

## University Spin-Offs: A Case Study On Their Characterization, Challenges And Entrepreneurship Ecosystem

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**Abstract:** University has moved away from the ‘ivory tower’ conceptualization that characterized it as an isolated and inexpugnable knowledge fortress. On the contrary, universities fully participate today of a system, acting the main agent for the dissemination of knowledge and technological change, but permeating its borders to be in full contact with its context. Academic literature, noting these transformations, has coined the term ‘entrepreneurial university’, to refer to this institution that interacts with private companies and other economic agents, exploiting entrepreneurship opportunities, and thus contributing to economic and social development. Within the context of the ‘entrepreneurial university’, this work focuses on business initiatives arising from academic R&D activities. For this purpose, the research provides a comparative study and a multiple case study based on in-depth interviews with the founding leaders of six firms constituted as spin-offs from the Public University of Navarre (henceforward, UPNA) and other agents related. The objective is to determine a characterization for these types of firms, with the aim of contributing to the literature regarding the phenomenon of university spin-offs and its idiosyncrasy. In turn, this work intends also to identify the main challenges faced by these firms, and to carry out an exploratory study on how the entrepreneurship ecosystem –promoted by the University- helps in overcoming these challenges. In this sense, the results of the analysis highlight the difficulties regarding the need to combine practices to explore disruptive technologies with the need to guarantee a sustainable model for the exploitation of the products developed by these spin-offs. Therefore, this study concludes that the main challenge for university spin-offs is ambidexterity. In addition, it elaborates on the relevance of the support instruments provided by the ecosystem, which intend to complement the initial deficiencies of university spin-offs in matters of management and commercial strategy. This insight is undoubtedly useful for practitioners, researches and policy makers alike.

**Keywords:** case study; university spin-offs; entrepreneurial ecosystem; entrepreneurship; technology-based companies; ambidexterity

### 1. Introduction

University stands as the figure par excellence in charge of the creation and dissemination of knowledge, which constitutes its main purpose (Wright et al., 2004). However, the conception regarding the activities that should embody this mission, have undergone substantial changes in recent decades (e.g., Miller et al. al., 2018; Centobelli et al., 2019). In this sense, the traditional research-teaching binomial has been completed with a third component related to the process of knowledge transfer and economic and social development; i.e., the fostering of innovation and entrepreneurship (Centobelli et al., 2019).

Framed within the context of 'entrepreneurial universities' (Rothaermel et al., 2007; Centobelli et al., 2019), this work focuses on business initiatives arising from academic research results, that is, university spin-offs. In particular, this study adopts a qualitative research approach, and provides a multiple case study based on in-depth interviews with the founding leaders of six firms constituted as spin-offs from the Public University of Navarra (henceforward, UPNA) and other agents related.

The objective is to highlight a series of common aspects that configure the characterization of this kind of firms. In addition, through a comparative case study, the aim is to identify the main challenges these companies face, as well as to determine the role that the entrepreneurial ecosystem fostered by UPNA plays in how spin-offs overcome said challenges. Diverging from the focus on this particular University, the purpose is also to provide conclusions applicable to the generality of firms that fall into the category of university spin-offs.

Summing up, the research questions of this study could be posed as follows: Which are the most relevant characteristics that define the phenomenon of university spin-offs? How do the particularities of this kind of firms affect the main the challenges they face and which are these challenges? How does the entrepreneurship ecosystem help university spin-offs overcome said challenges?

In the following sections, the aforementioned aspects will be developed. In the first place, a literature review on the phenomenon of university spin offs will be offered, with the purpose of presenting the analytical framework for drawing conclusions regarding the characterization of this kind of firms within the case study. Later, the main methodological aspects of qualitative research will be explained and the the spin-offs that conform the multiple case study will be presented. Results will be discussed in the next section; first, the analysis on the common features of the detected companies will be presented, in order to advance in the reflection on the characterization of university spin-offs, and the main challenge facing these companies will be stated. Second, an overview will be offered on the UPNA entrepreneurial ecosystem and, in particular, on the actions aimed at supporting the creation and sustainability of university spin-offs, in order to determine about their role in facing the challenge detected. Finally, the conclusions of the study will be summarized.

