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The concept of knowledge transfer effectiveness as an analytical framework for reviewing the regulations on the creation of academic spin-offs in Spanish universities

El concepto de eficacia de la transferencia de conocimiento como
marco analítico para la revisión de las normativas sobre creación
de spin-offs académicas en las universidades españolas

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Abstract From the company model established in the second half of the 20th century in the USA, the generation of knowledge is facing a new distributed model demanding increased social interaction, where the academic system plays a fundamental role. After the incorporation of research as an added task to teaching (by the end of the 19th century), academia is undergoing a *second revolution*, representing a greater involvement of the University in the development of new businesses, thus with a special focus on knowledge transfer mechanisms, and with Academic Spin-Offs (ASOs) as one of the most difficult knowledge transfer mechanism to implement with success. Then, *entrepreneurial universities*, as producers of knowledge, provide resources to promote the transfer of knowledge by supporting the creation of companies. For this purpose, the regulations (or norms) that guide the creation of companies from the academia play a fundamental role in optimizing the resources from universities. However, the specific way of implementing these regulations may influence their effectiveness as a mechanism for creation of ASOs.

Within this context, this paper proposes to analyse the concept of *effectiveness* associated to the norms framing the creation of ASOs as a tool for knowledge transfer, in order to decide if it can be used as an analytical model to assess and evaluate more accurately the ASO-creation process. Then, a selection of regulations for ASO creation from Spanish universities is analysed under this model.

Keywords University norms · Academic Spin-Off · Technology transfer · Public policy · Research

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1 Introduction

1.1 General context

Companies are being forced to deal with rapidly evolving technologies that can become obsolete in a very short period of time. This is why countries and companies need a good education system that encourages technology transfer. It must be taken into account that there is a transition from a productive sector based on very well differentiated technical fields to new demands derived from the appearance of emerging technologies [55]. This is why the organisation of knowledge production in advanced economic systems is facing a series of changes that start from the company model established in the second half of the 20th century in the USA towards a new distributed model ([60][28][29]). In this new model, the generation of knowledge is the result of increased social interaction and the academic system plays a fundamental role [10].

1.1.1 *The transfer of knowledge from Universities to companies*

According to [58], the University is undergoing a «second revolution». While the first, which took place at the end of the 19th century, involved the incorporation of research as an added task to teaching, the second, which took place at the end of the 20th century, refers to relations with business to promote the economic development of the environment. This new objective, and the conviction that basic research in the long term wins if it is compatible with commercial activities in the short term, has led to a greater involvement of the University in the development of new companies. It is then when the term «entrepreneurial university» is coined.

The concept of university technology transfer involves bringing the results generated by the research teams of academic institutions in their projects to the market. The mechanisms traditionally used for this have been the carrying out of projects on behalf of companies (contracting) and the licensing of patents formalised by universities to protect the inventions of their professors. However, new modalities for this technology transfer have appeared.

Then, currently one of the cornerstones of the transfer of knowledge from universities to society for the development of modern societies is through the promotion of the creation of companies linked to the university (this document focuses the specific case of the so-called Academic Spin-Offs –ASOs– throughout the document), whether motivated by research projects managed by the university, or by the collaboration of people linked to the university, as teachers, researchers, administrative or service staff [3] (a deeper definition of ASOs, in contrast to Academic Start-Ups –ASUs– and Technology-Based Companies –TBCs–, can be found below, in Section 2).

With the aim of fostering the creation of technology-based companies to commercially exploit the results of university research, this so-called «entrepreneurial university» concept opens up

new opportunities for social progress through a faster and more effective commercial application of scientific knowledge.

As is well known (e.g., review [31]), the creation of these technological companies is an instrument available to universities and public research centres to contribute to the development of their immediate environment. More specifically, the creation of companies from these centres contributes to development since:

- **ACCESS TO THE PRODUCTIVE SYSTEM.** It is often the only option for introducing certain scientific advances into the productive system, when the licensing of patents is not possible.
- **CREATOR OF INNOVATION FLOWS.** It creates a link between the spin-off companies and the laboratories of origin, originating a flow between the scientific world and the local production system.
- **FOCUS ON EMERGING SECTORS.** It increases the number of companies set up in emerging sectors present in the territory. In this sense, the creation of university companies has often been the main key to development, as it has encouraged the emergence of a network of technology companies that are real development poles, and which in turn attract external investment.
- employment opportunities for academic staff. It contributes to the creation of labour markets for specific research staff.
- **JOBS OF HIGH QUALITY.** Creates direct and indirect high-quality jobs.
- **IMAGE OF AN INNOVATIVE BRAND.** It contributes significantly to improving the image of a city or region, making it an innovative territory.

Traditionally, the literature specialising in the creation of technology-based companies from public research centres proposes four categories to explain the decision-making criteria for exploiting an opportunity or invention through the creation of a company [31]:

- **PEOPLE.** The nature of the person making the decision, this being the classical approach focusing on the entrepreneur.
- **TECHNOLOGICAL SECTOR / MARKET.** The nature of the sector where the opportunity can be exploited: focus on the opportunities of an emerging market.
- **CONTEXT.** The nature of the environment gives name to the approach focused on the conditions of the environment, which favour or hinder the creation of enterprises.
- **IDEA / OPPORTUNITY.** The nature of the opportunity itself: focus on the production of knowledge, i.e. the capacity of a company or institution to generate new knowledge.

Therefore, if we consider public research centres as producers of knowledge, the appropriate organisations to generate knowledge-based opportunities must be committed to pursuing development, i.e. they must have the resources to carry out quality research, have the appropriate institutional and organisational resources, and finally, make these resources available to the units, promoting the transfer of knowledge and the creation of companies, so that they can undertake their internal activities.

1.1.2 Regulations for the creation of companies linked to the university

In this *making resources available* is where the regulations or norms (both terms will be used interchangeably throughout the document) that regulate the creation of companies from the universities play a fundamental role in each university.

On the one hand, it may seem obvious that the main tasks of these regulations/norms is to identify opportunities and entrepreneurs, and offer them support in the form of advice, training, financing and spaces, and, in parallel, to promote the entrepreneurial spirit in the university or research centre, as well as offering them continuous support until their consolidation, in the event that this «opportunity» has already become a company. However, as will be analysed throughout the document, this «obviousness» includes many nuances, and the specific way of implementing

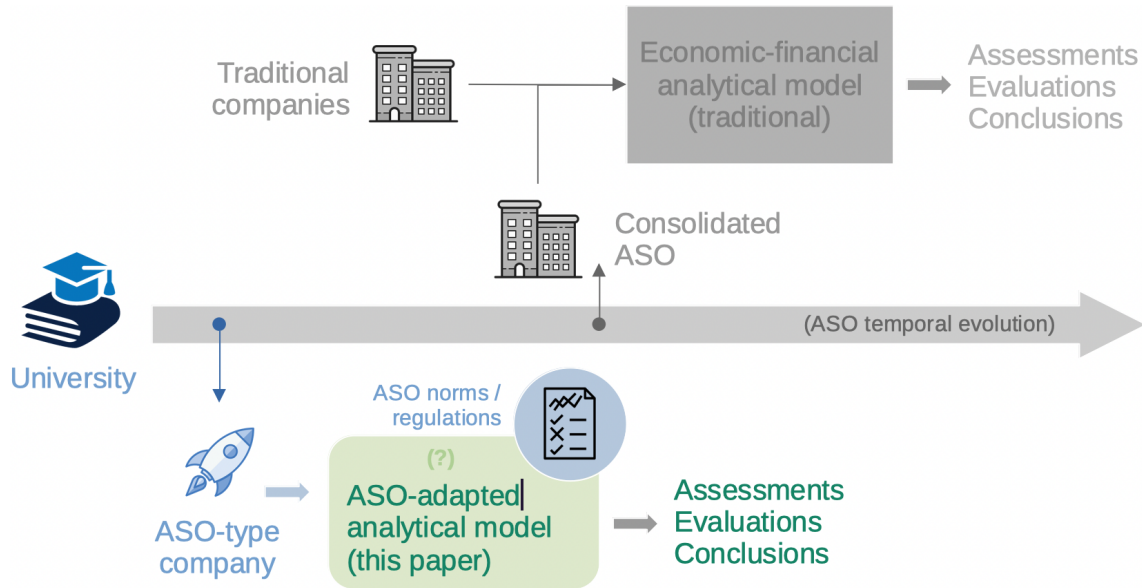


Fig. 1 Graphical summary of the analytical model considered in this study.

these regulations/norms influences, among many other things, their effectiveness (central concept of this document, which will be defined later).

Different regulations/norms will focus more or less on promoting entrepreneurial culture; or on facilitating the identification of those technologies (opportunities) with a high market potential and value creation for society; or on supporting, training and accompanying entrepreneurs and their teams to reach the market in the best possible conditions so that they can exploit their true potential; or on helping to improve the market positions of those that are already operating.

1.2 Objective

This paper is based on the hypothesis that, due to their idiosyncrasies (for example, as high-risk, highly uncertain initiatives that, literally, require actual research and innovation to survive), ASOs require a special regulatory framework (marked by the sometimes conflicting interests of researchers and the university institution) and valuation mechanisms in their initial phases that are clearly differentiated from traditional economic-financial mechanisms. It is only once this type of companies are consolidated that one can begin to speak of «companies» in traditional terms and, as such, those traditional valuation mechanisms would come into play; but not before.

This special (but not traditional) regulatory framework that may apply to ASOs is, to a large extent, defined by those regulations/rules that universities generate to structure the promotion, ideation, creation and maintenance of ASOs.

So, in this sense, this paper proposes to analyse the concept of «*effectiveness*» associated to the norms framing the creation of ASOs as a tool for knowledge transfer, in order to decide if it can be used as an analytical model to assess and evaluate more accurately the characteristics and capacities of this type of enterprises. See graphical summary in Figure 1.

1.3 Methodology

The paper is structured around three blocks.

