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R&D SPIN-OFF MODELS IN SPAIN

Key words

Technology transfer, commercialisation of research results, technology transfer mechanisms, technology transfer structures, R&D

Abstract

The recent years have seen increasing interest in the issues of technology transfer, as a result of which, in numerous countries, including Spain, research on models of R&D and industry cooperation has become widely promoted. The development of optimal models of technology transfer aims at the support of R&D commercialisation processes and enhances industrial implementation of innovative products and technologies. One of the common mechanisms of technology transfer and commercialisation of research results is the creation of spin-off companies.

In this article, the author identifies the technology transfer mechanisms and structures supporting the spin off processes in the Spanish public R&D and the business sector alike. Different models of spin-off creation models are presented, and legal regulations and national initiatives supporting commercialisation of research results through the application of this particular mechanism are discussed.

Introduction

There has been an increasing interest in the issue of the commercialisation of research results through spin-off ventures. Research and technology-based companies are viewed as one of the key elements of global knowledge-based economies, because they create new jobs for highly skilled personnel and offer high quality innovative products. The majority of spin-off companies established to commercialise research results are spun out of universities or public research organisations. In Spain, such companies are commonly known as "technology-based companies" (*empresas de base tecnologica-EBT)* or "innovative knowledge-based companies" (*empresas innovadoras basadas en conociemiento EIBC)*. The first of the names, i.e. EBT is a legal term, and it can be used interchangeably with the term "spin-off." The latter term – EIBC – encompasses a wider area and refers not only to academic spin-off companies but also to knowledge- and technology-based ventures established at technology centres and private firms.[1]

The awareness of the economic and technological benefits stemming from the activity of spin-offs has resulted in the introduction of effective knowledge transformation and technology transfer mechanisms in order to create suitable conditions for the commercialisation of research results in the developed countries [10].

In the case of Spain, the most appropriate division into spin-off categories is based on the type of parent institution from which these ventures emerge. According to this division, there are the following three types of spin-off ventures in Spain [1]:

– Academic spin-off (public sector), created as part of a public university, including the participation of the workers or members of the academic community;
– R&D spin-off (public sector), created by state research institutes CSIC; and,
– Private spin-off or start-up (private sector), spun out of another private company.

Based on literature review and the analysis and interpretation of legal acts concerning technology transfer [4, 5, 6, 7, 8, 12], the author presents mechanisms, procedures and models of spin-off creation in Spain.

1. Structures facilitating the establishment of spin-off companies in Spain

In order to fully understand the mechanisms of spin-off creation, the knowledge of the system in which they operate is necessary.

[1] In Spanish publications, the term "spin-off" is only used to describe technology-based companies in the public sector, whereas "start-up" refers to innovative ventures spun out of private companies or created by the employees of existing companies.

The Spanish education and innovation system encompasses public and private institutions engaged in the creation of new knowledge and technologies or their application. Although quite complex, the structure of this system is generally composed of the following three types of actors [3]:

– Public R&D sector institutions;
– Intermediary institutions supporting R&D and the culture of innovation; and,
– Private sector institutions.

The public R&D sector includes universities and public research organisations whose activity is focused on the generation of new knowledge and the development of innovative technologies. These two types of public R&D sector institutions are responsible for the majority of science and R&D activity in Spain.

The most important actor in the public R&D sector is the General Research Council (*Consejo Superior de Investigaciones Científicas* CSIC), whose science and R&D centres have the highest status among all Spanish public research organisations.

The intermediary institutions supporting R&D and the culture of innovation bridge the public R&D sector and the business sector, and their basic mission is to make the processes of technology transfer and commercialisation of research results more dynamic and to promote entrepreneurship among scientists and researchers [3]. The most common Spanish intermediary organisations include Technology Transfer Offices, Technology Parks, Technology Centres, and Public-Private Foundations.

Being the beneficiaries and the users of innovative technologies, the private-sector institutions are an essential element of the system. These institutions, both individually and collectively (e.g. foundations, chambers of commerce, etc.), are also the funders of R&D activity and frequently conduct their own research as well.

The majority of Spanish universities have recently introduced programmes promoting the culture of innovation, within which the support is mainly offered for the creation of spin-off companies [9]. The universities started to establish special management structures responsible for the coordination of technology transfer and commercialisation processes. As a result of the introduction of the National Plan for Science, R&D, and the Development of Technological Innovations, the Technology Transfer Office was created at Spanish universities. They are responsible for providing support for the development of the culture of innovation.