## **2. Literature review and analytical framework**

The current understanding of the mission that universities embody as social institutions has been reflected in various academic contributions. For example, in the context of innovation ecosystems, Etzkowitz and Leydesdorff's (1990) triple helix model established the premise that in order to foster economic and social development, the triad University-Industry-Administration needs to be aligned. This theoretical construct would be complemented years later by Carayannis and Campbell (2009), who added a 'fourth helix' to include society in the model, as an agent that both demands and co-creates knowledge and emerging technologies.

The interaction between various agents and the transformative nature of knowledge was also the object of reflection in the reference work by Gibbons et al. (1994), who proposed the existence of two paradigms regarding the production of knowledge and the role of the University in economic and social development. The traditional paradigm ('mode 1') implies the

development of basic research activities by universities, the results of which are disseminated to society through their educational work. 'Mode 2' considers universities as key actors for the transfer of knowledge and technology to industry and society, through both the inclusion of applied research work in the academic field and the commercialization of the knowledge generated (Gibbons et al., 1994; Miller et al., 2018).

Academic literature has coined the term 'entrepreneurial university', to address this institution that generates knowledge and technological advances and disseminates them through different mechanisms, participating in interactions with private companies and other economic agents, exploiting entrepreneurial opportunities, and thus contributing to economic and social development (Rothaermel et al., 2007; Centobelli et al., 2019).

In this context, the creation of university spin-offs is one of the main mechanisms by which the 'entrepreneurial university' generates knowledge and transfers it to society. For the purposes of this study, the term 'university spin-off' refers to a company that commercially exploits technology and/or knowledge resulting from research carried out in a university, whose creation normally implies the participation of the academic staff involved in said research and the support of the university for within it originated (Löfsten and Linderlöf, 2005).

In order to guide the data analysis, a framework was designed beforehand, based on relevant literature on the spin-off phenomenon (i.e., Ortín et al., 2007; Iglesias et al., 2012; Rodeiro et al., 2012).

Ortín et al. (2007) highlight the study of aspects related to the founding team, in terms of the motivation to launch the initiative and the assessment of the team profile, extending this consideration to the expanded team with subsequent incorporations. This paper also pays attention to the characteristics of the financial resources of the spin-offs, with special emphasis on the aid received. Information on the size and age of the companies is also provided. The aforementioned aspects are echoed in the work by Iglesias et al. (2012), who in turn rely on relevant research to extract the key elements for the analysis of the characterization of the spin-offs in their sample. Thus, in addition to the generic elements of the companies referring to their size and maturity, they study aspects related to the casuistry of spin-offs, such as the differential advantage they have based on being companies with an intense dedication to R&D&I activities. They also consider their participation in networks, and financing aspects, distinguishing between investments in capital, obtaining aid and generating income.

Taking into account all the above, the analytical framework for studying the characterization of university spin-offs contemplates the following specific aspects:

- Origin and team
- R&D&I activity and networks
- Financing
- Business model

Size and maturity are equally prominent aspects in the literature for the characterization of this type of companies. In this work, a certain correlation between size and maturity can be

observed, and we have chosen to consider these data transversally for the analysis of the other aspects listed.

### **3. Methodology**

This study adopts a qualitative approach, the purpose being to draw conclusions regarding the idiosyncrasy of university spin-offs phenomenon through a multiple case study. Although it is important to recognize the limitations of the qualitative methodology based on case studies, especially with regard to the generalization of the results, it is also true that this methodology is very appropriate to deepen the understanding of complex phenomena and to carry out inductive research (Eisenhardt, 1989; Yin, 2003). In addition, the multiplicity of cases used is a method that favors triangulation (Jick, 1979) and the generality of the results (Yin, 2003), providing robustness to the research (Herriot and Firestone, 1983).

Information was gathered through semi-structured interviews with founding partners and employees, as well as by comparing the documentation presented when applying for the official UPNA spin-off recognition. In addition, sources such as press releases, sector reports and financial data complemented the information. Subsequently, individual reports were drawn up for each of the six companies, with the aim of conducting an analysis for each case (Eisenhardt, 1989; Yin, 2003). Finally, a comparative study was conducted on the basis of these reports.