First, the analytical model on which the study is based and which allows to understand the proposed vision are settled; that is, defining ASOs (Section 2), framing the structure and content of ASO regulation norms (Section 3), and approximating the concept of «*effectiveness*» in the context of knowledge transfer (Section 4). This first block has been built based on and complemented from the review of the literature in charge of analysing the ASOs phenomenon.

Secondly, the main features obtained by analysing the use cases, that is, a selection of regulations for ASO creation from Spanish universities, are shown in Section 5.

Finally, last block (Section 6) intends to draw some conclusions that allow to advance in the knowledge of the use and effectiveness of ASO regulation norms as a knowledge transfer mechanism for universities.

2 Contextualization: what is an academic spin-off (ASO) under the scope of this research

Academic Spin-Offs (ASOs) are only one of the multiple approaches to implement University-derivate companies. With the final aim of obtaining an precise definition about what an ASO is, this section briefly analyses the different modalities to implement technology transfer initiatives based on the creation of University-derivate companies.

In general, University-derivate companies are business projects arising from the research environment of a University within the framework of knowledge transfer processes. Roughly, there are three types of University-derivate companies (classification and definitions adapted from [12][13]):

- **Technology-Based Company (TBC)**. A company based on technology or scientific knowledge, direct or indirectly promoted by a University in terms of **(1)** the participation of teaching and/or research staff from the University, and **(2)** the participation of the University in the company's social capital. The main purpose of this participation is the exploitation of the technical research results (or scientific knowledge) originated in the University.
- **Academic Start-Up (ASU)**. A newly created company with a high innovative capacity, created and participated by students, teaching and/or research staff from a University, with no intent to exploit the technical research results (or scientific knowledge) originated in the University, which does not participate in the company's social capital.
- **Academic Spin-Off (ASO)**. A newly created company whose purpose is to exploit the research results (or scientific knowledge) originated in the University, promoted and participated by teaching and/or research staff from the University, and with the participation of the University in the company's social capital, .

So, what is an ASO?

Academic Spin-Offs (ASOs) are business initiatives that has the participation of members of the University community to take advantage of and commercially exploit the knowledge acquired in the research results [36]. According to [46] are companies whose founders maintain a contractual relationship with the university, which in turn provides products and services developed and/or patented in laboratories and university research centres.

Yes, spin-offs may be originated in other corporations outside universities, but those that start from the university are characterized by the involvement of the university staff and because the transfer of knowledge occurs as a consequence of the research carried out in this institution of higher education.

In the creation of ASOs, both university professors and researchers may be involved, making the position of professor or university researcher compatible, with that of entrepreneur and promoter of a new company (at least for some time). Many times, the home university maintains political and/or economic rights over entrepreneurial activity, in such a way that the active and direct involvement of the universities in the transfer of knowledge through spin-offs allows increasing income and economic resources of universities [46].

The development of spin-offs involves an opportunity cost that must be taken into account. It is important to assess the survival risks of companies that receive public aid. It is evident that there are opportunity costs for the collective resources that new companies receive that can be compensated through the benefits produced by their technological and commercial success [46].

Academic spin-offs vs academic start-ups? (Figure 2)

Of course, university technology transfer can also be done by creating a start-up. Regarding their differences with a spin-off, they are based on the fact that they are companies in which the

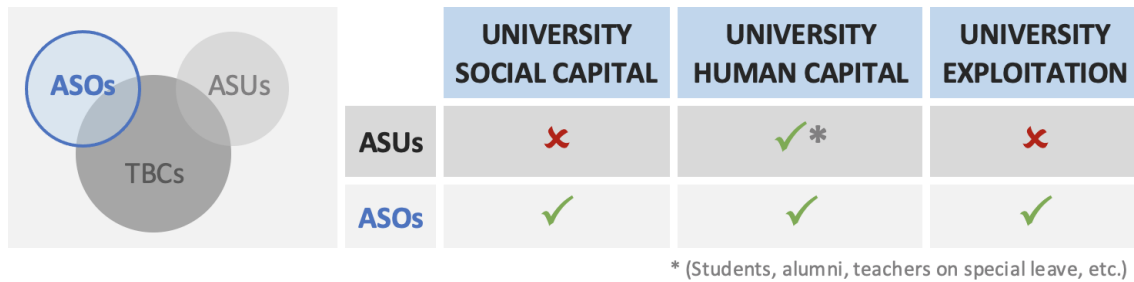


Fig. 2 Comparing the concept of (1) academic spin-off –ASO–, (2) academic start-up –ASU–, and (3) technology-based company –TBC– (own creation).

university participates in some way in their formation, but there is no formal agreement regarding the protection of intellectual property with the founders of the company [59].

Are all ASOs also TBCs? (Figure 2)

Finally, it is important to clarify that both, ASUs and ASOs can be TBCs ... or not. University-based spin-offs are not only technology-based companies, since knowledge from various fields is generated at the university [36].

3 Framing the boundaries of universities' regulations/norms for ASOs conceptualization, creation and maintenance

3.1 Legal basis for the creation of University-derivate companies

The fundamental legal basis for the transfer of research results in the Spanish University system is found in the LOU, which states that research is a «primary tool for social development through the transfer of its results to society» (art. 39.1). It also points out that the university has, as one of its essential objectives, «the development of research and the transfer of knowledge to society» (39.3). The link between university research and the production system, as a way to articulate the transfer of knowledge generated and the presence of the university in the innovation process, «may be carried out [...] by the creation of technology-based companies», as indicated in art. 41.2.g of the LOU.

Consequently, **the foundation for the creation of technology-based companies is the primary function of universities to transfer the knowledge generated in research to the productive system as a means for the progress of the community and support for the social transfer of knowledge.**

The University Statutes have also developed this university function and regulate specific mechanisms for the participation of teaching staff in these technology-based companies, mainly through article 83 LOU or through the granting of licenses.

How is this need for knowledge transfer finally articulated? For this reason, what universities and other public research centres have finally done is to develop their own regulations establishing what requirements companies must meet to be considered TBC of the institution of origin; if it participates, or not, in the new company; if necessary the participation of the teaching staff, etc. Other institutions have preferred not to define regulations and stick to internal procedures that, logically, take into account the existing legislative framework [31].

These regulations or internal procedures will be, ultimately, the first text to which the technical staff starting in this form of transfer must refer. They are further analysed next.

3.2 Dissecting the concept of ideal ASO regulation

This section intends to dissect the desired content of a, let's say, *ideal regulation document for ASOs*. This is done by developing the WHAT, HOW and WHY questions, that is (1) **WHAT** processes

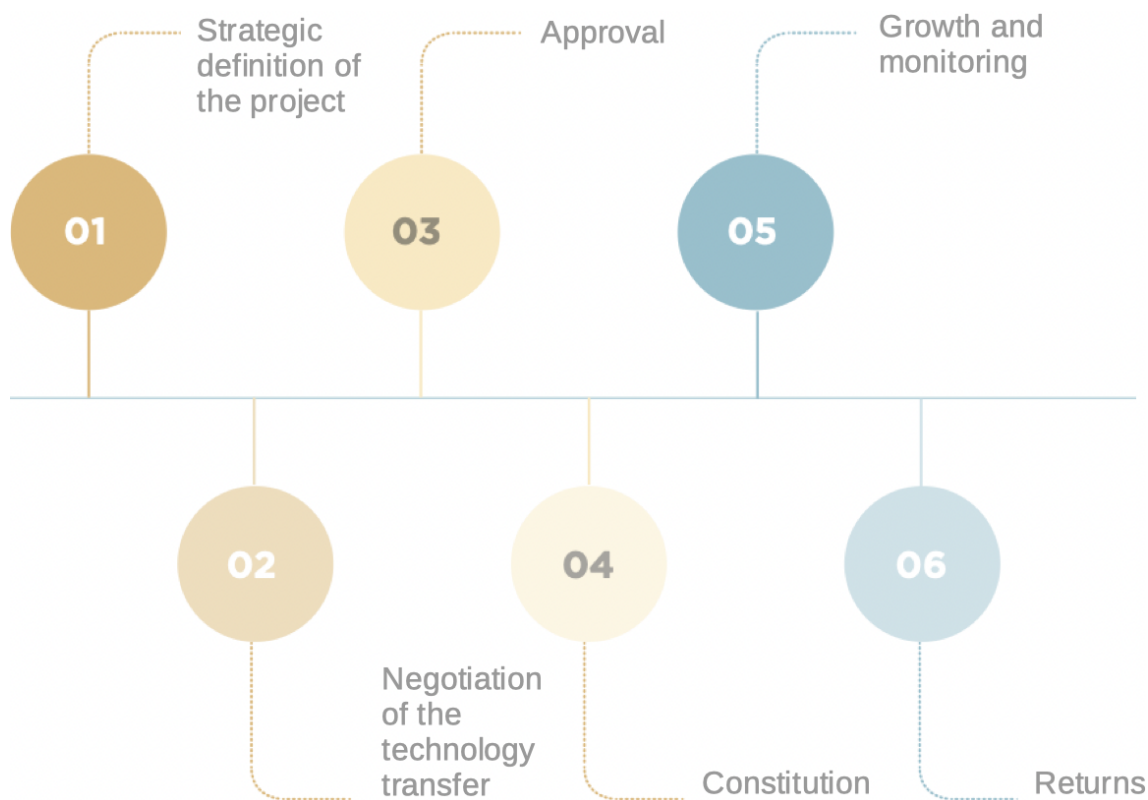


Fig. 3 Six phases of the value chain of business creation in the University environment (adapted from [31]).

regarding ASO conception, creation and maintenance has to be addressed, **(2) HOW** to optimise the implementation of/support to those processes, and **(3)** justify **WHY** these processes should be implemented/supported in such way (that is, what are the benefits of implementing/supporting those processes).

3.2.1 The ASO value chain.

One of the broadest (perhaps the most optimal) ways for understanding the role of regulatory documents in the creation of ASOs is to conceive them as regulators of one and each of the processes involved, not only in the *creation*, but also in the *conception*, and, eventually, (successful) *maintenance* of this kind of academic companies. In other words, an ASO regulation document must impact on every node within the value chain of creation (conceptualization and maintenance) of academic companies.