As a result of the above listed changes, the number of EBTs established at Spanish universities has significantly grown. The application of this transfer mechanism is more noticeable in the areas in which the results of both applied and basic research are highly likely to be translated into novel products and processes [3].

As execution of technology transfer processes is not an obligation, and providing support for this type of activities is also treated as a form of creating a culture of innovation. The national CSIC institutes focus on providing support for the spin-off creation process. This is executed by specialised CISIC bodies [6, 16].

In the case of structures supporting the establishment of EBT companies in the private sector, the ones worth mentioning are technology incubators, which are most frequently located within technology parks. Technology incubators provide business people with advice and training concerning the creation of a new company and its introduction into the market [1]. A special kind of technology incubator is entrepreneurship accelerators that offer help during the seed stage of the company's development and provide access to necessary infrastructure (e.g. office space, laboratories, warehouses, etc.).

2. Mechanisms supporting the establishment of spin-off companies in Spain

In Spain, direct support mechanisms targeting academic entrepreneurship and knowledge transfer between the R&D and the business sector, as well as financial mechanisms, i.e. fiscal, guarantee and venture capital mechanisms are the most common [11].

2.1. Direct support mechanisms

Direct support mechanisms are offered within national and regional strategies and R&D programmes stimulating the development of entrepreneurship and the culture of innovation at Spanish universities. The main government initiatives in this area include national programmes responding to the recommendations of the Lisbon Strategy, i.e.:

- The University 2015 Strategy and the *Campus de Excelencia Internaciona*[2] programme by International Excellence Centres;
- The National Programme for Public-Private Partnership and the INNPACTO programme within it; and,
- The National Programme for Technology Transfer, Valorisation and Promotion of Knowledge-Based Companies promoting the transfer of knowledge and technology leading to the establishment of spin-off ventures.

Programmes supporting technology transfer by means of spin-off companies are also executed regionally (e.g. the CAMPUS Programme, IDA in Andalusia or PRODEM in Catalonia).

[2] The main aim of the Program is to improve the quality of research results and their transfer to the economy through the creation of ecosystems of innovations focused around public higher schools.

As far as the direct support mechanisms are concerned, the most commonly applied by the Spanish universities are programmes promoting academic entrepreneurship, supporting the creation of knowledge transformation and technology transfer structures, and facilitating R&D-business cooperation in technology transfer (technology parks, technology centres, businesses). In the case of CSIC institutes, due to numerous legal limitations, direct support addresses only entrepreneurial researchers willing to commercialise the results of their research through a spin-off company.

2.2. Financial support mechanisms

The establishment of technology-based companies requires large investments at the initial stage of venture creation. When the investors cannot cover all the costs themselves, public and private institutions can provide all the financial support necessary. The main sources of external financing for spin-off companies in Spain include subventions, public loans, bank loans, venture capital, and business angels.

When discussing financial support mechanisms, the NEOTEC programme needs to be mentioned. It offers guarantee mechanisms, and the NEOTEC venture capital provides the researchers with the access to venture capital funds. The central and local authorities can use other financial support instruments to support the establishment of research-based spin-off companies. These include the reduction of costs through tax allowances and reliefs or subventions for spin-offs in particular industry branches[3] (fiscal mechanisms).

There are many different financial support instruments that spin-off companies are entitled to in Spain (Table 1).

Table 1. Financial instruments and sources of financing

	Source of financing						
Financial instruments	**Public administration**	**Banks**	**CSIC/ Universities**	**Venture capital**	**Business Angels**	**Shares**	**Partners**
Capital	Seed capital subventions		Capitalisation of debts	Start-up, seed capital	Seed capital, start-up	Shares on the stock exchange market	Own investments
Loan	Soft loans	Bank loans	Instalments on repayment obligations for the right to use licenses				

[3] Special support programmes, e.g. *Espacio*, *Areonautica*.