The six firms of the study were created within a period of seven years, obtained the UPNA spin-off qualification between 2014 and 2018, and are diverse in terms of maturity and fields of activity. However, all of them carry out businesses related to the commercial exploitation of advanced technology originated from the academic research of their promoters.

Annex I shows a table synthesizing the identifying aspects of the six spin-offs of the study.

### **4. Results and discussion**

#### **4.1. Characterization of university spin-offs**

##### **4.1.1. Origin y team**

Two were the main objectives pursued by the founders when deciding to embark on an entrepreneurial project: technology transfer and talent retention. These motivations respond to the idiosyncrasy of the figure of the university entrepreneur, for whom the achievement of economic results and social status is not as attractive as being able to exploit a business opportunity detected in connection with their scientific-technical discoveries (Ortín et al., 2007).

As a rule, the spin-offs have consolidated highly trained teams with a clear scientific-technical profile and, with a few exceptions, mostly male. In this sense, Iglesias et al. (2012) contrast the small size of this type of company with its ability to bring together a high percentage of highly qualified personnel. In addition, previous literature highlights the youth and gender (male) of both the founders of these companies (Rodeiro et al., 2012), and their teams consolidated over time.

These considerations notwithstanding, several companies in this study express the convenience of guaranteeing a certain level of multidisciplinary in their teams.

*“We are a multidisciplinary team; we come from very different fields: mathematics, computer science, telecommunications, sports medicine, physiotherapy, geriatrics... We have the knowledge, we have the technology, and we are convinced that what we do matters, because it helps a lot of people.”* (Mariano Velasco, founding partner and CEO of Movalsys)

Other companies in the study reached similar conclusions as they progressed in their business trajectory. For instance, in 2011 two new partners with expertise in business and commercial management in the ICT sector joined Naudit, in order to foster the establishment of a subsidiary firm.

In short, it should be noted that as UPNA spin-offs reach maturity, there is a tendency to expand the teams and diversify the profile (both in terms of gender and in terms of fields of knowledge), although maintaining the highly qualified staff.

#### **4.1.2. R&D&I activities and networks**

All spin-offs in the study are technology-based companies, whose business idea strongly identifies with the development of innovative technologies. Therefore, the firms show a clear commitment to innovation culture and to R&D&I activities. Besides, all spin-offs carry out said activities with the participation of external agents.

In particular, these companies maintain a close institutional relationship with UPNA, which is articulated mainly through the joint development of research projects, the formalization of technology transfer agreements and the hiring of graduates. In addition, five of the six companies use the equipment and facilities of UPNA for the development of their activity.

According to the study by Iglesias et al., (2012), university spin-offs often use the formula of collaborative projects for the development of their R&D&I activities, thus involving scientific staff from the research group from which they emerged. In short, the strength of the links between UPNA and its spin-offs aligns with conclusions highlighted in the literature (e.g., Soetanto and Jack, 2016). Unlike other types of start-ups, university spin-offs maintain ongoing relationships with their institution of origin, whose support plays an essential role at several levels, including aspects such as advice in both technical and commercial areas and intermediation in financing issues (Iglesias et al., 2012), giving rise to a symbiotic relationship from which both the University and the spin-off benefit.

*“Since the creation of Naudit, we deemed it important that our universities were part of the development of the firm. But we didn’t see this participation so much from the point of view of obligations for the universities, but from the point of view of trying to have an impact on society. The achievements at Naudit should translate to the universities that have trusted us throughout these years.”* (Eduardo Magaña, founding partner of Naudit)

In any case, the R&D&I practices carried out by this type of firms do not participate in this open paradigm solely because of their connection with their institution of origin, but rather encompass a broader catalog of activities and participating agents (Miller et al., 2018). In this sense, R&D&I activities in UPNA spin-offs, apart from implying close ties with the University, are also developed through collaborative projects with clients, suppliers, other research centers and other firms. In short, university spin-offs have an open attitude to collaboration, to the development of alliances and the use of synergies, consolidating networks with strategic agents of innovation and entrepreneurship systems (Iglesias et al., 2012).