This value chain is composed of 6 sequential nodes (phases) every ASO should go through [31]: **(1)** strategic definition of the project, **(2)** negotiation of the technology transfer, **(3)** approval, **(4)** constitution, **(5)** growth and monitoring, and **(6)** returns (see Figure 3) . Next, a brief description of each phase:

- 1. STRATEGIC DEFINITION OF THE PROJECT.** Currently, the main focus for ASOs is the detection of projects and technologies that have a high potential to reach the market, and for a possible idea or project to become a business project, it is necessary to carry out an exhaustive prior planning and analysis. The first step is to validate the idea, evaluating the business opportunity by means of a Business Plan: the main tool for developing and structuring the business project.

The Business Plan is a reflection on the suitability of the objectives to be pursued, the activities necessary to achieve them and the way in which they will be carried out. This document defines the strategy and general purpose of the business and must include all the aspects that shape its structure and development timeframe.

2. **NEGOTIATION OF THE TECHNOLOGY TRANSFER.** There are different types of agreements to transfer the technology and knowledge generated in the entities in favour of the ASO. The licensing agreement is a prerequisite for the implementation of the ASO, but at the same time a collaboration agreement can be signed with the promoter group to carry out part of the technology development and scientific-technical advice, or an agreement with the organisation for the use of space or infrastructure.

The terms of negotiation of the licence, including the royalties to be paid by the company, will be approached taking into account the particular circumstances of each transfer process and evaluating the contributions of each of the parties.

3. **APPROVAL & PARTICIPATION.** In Spain, universities choose whether or not to participate in their TBCs. For those cases in which the universities participate in the company, there are no established rules on what is the most appropriate percentage that they should have of the TBC, with different cases existing:

- Symbolic or representative participation.
- Fixed or case-by-case participation (depending on the different types of support, the type of company and the Fixed or case-by-case participation (depending on the different types of support, the typology of the TBC, etc.).
- Participation linked to the transfer agreement or not linked to it.

The different ways in which the universities approach this process seem to indicate a priori that there are not certain conditions for participation in the TBC that are more appropriate than others. In the same way, it is also clear that a successful model in one institution does not necessarily work in another, as there are many variables that have an influence (internal functioning, degree of involvement in TBC, environmental conditions, regulatory framework, etc.). It can be concluded that each university will have to establish a model of participation in its TBCs that fits its own circumstances.

It is in the Partners' Agreement that the relationships, rights and obligations of the partners are established, and in this case it aims to establish the basis of the relationship between the institution and the rest of the members of the company.

4. **CONSTITUTION.** Once the constitution and/or participation of the university in the TBC has been approved by its governing bodies and according to the procedures established in each institution, the actual constitution stage begins (in the case of having approved the creation of a company, the TBC), or the entrance to participate in an already constituted TBC.

5. **GROWTH AND MONITORING.** In the process of supporting the entrepreneurial team, the work, involvement and performance of both the promoting entities, the university in this case, and the team itself is necessary. Due to the stage of development of business creation in this field, it is necessary that the institutions are prepared and willing to help and support the business project itself and its entrepreneurial team in achieving a higher level of business growth and market position than the current one.

Even though they play a supporting and guiding role, it is important to highlight four factors that influence institutions, especially universities, to assume an important role in the acceleration phase:

- **Economic-financial aspects.** Throughout the life of the TBC, it will need to resort to sources of funding to be able to undertake the different objectives that will allow it to grow and consolidate itself in the market (maturing the technology, initiating commercial activity, making a leap in scale, internationalising, etc.).
- **Human resources and relationship with the research centre.** The research personnel from which the research results, which are the basis for the constitution of the TBC, usually establish some kind of link with the company, either participating as partners in it, working in it, or both at the same time. Another way to maintain the relationship with the company is through R&D contracts where the TBC hires the research group.
- **Evolution of the TBC.** The monitoring of the TBC will be specifically articulated according to the objective(s) being pursued.

This monitoring of the company provides current information on the economic and financial state of the entity. The information will serve to know the evolution of the company, and to

be able to contrast the fulfilment of the economic considerations derived from the transfer agreements or similar.

This information will be obtained periodically in order to be able to monitor it over time.

6. **RETURNS.** The TBC can generate returns for the university mainly through two channels:

- Consideration generated by technology transfer.
- Sale of its stake in the TBC.

The consideration generated by the technology transfer is regulated in advance, in the transfer agreement. A common form of consideration is the establishment of royalties (a percentage of the company's sales). In this way, the institution receives an annual income based on the company's sales.

All these elements that regulate the relationship between the university and the ASO should (ideally) be captured in a structured process, in a regulation or norm that the university would make public so that the community would know the «rules of the game». The following section elaborates on the ideal characteristics of such a documents.

3.2.2 How to optimally support the implementation of ASOs? The ideal content of a regulation document.

Here, a model with the *ideal* contents of an ASO regularion document is defined. This model is key for being able to assess the level of efficiency of specific instances of ASOs' regulation documents (i.e., for a given University as it is analysed in Section 5) and, besides, for being able to compare the regulation offered by different universities.

According to the analysis of the state of the arts and, more importantly, based on an internal research of the regulations addressed in Section 5, the proposed model has to address: **(1) objectives, (2) services, (3) forms of participation, and (4) requirements.**

OBJECTIVES. The model includes a set of objectives (e.g., primary and secondary) aimed at regulating the creation (conception and maintenance) of ASOs.

At the primary level, the objectives are usually related to the exploitation of the «research results and innovative ideas through the creation of companies with high growth potential» (as it happens for the *Technical University of Madrid*, see Section 5.1). Secondary objectives may include, for instance, facilitation of the transfer of research results through the promotion and encouragement of the creation of university spin-off companies, promotion of the viability and survival of the TBCs created, or regulation of the participation of staff belonging to the university and of the conditions of access to facilities and services (as occurs for the *University of Santiago de Compostela*, see Section 5.2).

SERVICES. The model must specify a comprehensive list of the particular services offered by each university to be used by the potential ASOs. The aim of these services is to help the ASOs achieve the previously defined objectives. Next, a detailed list with potential services to offer (adapted and extended from [31] and [3]) is presented:

- **Advice** to ASOs on all kinds of issues related to its activity (accounting, strategy, financing, etc.). Previous cases experiences can help advise ASOs on priority issues or on the most common mistakes that are often made. Advice may probably include the encouragement to carry out their first commercial contacts, through supporting and stimulation activities (i.e., by organizing sectoral conferences and meetings between companies that emerged in the University and in the industrial field).
- **External investment support.** Facilitate contact of the ASOs with investment entities, plus accompaniment in the negotiation processes. Technical support staff from the University is used to deal with the investment environment around. Their advice can help identify the best investment options for the business.
- **Legal support.** Advice to the ASOs on legal issues, which includes numerous aspects such as the constitution process, human resources management, industrial and intellectual property, etc.

- **Orientation on personal resources.** Although the main source of incorporation will probably be experts from the university or from the contact network of the ASO support organizations, however, universities may help search for specific professional profiles to join the company.
- **Incubation.** Many academic entities have spaces enabled for companies to settle, which helps reduce the initial expenses that new companies have to face.
- **Internationalization.** Support measures for a better positioning in international markets and for the consolidation and internationalization of the ASOs (such as stay programs in foreign companies or other universities, trade missions, etc.).
- **Dissemination.** Provide information to the ASOs on issues related to its activity (news, subsidies, conferences, etc.). The university technical support staff can also help the ASOs to prioritize its actions (presentation to calls, attendance at seminars, public aid for business development, etc.).
- **Training.** Increase the skills of the ASOs' staff by organizing training activities. Some of the most demanded training needs from ASOs' promoter teams are in managerial skills (team management, negotiation techniques, marketing, etc.) and in financial management issues.
- **Networking.** Promote relations between the ASOs and research groups. Beyond the original area of knowledge of each ASO, there are many opportunities for collaboration that may arise from other areas of research.
- **Mentoring.** In addition to advice from the universities' staff, external experts can also be exploited. One possibility is the creation of a mentoring-tutoring program, composed mainly of entrepreneurs and consulting companies, to advise the ASOs in their development and growth. It may be a specialized mentoring in sectors that are considered outstanding in each case (engineering, food, energy, ICT, etc.).

FORMS OF PARTICIPATION. Beyond the services that a University can offer for the creation of ASOs, there are various forms of participation of universities in this type of business initiatives. These forms of participation include, of course, financing instruments, but they also offer other relevant aspects that are discussed below (adapted from [27] and [31]).

- **Economic contribution.** Participation in the capital stock implies an economic contribution in the company, proportional to the agreed participation of each of the partners. Instead of making a monetary contribution, some institutions value the cost they have assumed in the project until the date of its entry into the capital and raise a contribution equivalent to that amount, but without any additional outlay.
- **Political rights.** Given the agility that is necessary for decision making in the company, many entities decide to act as passive partners, that is, they do not participate in the voting of partners, but they do have some rights such as demanding detailed information on the company accounts to find out about the company's situation and check its proper functioning or to track the value of its shares.
- **Assets contribution.** The University can contribute to the ASOs created under its auspices with all kinds of assets and rights: premises, scientific instruments, etc. with various types of formulas. However, public domain assets cannot be contributed. For these purposes, the University must comply with commercial legislation, the specific regulations on property assets and university regulations. The University can also make a specific financial contribution, which would be expressed in the ownership of shares or participations in the capital stock of the ASOs.
- **Use agreements.** Universities may also consider agreements for the sale/use of university technology, establishing the clauses they deem appropriate to facilitate such transmission. Likewise, agreements can be established that guarantee the use of university technology for the purposes for which the company was created, to ensure the social purpose of the research (e.g., retrocession agreements, etc.).
- **Intangibles contribution.** In addition to the above tangible contributions, there are other intangibles, such as the possibility for the University to form multidisciplinary teams at the service of an idea or a product. Indeed, in the case of an idea that requires the presence of

specialists in various fields of Science, the University can be the perfect integrator of efforts for a result that requires the sum of complex knowledge.