	Source of financing						
Financial instruments	**Public administration**	**Banks**	**CSIC/ Universities**	**Venture capital**	**Business Angels**	**Shares**	**Partners**
Subventions	Target subvention						
Cost cuts	Tax allowances		Free access to infrastructure				

Source: Author based on CSIC materials

The NEOTEC programme is one of the major financial support instruments. It is managed by the Technological and Industrial Development Centre, and its objective is to support the creation and the development of EBTs at universities and public research organisations [2]. NEOTEC offers help at two different stages of the EBT life – when the EBT is less than two years old, and when it has been on the market between two to six years. Within NEOTEC, an interest-free loan is offered for the 5-year company development plan, which will not exceed the 70 per cent of the value of the investment. The company is obliged to pay the loan back in annual instalments from the moment it starts to show a positive cash flow statement; however, the entire loan has to be paid back within 15 years. Companies which have been on the market between two to six years can be granted the loan on exactly the same basis, but the sum of the interest-free loan cannot exceed 1 000 000 EUR.

The NEOTEC venture capital was initiated in 2006. It offers two kinds of support, i.e. venture capital funds for private venture capital organisations and the venture capital funds for innovative technological companies.

Spanish universities and public research organisations offer spin-off companies different support instruments. The most common are cost cuts (free access to infrastructure, equipment, or the exemption from a part or all repayment obligations for the right to use licenses) [2].

Apart from the help offered by public institutions, there also are private financial support instruments to which spin-off companies can get access. These are venture capital funds, business angels, the sale of company shares on the stock exchange, or private investments of company partners [1]. The last of these options is by far the most frequently used source of financing spin-off ventures.

3. The procedure for the creation of spin-off companies at CSIC institutes[4]

As the main actor of the public R&D system in Spain, the CSIC is active in the field of technology transfer through developing innovative technologies ready to be commercialised and offering support for this process.

Based on the possibilities provided by the existing legislation, a spin-off creation procedure was developed for spin-offs established to commercialise the results of research conducted at CSIC institutes (Fig. 1).

The members of the research team take responsibility for the initiation of the spin-off process and the commercialisation of the results of their research. At all stages of the spin-off process, the entrepreneurial researchers can get help from the three qualified CSIC bodies, i.e. the Department for the Promotion of Research Results, the Department for the Protection of IPR, and the Department for the Support of Spin-off Companies.

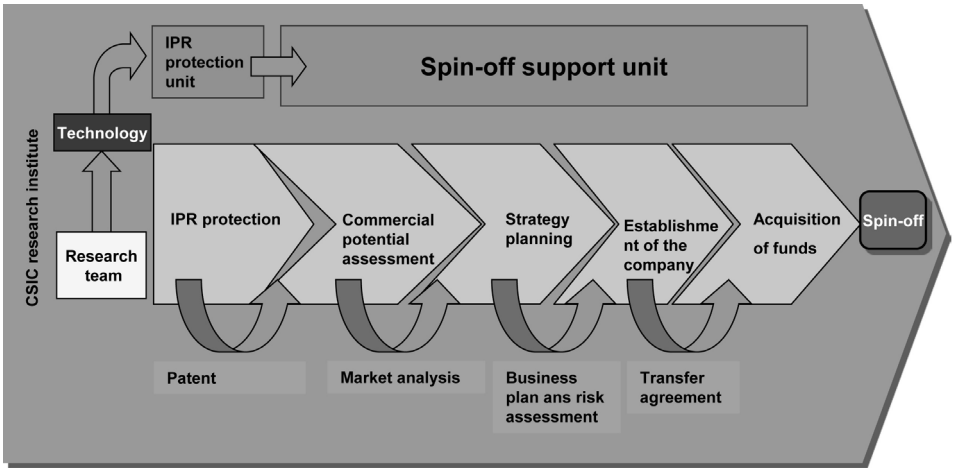

Fig. 1. Procedure preceding the creation of a spin-off venture at CSIC
Source: Author based on CISIC publications.

The stage of IPR protection is a crucial and a necessary stage of the procedure. At this stage, possibilities to patent the innovation are assessed, and once the patent is granted, the rights to publish the results of research are obtained, and then the spin-off procedure is initiated.

After that, the commercial potential of the technology is assessed. The market demand is analysed, and the decision concerning the palette of products the spin-off should offer is made. Additionally, recommendations about any necessary technological and utility changes are given to ensure

[4] Author based on CISIC data: http://ebt.ott.csic.es/ebt/Inicio.do

the higher economic potential of future products based on the commercialised technology.

Assuming that the two above listed stages are successful, a business plan is created. At this stage, the character of the EBT is decided upon (i.e. the legal form, the development strategy, the IPR management strategy, the organisational structure or the means of financing).

Before the next stage, the risks are analysed and assessed and the effective models of company management and a marketing strategy are developed.

Following that, the transfer agreement between the CSIC and the spin-off is signed.