#### **4.1.3. Financing**

The firms in this study saw their initial social made up almost entirely of the contributions of the academic entrepreneurs who promoted the initiative. This corresponds to the trend detected for this type of company, in which the main contribution to capital is the founders' own savings (Ortín, 2007; Rodeiro et al., 2012).

However, partners outside the project entering the capital of university spin-offs is a source of financing for which there is a growing trend, especially in the early stages of development of these firms (Iglesias, 2012). Among these external partners, the participation of the institution of origin stands out, which is very significant inasmuch as it stands as one of the main mechanisms to promote the objectives of the entrepreneurial university. Although it is an underdeveloped instrument, its advantage transcends the merely financial sphere, since it implies the involvement of an institution with a great knowledge of the problems, equipment and technology of the initiative (Rodeiro, 2012). Indeed, of the six companies analyzed here, five of them have UPNA participation in their capital, albeit with modest participation percentages, which range between 4% and 5%.

In addition, several spin-offs count with participation of other agents, such as 'family, friends and fools', industrial partners and, especially, investment funds and venture capital companies. These are sources of a very heterogeneous nature, in terms of accessibility, cost and implications. The low cost and ease of access represented by the savings of close people contrasts with the traditional limitation of this type of resources, which in any case are usually the first source that entrepreneurs turn to (Rodeiro et al., 2012). On the other hand, the participation of industrial partners depends on the knowledge and skills that the new agents incorporate into the company, complementing its needs. This is the case of Naudit, which in 2011, and with the aim of separating the commercialization of their products and services from R&D&I activities, constituted a subsidiary company. Regarding the creation of this new company, two partners who are experts in business management in the ICT sector joined the project.

*"The participation of external partners is not valued in terms of financing; it is valued in terms of the technical or commercial contribution that they can provide."*

(Eduardo Magaña, founding partner of Naudit)

Finally, it is worth mentioning financing through capital investments made by venture capital entities, investment funds and, as a hybrid instrument, the participative loan. For example, Eversens has received capital contributions from a public venture capital company, a semi-public

investment fund, and a private fund. This type of mechanism is a very attractive solution in the early stages of university spin-offs, given the limitation of the aforementioned resources and as an alternative to traditional debt (Rodeiro et al., 2012).

Subsidies and aids for the development of R&D&I activities are other typical forms of financing university spin-offs, which implies the participation of different bodies from state and regional administrations and, to a lesser extent, bodies of the European Union (Ortín et al., 2007; Rodeiro et al., 2012). Among the UPNA spin-offs, it is clear that access to this type of resources is essential for the advancement of the different initiatives.

#### **4.1.4. Business model**

University spin-offs tend to function emulating the dynamics of university research groups (Iglesias et al., 2012), in the sense that they usually become the external R&D department of other agents. However, it has been pointed out that these companies undergo a permanent reconfiguration, in order to reorient their service and product portfolios and adapt their business models to the changing needs that arise in their trajectories. (Iglesias et al., 2012; Clausen and Rasmussen, 2013).

The cases in this study reveal notable changes in the strategies and business ideas of the UPNA spin-offs. Moreover, as firms mature, they let go the focus on a value proposition based on basic research and the exploration of disruptive technologies, and open up to the search for opportunities and the commercial exploitation of its technological results.

As an example, several years after into its activity, Anteral verified that the application of terahertz technology for production techniques was a line that required great efforts in R&D, which was hard to profit from. The company decided to focus efforts on Industry 4.0, developing its own radar systems, which could lead to a more marketable product. In the same way, Nadetech is currently in the process of implementing a strategic plan with the aim of systematizing and professionalizing the operation of the company. In a similar vein, Naudit began its journey by offering highly specialized, personalized and high-value solutions related to traffic analysis consulting and to the inspection and quality assurance of communication networks. In 2011, the incorporation of the two industrial partners and the delimitation of commercial activities promoted the definition and expansion of the client portfolio.

