey. In particular, the hypothesis on the first four models arose for the most part by the analysis of the data collected, while for the fifth category it is resulted of more valuable the review of the actual literature. For this reason, it is not possible, with the data available up to now, to state some hypotheses on the fifth category; therefore, it will be the object of further study.

The aim of the present work is to study in depth and to verify the results regarding the four emergent business models through a statistical analysis, using the database made up in the previous work by the same authors. Specifically, the objective of this research is, first, to verify the existence of clusters of companies with similar characteristics, that are internally homogeneous groups (but heterogeneous among them). These clusters will be then compared with the four models in order to check for

consistency with our previous work and the emerging literature.

If the results will confirm these hypothesis, it will represent a statistical evidence of the existence of these four business models, and the next step of the research will be the analysis of a single representative case, with the purpose to specify and outline in depth the features of each model.

2. The context

The present study has analyzed the Italian companies that develop new biotechnological application in order to obtain new products/processes or to improve the existing ones (e.g. fermentation, DNA recombination techniques, etc.).

According to the Organisation for Economic Co-operation and Development (OECD, 1989), biotechnology consists in the use of scientific and engineering principles (based on microbiology, genetic, biochemistry, chemical and biochemical engineering) to transform materials using biological agents, (such as micro organism, enzymes, animal or vegetable cells), with the purpose to obtain products and services.

OECD, in order to make more understandable the different employments of biotechnologies, has classified it into three categories:

- classic biotechnologies: age-old biotechnologies, such as fermentation;
- recent biotechnologies, asserted after the industrial revolution: this type of biotechnology has allowed to obtain vaccines, enzymes and hybrids;
- new biotechnologies, well-established after 1970, principally because of the discovery of techniques such as DNA recombination and cellular fusion.

The recent discovery related to genetic engineering can be considered the ‘propelling element’ that has greatly increased and spread the possible uses of biotechnologies. In fact, the industries in which these technologies are at present developed are numerous and they mainly take in healthcare, agriculture and zootechny, feeding, fine chemistry, environment, instrumentation (see website: www.assobiotec.it; Spalla, 1996; Alberghina and Cernia, 1996; Nosella et al., 2004).

The United States have been the pioneer country in the development of the new biotechnologies: in this country in fact, since the beginning of the 1980s, a network of small biotechnological firms (named NBFs), developing industrial applications out of genetic engineering started up. NBFs are small research firms interested, for example, in protein production, discovery of a new drug or in the supplier of some services. Usually, they are not able to complete the whole innovative path, and for this reason they create buyer-supplier relationships with larger firms, characterized by a consolidated presence into the industry (the so called

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