- **Administrative body.** Although, in general, the host institution do not participate in the governing bodies (in order to allow the promoting team independence), however, it is possible. In that case, organization of general meetings of partners should be specified.
- **Venture capital companies (VCC).** The participation of venture capital companies in ASOs is increasingly common. The University may provide means to promote its massive incorporation to this type of academic businesses. Note that the spin-off company-University relationship conditions and the ownership of each party must be clearly established in advance, so VCC could participate with success in ASOs' businesses.

Other forms of participation to take into account are: monitoring commissions, accompanying rights or trawling rights.

REQUIREMENTS. ASOs that wish to be participated by a university must meet a set of requirements. These requirements (usually in the form of input documents, agreements, signed contracts, mandatory milestones, etc.) will emerge in several phases of the constitution of the ASO (mainly during its creation, but also in the ideation and maintenance phase).

In general, these requirements to fulfil are directly linked to the different phases of the value chain of the creation of ASOs (recall Figure 3). They are summarized next:

- **Requirements related to the strategic definition of the business project:**
 - Feasibility report.
 - Business plan.
- **Requirements related to the negotiation of the technology transfer:**
 - License agreement.
 - Collaboration agreement. Often, at the same time that the license agreement is signed, it is advisable to sign a collaboration agreement with the research group of the promoter team to carry out part of the technology development, or an agreement for the use of spaces or infrastructure of the entity.
- **Requirements related to the approval of the creation of the company and/or the form of participation of the university:**
 - Partners' agreement. The partners' agreement is the contract that establishes the relationships, rights and obligations of the partners, and in this case it aims to establish the bases of the institution's relationship with those who form the company.
- **Requirements related to the development of the ASO:**

The follow-up to the ASOs will be articulated in a specific way depending on the objective or objectives to be pursued. This monitoring of the company provides up-to-date information on the financial and economic status of the entity. The information will be used to know the evolution of the company, and to be able to verify the fulfilment of the economic considerations derived from the transfer agreements or similar.

 - Financial reports. This information will be obtained periodically so that it can be followed over time. To do this, it is necessary to use the following company documents:
 - Balance.
 - Profit and loss account.
 - Main economic-financial ratios.
 - Periodic reports on technological and commercial evolution.
 - Non-financial data. The purpose of these monitoring information is to know what impact the activity of the company has in the territory:
 - Number of people employed in the company..
 - Quality of the jobs created in the company (salary, duration and degree required in hiring).
 - Indirect jobs generated.
 - Participation of the ASOs in social commitment initiatives (sponsorships, patronage, cooperation projects, etc.).

3.2.3 Why ASO regulations are advantageous? Benefits.

In theory, and if smartly constructed, the set of services offered by the universities, plus the fulfilment of the requirements by the ASO, all linked together thanks to specific forms of participation, will lead to the achievement of the proposed objectives. Objectives reach will bring, ultimately, several benefits to the different actors involved in the creation of ASOs; that is:

- **Benefits for scientific promoters (researchers):**
 - Obtaining greater personal financial resources, that is, earn money.
 - Personal exploitation of the developments carried out, as the results of the research effort are supposed to have applications in society.
- **Benefits for the research group:**
 - Generation of resources for the maintenance and enhancement of the group researcher activities through the subcontracting of ASOs activities.
 - Job opportunities for highly qualified professionals from the research group, as a natural extension of their research-training cycle at the University.
 - Increase business relationship with the business world, promoting the development of other university-companies R&D collaborative activities.
- **Benefits for the university:**
 - Wealth and employment creation within the ASO influence area, by disseminating and transferring its scientific and technological knowledge.
 - Generation of resources to finance the research activity.
 - Establishment of a network of companies that allow the dynamization of strategic areas for the institution.

All in all, these benefits also impacts on society as, by making the research profitable (through technology transfer services, etc.), it can **(1)** boost the economic activity and job creation, **(2)** modernize the structures of productive fabrication, **(3)** offer a new perception of the important role and value of the University, and finally **(4)** promoting a greater involvement of the University within its social economic environment.

4 State of the art analysis of the term «effectiveness» in the ASO- and technology transfer-related literature

It has to be recalled that the primary aim of this article is to analyse the concept of «effectiveness» associated with knowledge transfer in order to use it as an analytical model to assess and evaluate more accurately (at least more than with traditional models) the characteristics and capacities of ASOs. Recall Figure 1. Therefore, it is necessary to agree on a definition of this *effectiveness* in the context we are talking about (i.e., the creation of ASOs).

For this purpose, a state of the art analysis of the term in the scientific literature related to ASOs and technology transfer is presented in this section. As said, the aim of this exercise is to narrow down a precise definition that will be used as analytical model to frame the analysis of the use cases proposed.

4.1 Bozeman’s Contingent Effectiveness Model of technology transfer

Some of the more formal works related to the effectiveness of knowledge transfer mechanisms are, probably, those of Bozeman. Specifically in [16] and [20], Bozeman presents (2000) and updates (2015) his Contingent Effectiveness Model of Technology Transfer, an approach that, by organizing the up-to-date literature on technology transfer’s impact and effectiveness, considers a number of determinants of effectiveness, including various characteristics of the technology, the transfer agent and the technology recipient. However, the most important point of the model (as its name implies) is that technology transfer effectiveness can have several meanings, including market impacts,

political impacts, impacts on personnel involved and impacts on resources available for other purposes and other scientific and technical objectives. This approach clashes with the more traditional effectiveness criteria, only considering market impacts.

Figure 4 (below, in page 14) presents the elements of the Contingent Effectiveness Model of technology transfer. It draws its name from the assumption that parties to technology transfer have multiple goals and effectiveness criteria. The model identifies five broad dimensions/categories of technology transfer effectiveness determinants (or contingencies), including:

- CON1.** Characteristics of the **transfer agent**.
- CON2.** Characteristics of the **transfer media**.
- CON3.** Characteristics of the **transfer object**.
- CON4.** The **demand environment**.
- CON5.** Characteristics of the **transfer recipient**.

These dimensions are not entirely exhaustive but are broad enough to include most of the variables examined in studies of university and government technology transfer activities. The **arrows** in the model indicate relations among the dimensions (broken lines indicate weaker links). In a nutshell, both models (original and revised) maintain that the impacts of technology transfer can be understood in terms of *who is doing the transfer*, *how they are doing it*, *what is being transferred* and to *whom*.

The term «contingent» is key in both the original and revised models because of the assumption that technology transfer, by definition, includes multiple parties and these parties generally have multiple goals and, ergo, multiple effectiveness criteria. Effectiveness is then considered in terms of multiple criteria including:

- CRI1.** «Out-the-door» (was anything transferred?).
- CRI2.** Market impact.
- CRI3.** Economic development.
- CRI4.** Political advantage.
- CRI5.** Development of scientific and technical human capital.
- CRI6.** Opportunity cost considerations.

The revised model adds an additional effectiveness criterion:

- CRI7.** Public value.

4.1.1 Determinants of effectiveness (or contingents)

CON1. TRANSFER AGENT. A broad issue in characteristics of the transfer agent is the nature of the institution, its history and culture. Indeed, a good proportion of the work on technology transfer deals with just this one question: «How does the institutional culture of the university (or government institution) affect its ability to conduct technology transfer?».

So much of the research focuses on the *culture* of the university to frame the role of universities as a technology transfer agent. Other researches focus on the *motives* of academics involved in technology transfer or on the University as a setting for *cooperative technology development*, drawing a link between competitiveness policies and changes in academic science and technology. Other authors have examined universities' technology transfer *activities* and the extent to which the *characteristics of their research groups* could explain participation in technology transfer.

CON2. TRANSFER MEDIA. One of the most comprehensive studies of transfer media [51] examined firms' interactions with government laboratories, he considered a wide variety of interactions including contract research, cooperative research, workshops, licensing, sponsored research, technical consultation, employee exchanges, use of lab facilities, lab visits and formal information dissemination through publications. By far the most important category of interaction was contract research, followed by cooperative research. Few valued licensing and more formal interactions. Another transfer mediums that has received a good deal of attention during the past decades is the R&D consortium and the science park.

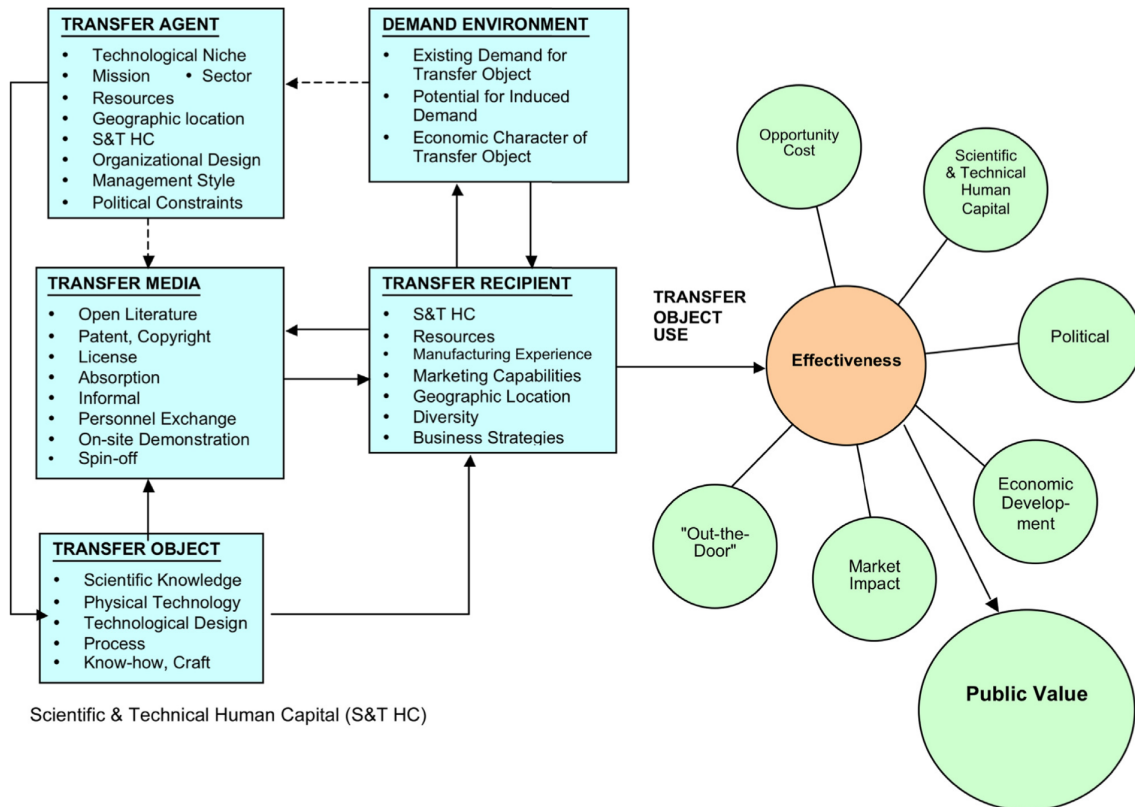


Fig. 4 Revised contingent effectiveness model of technology transfer [16][20].