In short, the spin-offs of this study have experienced the need to focus their efforts on practices that guarantee turnover through the exploitation of knowledge and technology in new markets, as opposed to a first vocation more oriented to basic research and technological exploration, a vocation that undoubtedly derives from the academic environment in which the initiatives arose.

#### **4.2. The challenge of ambidexterity and the role of university entrepreneurship ecosystem**

The comparative analysis lead to conclude on the difficulties arising in the search and consolidation of a sustainable business model that combines the use of the disruptive innovative capacity of these initiatives with the sustainable exploitation of their research results. This problem is due to the particular idiosyncrasy of this type of firms, deeply linked to R&D and the modus operandi of their institutions of origin, largely dependent on public funding for the

development of these tasks, and with eminently technical teams who usually lack managerial and commercial experience.

In line with the arguments in favor of the ambidextrous company (e.g., Gupta et al., 2006), it has been pointed out that university spin-offs, which normally face higher levels of uncertainty than other startups, should combine exploration strategies with exploitation strategies (Soetanto and Jack, 2016).

#### **4.2.1. Ambidexterity in university spin-offs**

Management deficiencies are common in university spin-off teams. Literature has linked the failures of this type of firms with problems in the management team and not with the suitability of the technology or the business opportunity (Timmons, 1994). In this sense, it is particularly important to focus on the figure of the university entrepreneur, who considerable challenges, especially considering that their professional experience and personal skills are not usually aligned with the demands in the field of business management (Miller et al., 2018).

This way, the studies underline the complexity of the creation of companies derived from the scientific-university field, which need to combine the management of technical challenges with commercial and organizational efficiency. These challenges are boosted by the fact that the teaching and academic staff in charge of university spin-offs lack in most cases a market orientation, which constitutes a significant disadvantage (Gómez et al., 2007). In fact, founders and managers of these firms declare themselves aware of said disadvantage (Ortín-Ángel et al., 2007), also informing of a feeling of 'loneliness' (Rodeiro et al., 2012) in the face of the uncertainty in the market and regarding the approach to the business strategy.

For this reason, the heterogeneity in terms of technical and management profiles in the teams in charge of the university spin-off has been pointed out as a factor that influences their chances of success (Ortín-Ángel et al., 2007). Thus, in its development process, the founding team tends to be complemented by professionals in commercial and business management (Vanaelst et al., 2006, Rodeiro et al., 2012).

These issues have been reflected in our case studies, from the main deficiency in management areas detected in the human teams of the spin-offs, to the tendency to diversify them as the companies mature, in order to promote the entry of people with profiles complementary to the eminently scientific-technical ones of the founders.

After all, university spin-offs originate from the development of scientific-technological solutions, through intensive R&D processes in research departments, so the germ of the idea does not reside inasmuch the detection of a need in the market as in obtaining said solution (Fuentelsaz et al., 2017). Thus, these types of initiatives are much more prone to strategies for exploring disruptive technologies than to exploitation strategies (Colombo et al., 2015).

Bearing this in mind, the success of university spin-offs depends on their abilities to combine the maintenance of their competitive advantage based on the development of high technology with organizational and commercial skills that allow them to succeed in the positioning of the business model (Ortín-Ángel et al., 2007). In short, it is all about attending to the two strategies



–i.e., the exploration of new opportunities and the exploitation of old certainties–identified by March (1991). Literature has underlined that the synergistic effect between the two mentioned strategies may be beneficial, arguing in favor of the development of ambidextrous strategies, which imply the dedication of effort and resources both to the development of new disruptive technologies, and to exploiting the knowledge base of the company (Gupta et al., 2006).

Focusing on ambidexterity for the particular case of university spin-offs, the study by Clausen and Rasmussen (2013) concludes that the most innovative and successful spin-offs in the commercialization of research results are those that establish complex business models that take advantage of the complementarity among the different alternatives for exploiting said radical technologies.