At the final stage of the spin-off creation model, external sources of financing are explored.

4. Spin-off creation models in Spain

When analysing case studies of the formation and operation of spin-off companies in Spain, the author encountered three spin-off models: the academic spin-off model, the R&D spin-off model at research institutes, and a private spin-off model (Fig. 2.). The academic spin-off is created to commercialise university research results both in form of novel technologies or know-how.

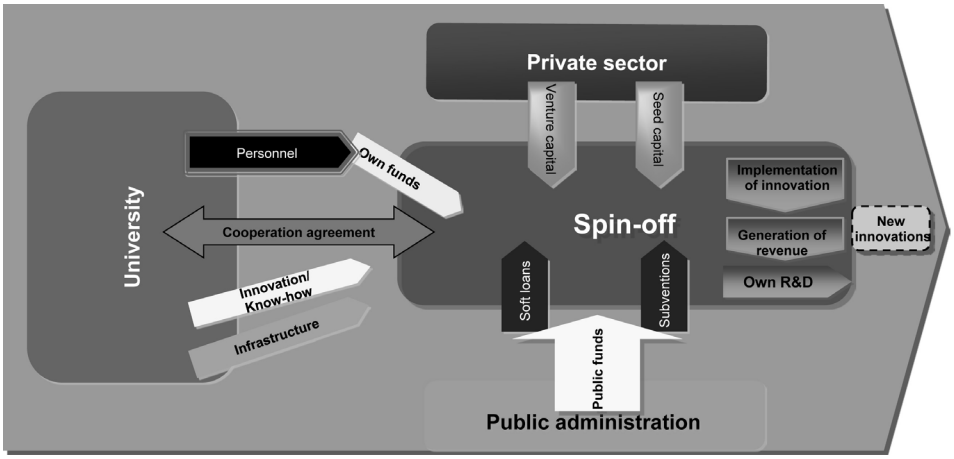

Fig. 2. Academic spin-off model in Spain
Source: Author.

In the case of the academic spin-off, the income it generates can be used for the spin-off's own R&D activity. This type of a venture is established by entrepreneurial academic researchers who are willing to commercialise their know-how expertise and the results of their research. They are assisted by

university Technology Transfer Offices and are entitled to the external sources of financing (i.e. subventions, venture capital funds, and private investments).

The characteristic feature of an academic spin-off is the lack of financial engagement of the parent institution [9]. The university's help is limited to providing free access to its infrastructure (laboratory equipment, office space, etc.), which the spin-off can use once the agreement of cooperation is signed.

It is worth noticing that there have been numerous simplifications introduced in Spain for entrepreneurial researchers that have significantly boosted the number of academic spin-offs [13]. The legal regulations concerning the issues of technology transfer and the commercialisation of research results have been amended to correspond to the needs of users and the demand of the market.

There are only slight differences between the academic and the R&D spin-offs established at a research institute (Fig. 3), which result from differing legal requirements as far as the technology transfer from these organisations is concerned.

CSIC research units are obliged to conduct scientific research, protect its results, and then transfer them to the market. Therefore, the objective of spin-off companies established by these institutions is to commercialise patented innovative technologies rather than the researchers' expertise. The CSIC spin-off is entitled to use the transferred technology only once the agreement is signed with the parent institution. This is mainly a licencing agreement. While university researchers can freely invest their own funds in the spin-off, CSIC researchers cannot have more than 10 per cent of shares in the new venture.

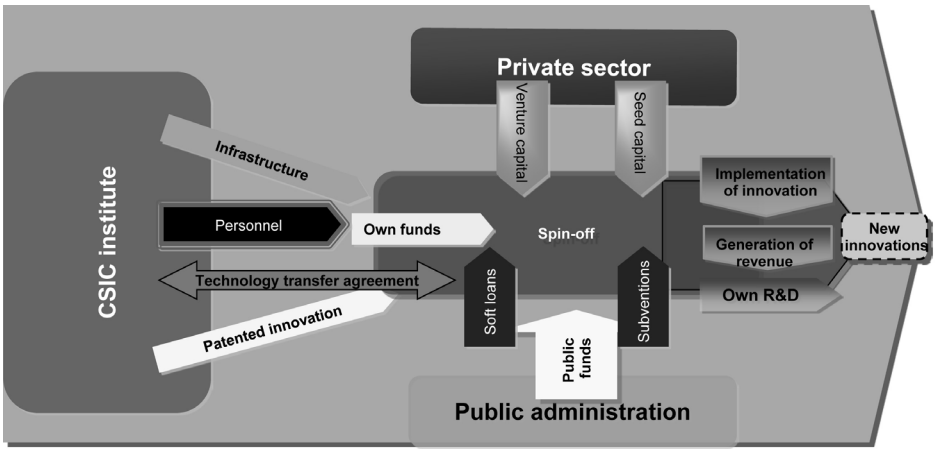

Fig. 3. R&D spin-off model in Spain
Source: Author.