The role of human capital and training in technology transfer is becoming more widely recognized. This medium for technology transfer arises in a variety of ways including ASOs, but also directed training aimed specifically at managing technology transfer, use of consultants, training of students, especially relocating international students, personnel exchange or secondment and, of course, informal relations among bench level scientists [19].

Finally, a general issue pertaining to transfer media, is the influence of intellectual property policies (but beyond the scope of this work).

CON3. TRANSFER OBJECT. Among the many categories of transfer object (e.g., knowledge vs technology transfer, civil vs military application, basic or applied science, etc.), one enduring focus has been on commercializable products. To what extent do the transfer objects achieve commercialization and what is their rate of commercial success? Key aspect when exploiting ASOs as knowledge transfer media.

CON4. DEMAND ENVIRONMENT. This determinant is typically divided into public and private demand, with the usual stereotype of demand for technology either market-*push* or market-*pull* (although often non-market forces shape demand).

Some authors concluded that insufficient attention has been given to the public sector's role in shaping demand and markets for technology. Others found that the government broker role is much more effective when government managers take an active role, and that co-funding is a particularly helpful strategy that a state agency can use to induce demand.

Regarding private demand, several researchers have focused on the flow of scientific knowledge from a university to small and medium enterprises. They argue that the changeability of demand, both type and extent, for new technologies requires a «flexible infrastructure» rather than a set of fixed, institutionalized resources. Their study of technology transfer (although just focused on the biomedical industry) suggests that the critical mass of demands for technologies and technical competencies is a major factor in determining market impact technology transfer success.

CON5. TRANSFER RECIPIENT. One of the most important considerations in assessing the effects of the transfer recipient on transfer success is whether the recipient is a government

agency, non-profit organization or a business. Most of the literature assumes that businesses are the recipient, with just a few focusing on transfer of technology to government users). Research comparing directly business and non-profit or government technology recipients consistently finds marked differences in process, barriers to effectiveness and, indeed, definitions of effectiveness. For instance, [32] set out to determine whether the size of firms involved in university-initiated technology transfer related either to activity or effectiveness. Focusing on 23 different technologies, the authors found that business firms involved in transfers could be placed into several groups including, established firms, recently created new ventures or a new company created explicitly to develop and market the transfer object. More than half of the transfers were to large companies that were using the technology to extend existing product lines. In eight cases the recipients were small firms and in three cases recipients were venture capital firms. The remainder were new firms created by the university scientists and inventors seeking to develop and commercialize the transfer object begun at the university; in only four cases did the firms have no prior relationship with the university.

4.1.2 Effectiveness criteria

Next, the effectiveness criteria to structure the analysis of the strengths and weaknesses of technology transfer mechanisms of the Contingent Effectiveness Model are described.

CRI1. «OUT-OF-THE-DOOR». The primary assumption of the Out-the-Door criterion for technology transfer effectiveness is that the technology transfer agent (e.g. the university) has succeeded once the technology has been converted into a transfer mechanism, either formal or informal, and another party has acquired the technology. The organization acquiring the technology may or may not have put it to use. Thus, the organization receiving the intellectual property (IP) may do so reflexively or because there is a directive to do so, with an intent to use the IP or not, or even with an intent to quash the technology so that it is not available for rivals. Neither the motive nor the uses of the IP are considered in the Out-the-Door criterion. As suggested by the label, the goal is getting the IP out the door.

Technology transfer research gives disproportionate attention to the “Out-the-Door” criterion. This criterion is most often used by both scholars and practitioners and, in many cases, the only one used. For this reason, if no other, it warrants special attention.

Within this general concept of the Out-the-Door model we can distinguish three sets of significantly different results revealed by three different sets of indicators:

1. **Pure Out-the-Door.** In this case, there is no indication that anything has occurred with research to the IP except for its transfer.
2. **Out-the-Door with Transfer Agent Impacts.** In some cases it is clear that the transferring organization has benefited from the activity even if no one else ever does. Thus, if a university obtains licensing revenue, that is a sort of impact.
3. **Out-the-Door with Transfer Partner Impacts.** In most cases public policy focuses not on enriching technology transfer partners but rather on broader social and economic impacts. Nonetheless, if partners benefit then certainly that qualifies as an external benefit, though usually a relatively narrow one.

Despite obvious limitations to the sole application of the Out-the-Door criterion, the model has a certain compelling logic. Depending upon whom one views as the transfer agent, care must be taken to give some account of the agents’ domain of control. To put it another way, a technology transfer agent typically has a domain of influence but a limited one. For example, a TTO (Technology Transfer Office) may have some capability of strategic choice among technology options, may be able to induce work on selected technologies, and may be able to develop good administrative and business practices such that technology transfer can be facilitated. However there are many other factors over which the technology transfer agent may have no control, particularly the ability of firms to effectively develop and market technology or the ability of firms to manage products once they have been brought to market.

To be sure, some might argue that the technology transfer agent is at least partly culpable if it transfers technologies to companies who have inadequate capital, manufacturing ability, or market savvy to make a good technology into a good, profitable product. However, since the transfer agent

certainly does not control the transfer partner (or in many instances even have much influence on the partner) and since many transfer agents have limited or no background market forecasting [48][30] it does not seem reasonable to hold the agent and its technology transfer professionals responsible for the actions or inactions of partnering firms.

The expansion beyond the Pure Out-the-Door category to consider impacts on, respectively, transfer agents and transfer partners suggests that the Out-the-Door models has some reach and viability. Likewise, the obvious fact that technology transfer agents have clearly limited domains of control over the actions of transfer partners means that the criterion has some common sense appeal. Nevertheless, we must consider this: if one uses only Out-the-Door criteria one will likely never have direct knowledge that the technology transfer activities have achieved the goals of having economic and social impacts beyond those accruing to the technology transfer partnership. Conceivably, despite the inferences one might wish to make, it is possible that in many instances simply getting technology out the door achieves little beneficial impact and, absent more intensive analysis, may actually do harm.

Regarding the impact of ASO facilitation, it is worth mentioning [22], which found that the size of the technology transfer office in 52 Spanish universities is associated with greater R&D income, spin-offs, and licensing activity although not licensing revenue. While license activity and revenue do not necessarily provide evidence of impacts outside the transferring institution (for example, companies could pay for a license to suppress activity) it is likely that license revenue is *usually* an indication of external impacts. Whether the impacts are in the Economic Development category is a question unanswered here. Moreover, it is even unclear whether spin-offs, which do commonly fall into the Economic Development category, actually lead to broader economic outcomes for a region considering the propensity of these spin-offs to fail or, in the pursuit of proximity to financing and markets, move to another region [21].

CR12/3. MARKET IMPACT / ECONOMIC DEVELOPMENT. The “Market Impact/Economic Development” criterion focuses on (1) the commercial success of the transferred technology including (2) impacts on regional and or national economic growth. Generally, market impact pertains to commercial results obtained by a single firm or a few firms. However, much of the technology transfer activities undertaken by government agencies, as well as by universities, is rationalized by broader economic multipliers assumed to flow from technology transfer.

To a large extent the Market Impact criterion is the ‘gold standard’ for technology transfer effectiveness evaluation. For instance, to a large extent university policy reflects quite comfortably the idea that economic impact is de facto social impact and that economic growth accruing from science and technology policy investments are inherently good.

However, it can in some instances prove to be a, let’s say, deficient ‘gold standard’. An important problem with the Market Impact criterion is misattribution of success and poor understanding failure. For example, if a particular instance of transfer is not commercially successful, is it because the product or process transferred is of limited value?

CR14. POLITICAL ADVANTAGE. The Political Reward criterion receives relatively little attention in the literature but is worth mentioning. Parties to technology transfer think in terms of possible political rewards accruing from compliance or from ‘good citizen’ activities. Technology transfer activities are often seen as a way to curry favor or enhance political support rather than as a means providing significant economic and social benefit.

As noted in [16], there are at least three possible avenues to political reward:

- In the least likely of scenarios, a transfer agent is rewarded because the technology it has transferred has considerable national or regional socio-economic impact and the agent’s role in developing and transferring the technology is recognized by policy superiors and, in turn, the transferring entity is rewarded with increased funding or other resources.
- Another way in which the Political Reward criterion may yield resource results for the transfer agent is through the transfer recipient. Under this scenario, the organization or industry benefiting from the technology transfer, communicates to policymakers the value of its interaction with the technology transfer partner. The policymaker then, in turn, rewards the transfer agent for being a “good industrial partner.” There is evidence of such political reward but, understandably, it is based on rumours and anecdotes.