#### **4.2.2. The role of university ecosystem in overcoming the challenge of ambidexterity**

UPNA articulates a great variety of these instruments, acting on many occasions hand in hand with the institutions and instruments of the regional public administration, creating an ecosystem to support entrepreneurship that aims to promote the creation and development of business initiatives. This way, internal agents such as the Research Service and the Vice-Rector's Office for Students, Employment and Entrepreneurship coordinate with external agents such as the European Center for Business and Innovation of Navarre (hereinafter CEIN), the Company for the Development of Navarre (hereinafter SODENA), the Government of Navarre or banking institutions to stimulate and promote the aforementioned actions.

Regarding the ecosystem instruments used by the companies in this study to support the development of the initiatives, the mechanisms for accessing to financing stand out. The investment funds of the entrepreneurial ecosystem play a very important role in this regard, as indicated in the characterization of the companies in the study. Eversens has the participation in its capital of companies such as Start Up Capital Navarra and SODENA. As for Nadetech, SODENA stands out as one of the most relevant agents when it comes to providing help to overcome obstacles, for the support provided to access the Navarre Tech Transfer investment fund. These firms benefit, beyond financing, from the advice offered by these partners.

*“Financing is essential to execute the plans developed; even so, up to now we have always sought investors who can contribute more than just money. Specifically, our investor Navarra Tech Transfer is providing us with contacts of interest and support in management, helping to professionalize the company.” (Juan Antonio Ruiz, CEO of Nadetech)*

Besides financial support, the instruments of the UPNA ecosystem most valued by spin-offs are those related to training and advice. In particular, the firms highlight the services offered by CEIN. According to Lucía Nieto (CEIN technician), the programs that are usually most interesting for academic entrepreneurs are those that offer business advice, which are highly valued by UPNA spin-offs:

*“During our stay at CEIN, we expanded the knowledge received by participating in various events aimed at MEDTECH companies. The actions were aimed at*

*regulatory, marketing, negotiation and sales issues.” (Juan Mari Pérez, founding partner of Eversens)*

The trajectories of the UPNA spin-offs reflect how they have undergone notable changes in their business models in terms of the design of marketing strategies for their highly specialized technologies. In this sense, the comparative study makes it possible to link this openness to strategic visions of a more commercial type with the use of the support instruments of the UPNA entrepreneurial ecosystem.

*“The business model of these projects is evolving (...). University spin-offs are usually created before defining fundamental aspects of the business model. There is a need for a reorientation because, for example, customers are not defined or segmented. It is important that they participate in these kind of programs to question and define the business model (...); so they can get the necessary reorientation, advice and training.”*  
(Lucía Nieto, CEIN technician)

Thus, the mediating role of the ecosystem stands out in enabling the development of management skills and a commercial vision and, in general, to promote reflections regarding the orientation of the business model.

## **5. Conclusions**

This paper has offered a comparative analysis of six university spin-offs, based on case studies, whose aim was to determine a series of common features that could configure the characterization of these kind of firms, with the purpose of offering a contribution to complement the studies on the phenomenon of university spin-offs and their idiosyncrasy. In turn, this paper also intended to identify the main challenges these companies face, and to carry out an exploratory study on how the university ecosystem influences in overcoming these challenges.

As a summary, the following list of aspects can be presented as a general characterization proposal applicable to the university spin-offs phenomenon:

- The motivations driving the creation of university spin-offs are the transfer of knowledge and technology, and their commercial exploitation, on the one hand, and the generation of job opportunities to retain talent in the region, on the other.
- The profile of the academic entrepreneur corresponds to male highly qualified in scientific-technical areas. Diversification in this profile, both in terms of gender and in terms of areas of experience, arises as companies mature and teams expand.
- The spin-offs show a marked commitment to the culture of innovation and to R&D&I activities. These companies participate in collaborative projects with their institution of origin and also with clients, suppliers, other research centers and other companies.
- The spin-offs maintain a close relationship with the universities from which they emerged. In addition to the continuous development of joint research projects together and the usual

formalization of technology transfer agreements, the teams in these firms usually come from these universities, which also tend to provide the firms with equipment and facilities for the development of their activity.