The third spin-off model is the private spin-off by companies conducting their own R&D activity (Fig. 4).

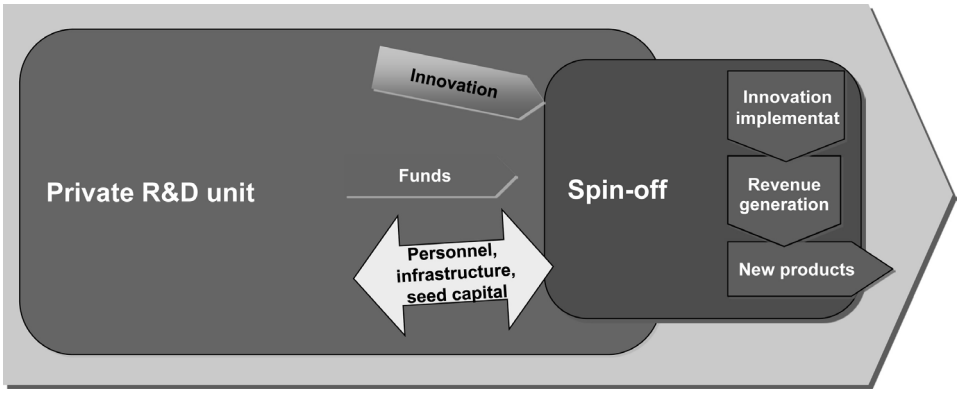

Fig. 4. Private spin-off model in Spain
Source: Author.

In the private model, the new company is set up based on an innovative technology developed by a private research centre. The income it generates is used for future research and the generation of the next novel products, which can be brought to the market. Spin-offs created using this model are closely connected to the parent institution, which has the role of the founder and funder of the company and is its main shareholder.

Summary

What characterises the creation of spin-off companies in Spain is the involvement and cooperation of the public and the private sector. The Spanish spin-off model is based on the commercialisation of patentable innovations; however, this is not a prerequisite. Thanks to the flexibility of legal regulations (as far as academic spin-offs are concerned), these ventures can also be established in order to commercialise unpatented innovations or expertise.

Significant simplifications introduced by the Act on science, technology, and innovations (2011), stimulate the creation and development of academic spin-off companies. In the case of CSIC research institutes, because they are not legally obliged to set up such companies, spin-offs are established to commercialise patented research results. The private sector is also active in supporting and creating spin-off companies.

The weaknesses of the spin-off mechanisms in Spain stem from the very rare financial involvement of parent institutions in these processes. In the majority of cases, the funds for establishing these ventures come from public support programmes or private investors.

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Modele tworzenia i funkcjonowania spółek typu spin-off w Hiszpanii

Słowa kluczowe

Transfer technologii, komercjalizacja wyników badań, mechanizmy i struktury wsparcia transferu technologii, spin-off, B+R.

Streszczenie

W ostatnich latach w wielu państwach, w tym również w Hiszpanii, trwają prace nad rozwojem najbardziej odpowiedniego modelu współpracy między przedsiębiorstwami i środowiskiem nauki. W efekcie tych prac wprowadza się zmiany, których celem jest wspieranie komercjalizacji wyników badań naukowych i wprowadzania na rynek innowacyjnych produktów i technologii. Jednym z mechanizmów realizowania tego procesu jest tworzenie spółek typu spin-off.

Celem niniejszego artykułu jest identyfikacja stosowanych w Hiszpanii mechanizmów i struktur wspierania tworzenia i funkcjonowania spółek opartych na wiedzy, zarówno tworzonych przez publiczne instytucje naukowe, jak i tych tworzonych w sektorze prywatnym. W artykule zaprezentowano modele tworzenia i funkcjonowania spółek typu spin-off na bazie obowiązujących regulacji prawnych oraz ważne, zdaniem autora, inicjatywy wspierania tworzenia firm typu spin-off w Hiszpanii.