- Probably the most common and realistic rationale under the Political Reward criterion is for the transfer agent to be rewarded for the appearance of active and aggressive pursuit of technology transfer and commercial success. In this case, the Political Reward criterion turns out to be much the same as Out-the-Door: activity is its own reward. Much bureaucratic behaviour seems to support this view. For example, often universities are as active in publicizing their technology transfer and economic development activities as in actually doing the transfer work.

CRI5. DEVELOPMENT OF SCIENTIFIC AND TECHNICAL HUMAN CAPITAL. A premise of the Scientific and Technical Human Capital model is that one of the most critical objectives in almost all aspects of science and technology policy is building human and institutional capabilities, even aside from particular accomplishments reflected in discrete knowledge and technology outputs [18]. The focus of Scientific and Technical Human Capital is on long-term capacity building. Indeed, a deep understanding of the value of scientific and technical knowledge requires a view of the role of scientific and technical human capital in the capacity for producing scientific work [23] and an understanding that all such work is produced in networks (Casper2005). The formal and informal networks of scientists, engineers and knowledge users depend upon the conjoining of equipment, material resources, organizational and institutional arrangements for work, and the unique human capital embodied in individuals [49]. At any level, from the individual scientist to organizational actor, network, or entire fields, knowledge value is capacity—capacity to create new knowledge and technology [18].

CRI6. OPPORTUNITY COST CONSIDERATIONS. When considering technology transfer activities it is well worth recognizing that technology transfer is one of many missions of an agency or organization, and often not the one viewed as the most important. Even as technology transfer activity is enhanced and nurtured, it remains important to understand that technology transfer takes its place, and often a secondary place, to missions such as the advance of basic research and scientific theory, and providing equipment and infrastructure for the growth of scientific knowledge, training scientists and engineers.

While it is easy enough to understand the fact of opportunity costs in technology transfer, it is not so easy to draw practical lessons about technology transfer measures and metrics. Success not only concerns “go” decisions or validation from customers that there is a viable business model, but also “no go” decisions that there is no market for the technology, but that were reached more quickly without requiring significant expenditure of technology transfer resources, thereby presumably reducing opportunity costs.

CRI7. PUBLIC VALUE. The term “public value” has many meanings and implications. Some use the term as equivalent to the collective good, others in connection with the public interest, and still others as a sort of residual category for commodities not encompassed in either private value or markets. At the broadest level, we can begin with, and then build upon, a public values definition provided elsewhere [17]:

“A society’s “public values” are those providing normative consensus about (1) the rights, benefits, and prerogatives to which citizens should (and should not) be entitled; (2) the obligations of citizens to society, the state and one another; (3) and the principles on which governments and policies should be based.”

While this definition has some merit for present purposes, it shows that public values may be the most fundamental criterion upon which to evaluate nearly any public policy. However, its practical use as a criterion for technology transfer is quite limited.

For instance, in the case of university–industry technology transfer, a cornerstone of so-called “academic capitalism,” some critics [37][54][33] have alleged that the increased commercialization of universities has undermined the core educational mission of universities.

Overall, the “public values” criterion can be thought of as the “keep-your-eye-on-the-prize” criterion in the sense that it focuses on provision of beneficial public outcomes as opposed to the lesser value of organizational goal achievement. To this end, as previously mentioned, the public values criterion is consistent with recent emphasis on responsible research and innovation.

4.2 Beyond the Contingent Effectiveness Model of technology transfer

Beyond the previously reviewed works by Bozeman (i.e., mainly [16] and [20]), other researches have addressed the role of university (and, particularly, its norms and regulations regarding ASO creation) in the effectiveness of this kind of companies. Next, some of the most interesting works found in this regard (ranked in order of their relevance) are addressed.

4.2.1 Aguirre's four-action-line-model

Research from [9] attempts to improve understanding of the role of the University Spin Off Programmes (USOP) by describing the technological opportunities creation, recognition and exploitation process; identifying the main factors involved in this process; and proposing a model that integrates the core functions USOPs have to carry out to minimize the difficulties in ASO creation.

Firstly they propose a process for the commercialisation of opportunities for ASOs (based on the approach adopted by [50]). This process starts with the creation and recognition of the opportunity, and is followed with its evaluation and ends once the decision whether to exploit it or not has been taken. Likened as a metamorphosis process, it consists of a complex process, developing from an unclear gap to a more defined situation; an idea, which responds to a gap or opportunity, is conceptualized as a business, developed through a business plan and commercialized as a spin off. Thus, the university can be considered as a perfect environment for the creation of these technological opportunities.

Then, from [38] (which state that the first main objective of a USOP is ASO creation), and from [57] (which divide the elements identified in USOPs into two parts: on the one hand, there are the "soft elements", such as consultancy services, social networks, education and financing; on the other hand, there are "hard elements", which included the physical spaces for the establishment of new ventures, such as incubators, science parks, technology parks and offices) these authors propose a four-action-line-model which describes, integrates and structures the most important activities of a USOP. Figure 5 depicts both, (a) opportunity metamorphosis process, and (b) the four-action-line-model.

The model describes the main functions and activities of an effective USOP. The first two activity lines address the university governing body, department directors, researchers and academics, in order to facilitate a cultural change towards an entrepreneurial university. In a similar vein, the other two activity lines address the researchers, entrepreneurs and students, and offer them the necessary support to evaluate and exploit their business ideas. Educational training carried out by USOPs plays a fundamental role in this model, because it targets students and entrepreneurs, as well as academics and researchers. Academics should use appropriate methodologies to develop creative and proactive attitudes in their students, while researchers should do their best to create awareness among students of the importance that technological opportunity creation has for economic growth and social welfare. By so doing, students will be able to develop business competences, as well as entrepreneurial and proactive attitudes, allowing them to not only identify opportunities and solve problems, but to do so in innovative ways. After applying their model, they conclude that there are some well-known successful ASOs that were created without the support of any programme. Is it then that some universities do not seem to need a USOP to create successful ASOs? According to them, the reason lies in environmental factors related to the market as well as university issues. In fact, most universities which have a quality education and research standards and whose managerial strategies foster technology transfer, do not need external support for ASO creation. Finally, they concluded that it is not possible to build a unique and optimum model to explain the structure and the way all USOPs work. Each USOP has to adapt continuously to the requirements of the market and the idiosyncrasies of the university, to fill the gaps of the environment.

4.2.2 Conceptual model on ASOs' development, growth, and performance

According to [42], while most other studies have examined the antecedents of ASO creation, the impact of spin-offs commercializing university research cannot be properly assessed without con-

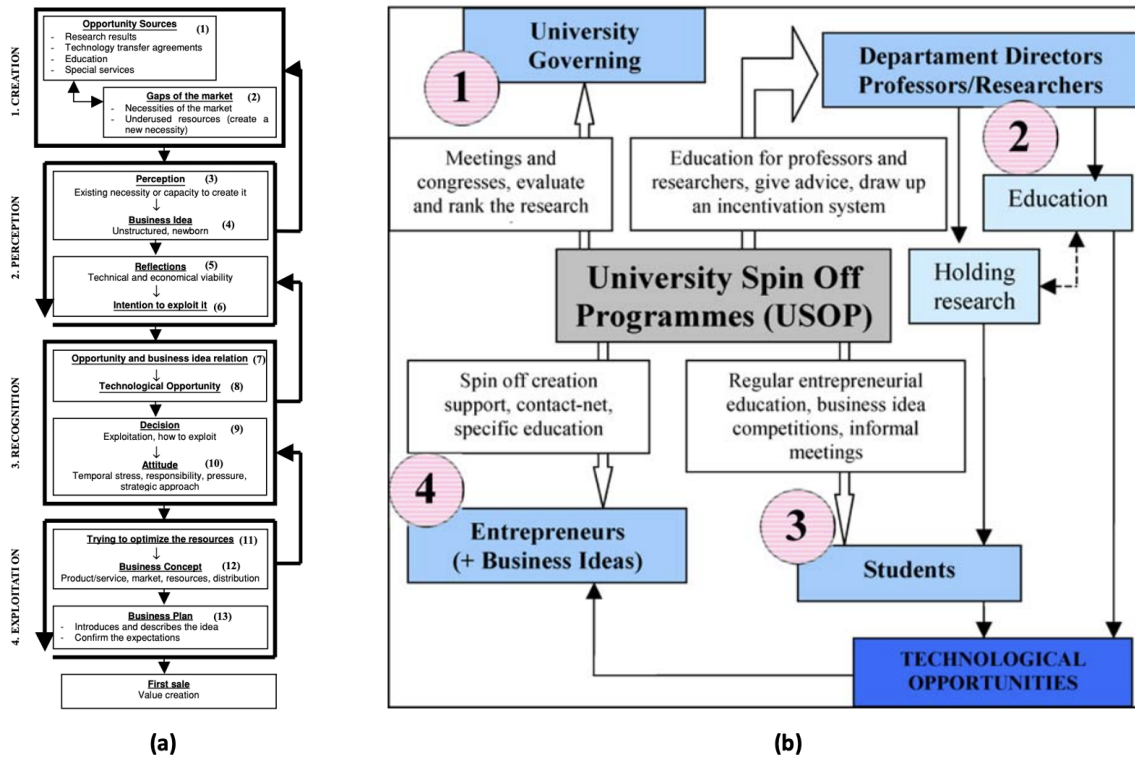


Fig. 5 (a) Opportunity metamorphosis process; and (b) The four-action-line-model [9].

sidering how these firms develop, grow, and perform over time. Then, they provide a systematic review of a recent research stream addressing the development, growth, and performance of ASOs. By critically analyzing 105 research papers published since 2000, this research presents a conceptual framework (Figure 6) outlining the variety of outcomes used in the literature to assess the development, growth and performance of ASOs, as well as the determinants of these outcomes at different levels of analysis.