- To start-up the initiatives, the spin-offs are financed mainly with their founders' savings; however, it is worth highlighting the participation of funds contributed by various agents, such as the university of origin, industrial partners and investment funds.
- Another representative and generalized form of financing in the phenomenon of university spin-offs is the aid for the development of R&D&I activities of the various public administrations.
- University spin-offs, throughout their trajectory, experience profound changes in their business strategies and ideas. In general, they experience the need to refocus towards exploiting knowledge and technology in new markets, in contrast to an early vocation more oriented to basic research and technological exploration.

After all, university spin-offs are technology-based firms closely linked to the work of their home institutions, with technical profiles that often present notable deficiencies in management areas. Therefore, they are more likely than other types of companies (even other types of technology-based start-ups) to remain stuck in strategies that prioritize basic research and the exploration of disruptive knowledge. The difficulties in adopting a market vision therefore lead to a greater incidence in this type of companies to replicate the *modus operandi* of the research departments of the universities and end up becoming laboratories that provide R&D services to other agents.

However, the success of these initiatives has been linked to the ability to manage resources and tensions in order to carry out an ambidextrous strategy. The role of the entrepreneurial ecosystem energized by the University acquires a special relevance in overcoming this challenge of ambidexterity. The analysis concludes on the relevance of the ecosystem instruments aimed at filling the initial shortcomings of academic spin-offs in management and commercial strategy matters, both with regard to participation in training and specific programs, and through the entry into the capital stock of specialist investment companies that, in addition to financing, offer advice.

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## ANNEX I: UPNA spin-offs

|                                 | <i>Origin</i>      | <i>Activity</i>  | <i>Currently</i>  |
|---------------------------------|--------------------|--|---|
| <i>Anteral, SL</i>              | Idea: 2008         | Development and commercialization of high performance and custom antennas for the aerospace industry; of millimeter wave and terahertz technology, with medical and pharmaceutical industrial applications, and of sensing systems to control production systems and perform measurements in a non-invasive way. | 10 workers.   |
|                                 | Constitution: 2010 |  | Sales: 0.5 million €.   |
|                                 | UPNA seal: 2017    |  | Clients: major aerospace agencies, public administrations, universities and research centers.                                 |
| <i>Nadetech Innovations, SL</i> | Idea: 2008         | Development and commercialization of equipment related to nano-metric thickness coating deposition techniques, for application in the scientific and research field.   | 7 workers.  |
|                                 | Constitution: 2011 |  | Sales: 0.5 million €.   |
|                                 | UPNA seal: 2014    |  | More than 100 clients in more than thirty-five countries, mainly laboratories and universities.                               |
| <i>Naudit HPCN, SL</i>          | Idea: 2009         | Development and commercialization of tools for data traffic analysis, network monitoring and advanced measurement data analysis.   | More than 20 workers in both firms (in 2011, a subsidiary was created).   |
|                                 | Constitution: 2009 |  | Sales: 1 million €.   |
|                                 | UPNA seal: 2014    |  | National and international clients from the banking sector and the telecommunications sector.                                 |
| <i>Eversens, SL</i>             | Idea: 2015         | Development and commercialization of equipment for measuring biomarkers in human breath, which allow the non-invasive diagnosis of certain diseases.   | 6 workers.  |
|                                 | Constitution: 2015 |  | In the process of closing commercialization agreements for their product 'evernoa'.   |
|                                 | UPNA seal: 2017    |  |   |
| <i>Movalsys, SL</i>             | Idea: 2015         | Development and commercialization of software and measurement sensors for the study of movement patterns, and for evaluating and monitoring injuries, with applications in the clinical field.   | 10 workers.   |
|                                 | Constitution: 2015 |  | Clients: Navarre Brain Damage Association (ADACEN), large automobile companies, residences for the elderly, and sports clubs. |
|                                 | UPNA seal: 2016    |  |   |
| <i>Bioinsectis, SL</i>          | Idea: 2016         | Development and commercialization of biotechnology solutions in the field of insecticides of microbial origin for pest control, with applications in the agricultural and medical-veterinary sectors.  | 6 workers.  |
|                                 | Constitution: 2016 |  | Sales > 200.000 €.  |
|                                 | UPNA seal: 2018    |  | Clients: national and international companies in the phytosanitary sector; specifically, of the new bioinsecticides.          |