Their findings support that ASO norms and regulations can shape the growth trajectories of ASOs [26][43]. Under conditions of low support and selectivity, ASOs tend to be established with simple and low-growth oriented business models. In contrast, USOs that are established under high support and selectivity models are established with more growth-oriented business models. According to academic entrepreneurs, support programs within these norms/regulations are useful when they provide access to funding, business networks, and training [47]. Moreover, the perceived benefits increase when programs reduce administrative burdens and provide tax incentives and access to financing. [44] shows how contextual differences significantly impact technology commercialization success, and illustrate some of the key advantages of ASOs as a commercialization channel

Thus, in the conceptual framework they propose, universities have a number of policy initiatives (e.g., norms and regulations) and set up support structures to facilitate the creation and growth of ASOs. They conclude that these policies aim to influence the type of ASOs created and shape their growth trajectories. For instance, if the support system is highly selective the university may spawn fewer ASOs, but these will have higher initial resource endowments. However, assessing the additionality and long-term effect of such policies and support on the ASOs development, growth, and performance is challenging because of selection issues, the broad number of other influencing factors (recall Figure 6), and the long time spans for which data is required.

4.2.3 Quantitative model of effectiveness of university spin-off support programmes

Based on a theoretical framework bounded by next hypotheses,

H1. An environment of innovation increases the effectiveness of university spin-off programs.

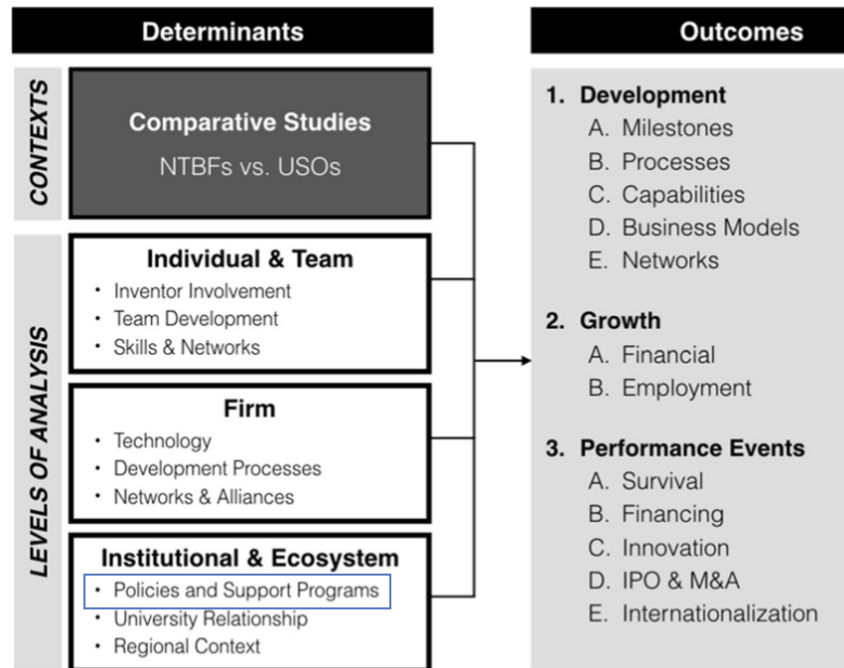


Fig. 6 Conceptual model on ASOs' development, growth, and performance [42].

- H2. A policy of high support/high selectivity is more likely in unfavorable environments.
- H3. Universities in unfavorable environments are forced to start with low selectivity/low support programs for the creation of spin-offs.
- H4. Previous technology stock promotes the effectiveness of university spin-off programs.
- H5. The university's commitment to promoting an entrepreneurial culture improves the effectiveness of university spin-off programs.
- H6. The human resources available in the program improve the effectiveness of university spin-off support programs.
- H7. The experience of the program contributes to the effectiveness of university spin-off support programs.
- H8. Proactivity in searching for and detecting ideas contributes to the effectiveness of university spin-off support programs.
- H9. The university's involvement in spin-offs contributes to the effectiveness of university spin-off support programs.
- H10. Universities pursue different spin-off support policies, generate firms with different characteristics, and have different levels of effectiveness.

[15] proposes to identify different program models supporting the creation of ASOs, analysing the characteristics that differentiate them, and identifying the factors that determine their effectiveness. Their analysis is performed using data collected through a survey targeting the heads of spin-off support programs at universities in the UK and Spain. The authors then applied factorial and cluster analysis techniques and a logistic regression analysis to the data to confirm the results.

From a methodology as depicted in Figure 7, which shows hypotheses graphically, providing a representative model of the conditions for university spin-off support program effectiveness, this research identifies three types of ASO creation programs:

- **Type 1** programs have little experience in spin-off support, have few resources for this task, and do not enjoy much commitment from the university. They are not very proactive in searching for and detecting ideas and follow a high-selectivity policy; as a result, they are not very effective in the creation of spin-offs and do not intervene in their running.
- **Type 2** programs have great experience in spin-off support, have plenty of resources for this task, and enjoy great commitment from their universities. They are not very proactive in

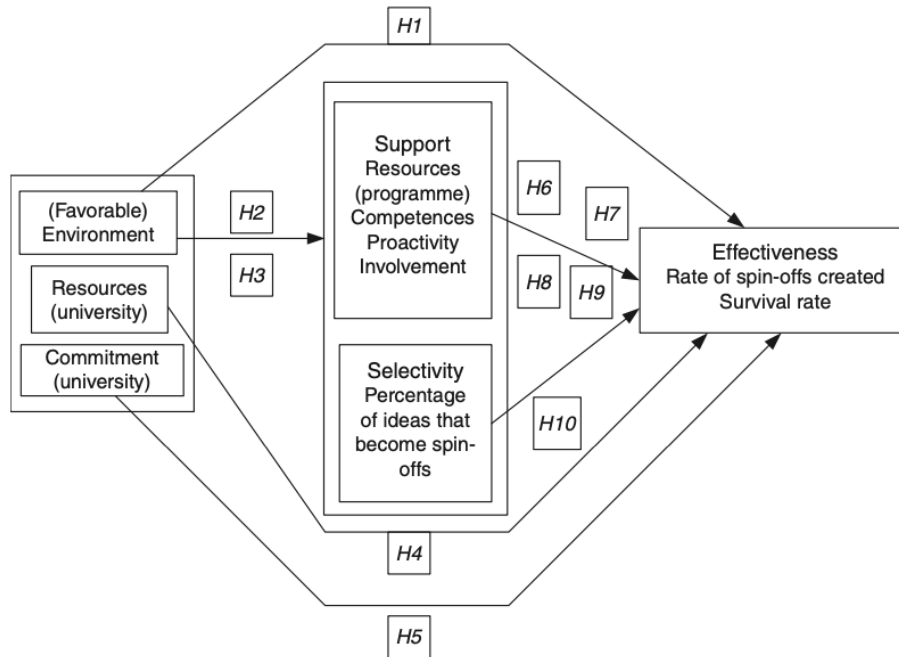


Fig. 7 Representative model of the conditions for the effectiveness of a university spin-off support program [15].

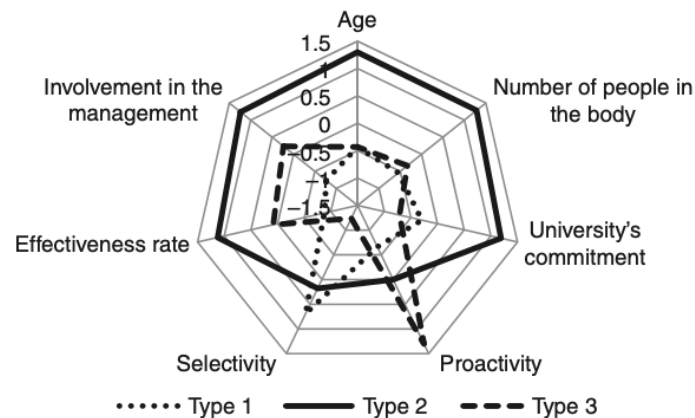


Fig. 8 Profiles of the three types of program in [15].

searching for and detecting ideas and follow a policy of intermediate selectivity; as a result, they have great effectiveness in the creation of spin-offs and intervene in their running.

- **Type 3** programs have little experience in spin-off support, enjoy few resources for this task and less commitment from their universities, and are very proactive in the search for and detection of ideas, but follow a low selectivity policy; as a result, they have intermediate effectiveness in the creation of spin-offs and intervene in their running, but not actively. Therefore, Type 2 programs seem to be the most effective.

Figure 8 graphically shows the profiles of the three different types.

4.2.4 Institutional-layered conceptual model

Investigations from [14] describe and analyse ASOs as a relatively new phenomenon for transferring knowledge from science to industry. They argue that the effectiveness of this mechanism is subject to a complex array of institutional factors, entailing national, sectoral, regional and managerial institutions. Based on an indicative comparison between the Netherlands and the USA they find that is especially the combination of national and sectoral institutions that condition whether an

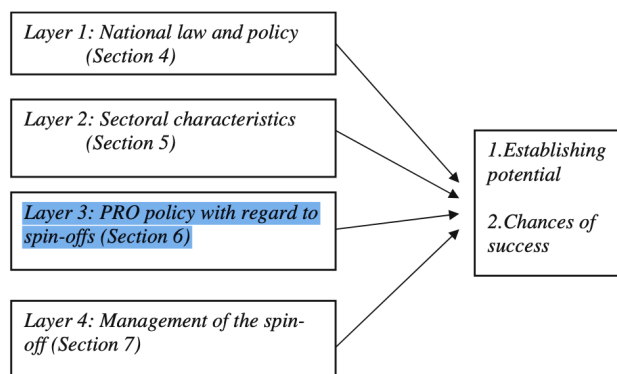


Fig. 9 Conceptual model of different institutional layers that affect the establishment and chances of success of ASOs [14].

ASO is established in the first place, whereas regional and managerial institutions condition its subsequent chances of success.

Particularly, they build a conceptual model consisting of four relevant institutional layers, each with an effect on the potential to establish an ASO and/or on its subsequent success chances. With layers 1, 2, and 4 representing the national economy, institutions at the sectoral level, and a micro-level focusing on the management of the ASO, respectively; then, the 3rd level comprises university policies concerning ASOs, including university patenting policy and technology transfer strategy, arrangements and activities (see Figure 9).

For this 3rd lever, they distinguish between two types of factors: (1) those that especially shape the degree, in which ASOs are established, and (2) those factors that entail how norms/regulations are implemented in terms of its organizational set-up, type of support services and level of formalization. They achieve substantive conclusions, however, only addressing the particularities of the USA vs the Netherlands. Then, and in contrast to the Netherlands, most norms in the USA have clear technology transfer policies in place and actively pursue patenting and licensing activities, aimed at establishing ASOs. Relevant elements of such regulation are formed by clear agreements on royalty sharing, the possibility to make equity investments in ASOs and the role of incubators. Implementation of regulations through specialized technology transfer office services, clear contractual agreements on IP-protection and the type of staff involvement mostly affect chances of success. The relative absence of such norms in the Netherlands may form one of the key reasons for its comparatively poor performance in establishing ASOs and their success chances.

4.2.5 Other models

As examples of other interesting, though less relevant, models, there is that of [8] which, based on the distinction between «Pull spin-offs» (where individuals are pushed out of the university by the expectations of profit offered by the business opportunity to commercialise the invention in the market) and «Push spin-offs» (where the university has influence on the inventor's exit to the business world), they propose the model Figure 10, where, in addition to the «Applicable legislation», the influence of the university's organisational resources on the effectiveness of the instruments for the creation of ASOs is considered.

In particular, they highlight the importance of the university's support strategy, accepting that the strategy to support the generation of spin-offs is directly related to the culture and general objectives of the university: universities with a commercial culture, which fit the Triple Helix model, are the ones that tend to design strategies that support the generation of spin-offs to a greater extent, as this is one of their objectives.

Analysing different classifications of strategies to support the creation of ASO (e.g. [25][26]), it is worth highlighting that of [24] which identifies three models.

- The first model, known as the low selective model, is based on the University of Twente in the Netherlands and Crealys in France. The main objective of universities developing this model is to generate as many ASOs as possible, with profitability being a secondary objective. According

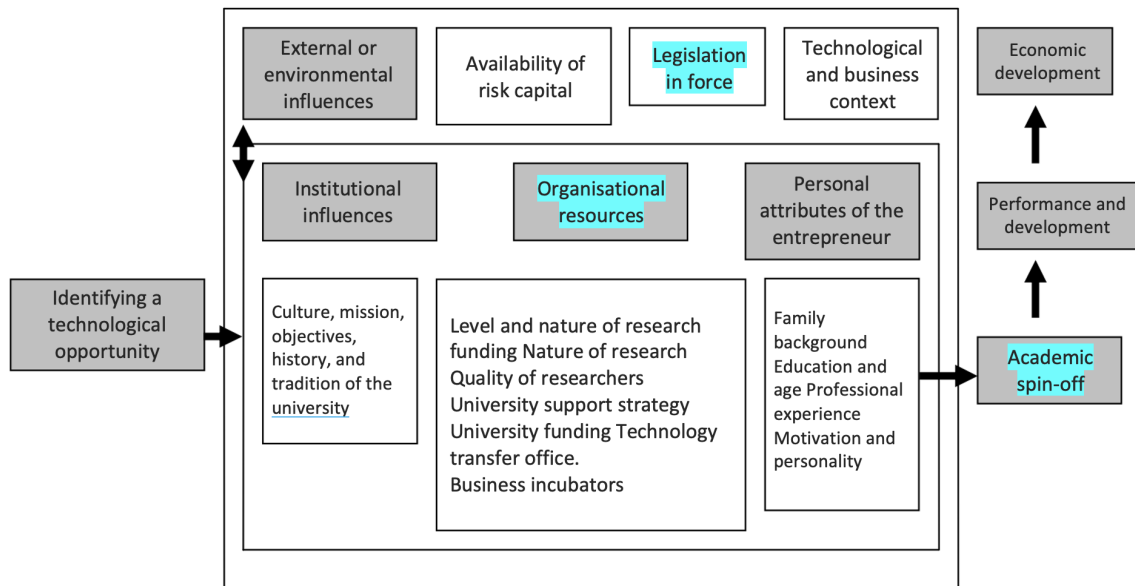


Fig. 10 Factors influencing the generation of academic spin-offs according to [8] (own translation and highlighting).

to [24] the results in this model are good in terms of the number of companies created and the generation of employment, but in many cases the spin-offs are not oriented towards growth, but only towards survival.

- The second model is the supportive model, represented by the Catholic University of Leuven. In this model, spin-offs are seen as a way of commercialising research results as an alternative to patent licensing. The companies created tend to be fewer than in the previous model, as they must meet minimum expected profit criteria. On the other hand, the resources offered by the university to support the promoter teams are greater and a monitoring process is carried out before and after the creation of the company.
- The third model is the incubator model, represented by IMEC (InterUniversity Institute for Microelectronics, Leuven), TTP (The Technology Partnership, Cambridge, UK) and Scientific Generis (also Cambridge). In this model, the objective is to seek opportunities arising from scientific research for which the spin-off is the most beneficial form of commercial exploitation, as opposed to other traditional forms of commercialisation, such as patent licensing. In this case, there is an active search for technological opportunities in the early stages of research and a choice is made between licensing and spin-off as the form of commercial exploitation for each of them. The selection criteria in this model are more demanding than in the previous ones and, consequently, the number of spin-offs created is lower, but they are highly market and growth oriented companies.

According to the previously mentioned authors, it cannot be said that one model is better than another. On the contrary, each one fits a given context and is appropriate for the objectives set and the type of spin-off to be promoted [24].

Finally, it is worth mentioning the attempt to quantify the effectiveness of the technology transfer process in universities by [52] ([39] also proposes something similar). Although it does not focus on the analysis of regulations for the creation of ASOs (nor of ASOs in particular, but of any type of university-led enterprise), it does propose a model based on six variables to measure technology transfer effectiveness from a research university: (1) the number of invention disclosures received, (2) the number of U.S. patents filed, (3) the number of licenses/options executed, (4) the number of licenses/options yielding income, (5) the number of start-up companies, and (6) the gross licensing income received. This six-item scale reflects certain of the four dimensions of technology transfer strategies utilized by federal USA R&D laboratories, as suggested by [53]: (1) passive technology transfer, such as publishing research results in scientific journal articles or making invention disclosures; (2) active technology transfer, such as filing patent applications, executing

technology licenses and options, obtaining income from licenses/options, and earning income from technology licenses; **(3)** entrepreneurial technology transfer, as indicated by the number of start-up companies; and **(4)** technology transfer for local economic development.

5 Analysis of regulations for ASOs creation in the Spanish universities

In the this section, an analysis is made of the regulations governing the creation of ASOs for some of the most important Spanish universities:

- 5.1. Universidad Politécnica de Madrid** – UPM (Technical University of Madrid)
- 5.2. Universidad de Santiago de Compostela** – USC (University of Santiago de Compostela)
- 5.3. Universidad Politécnica de Valencia** – UPV (Technical University of Valencia)
- 5.4. Universidad Autónoma de Barcelona** – UAB (Autonomous University of Barcelona)
- 5.5. Universidad Carlos III de Madrid** – UC3M (Charles III University of Madrid)
- 5.6. Universidad de Oviedo** – UNIOVI (University of Oviedo)

Three factors have motivated the selection of these and not other universities: **(1)** their position in the rankings [45]¹ in number of ASO generated, **(2)** their historical track record in supporting the creation of ASOs, and **(3)** the amount of information available to collect (mainly from their websites, but also through direct contact -by email- with their representatives).

The Technical University of Madrid (**UPM**) is positioned as the first Spanish university in the promotion of university entrepreneurship, with 174 ASOs created in the period 2009-2018, promoting entrepreneurship and encouraging innovation in the university community for more than a decade. The University of Santiago de Compostela (**USC**) was one of the first institutions to develop a wide range of support structures for the creation of companies, founding, in January 1999, UNINOVA (Sociedade para a promoción de Iniciativas Empresariais Innovadoras, S.L.) with the aim of promoting the creation of innovative technology-based companies from R&D projects of the University of Santiago de Compostela, which currently operates as an incubator. The Technical University of Valencia (**UPV**) has, in the Polytechnic City of Innovation, corporate laboratories of companies that have a strong collaboration with the university, both in terms of research and recruitment of talent. With regard to the transfer of knowledge to the productive sector, the intensification of the relationship between university and business and the promotion of entrepreneurship, the Autonomous University of Barcelona (**UAB**) has taken an important step forward since 2007, when the UAB Research Park (PRUAB) was inaugurated. The business community at the Universidad Carlos III de Madrid (**UC3M**) Science Park is made up of 22 start-ups and eight spin-offs. Of the latter, 50% are owned by UC3M. In addition, the community includes companies and innovation driving institutions that collaborate through corporate programmes, such as the European Space Agency (ESA), Airbus and Telefónica. The business incubator of the University of Oviedo (**UNIOVI**) consists of 6 premises with a useful area of 40 m² each, for the installation of spin-offs. The UniOvivero is a tool of the University of Oviedo that facilitates the installation of spin-offs through the offer of premises for use as an office or laboratory, in advantageous economic, environmental and collaboration conditions, adapted for the installation of innovative companies and/or with a technological or innovative component generated in the University itself as the basis of its activity.

It is worth noting here that the purpose of this study is to analyse the framework, the context, provided by these regulations, and not as much the specific details of the (legal) needs to be fulfilled by the promoters, etc. Similarly, the analysis is more focussed on that part of the regulations focused on the *process of creation* of ASO, but not so much on *encouraging* (i.e., *motivating*) potential promoters to set up such companies.

¹ Note that it is not possible to use a single criterion to calculate the number of ASOs created by each of the Spanish universities, as there are a multitude of different sources. In this sense, the data from the INUE [45] has been considered as one of the most updated to date.

5.1 Universidad Politécnica de Madrid

The UPM's regulations regarding the creation of ASOs have their origin in its own statutes [6] (originally from 2003, but updated in 2018), which contemplate support for the creation of companies among the activities to be carried out at the University. Thus, in the third Title, Chapter III on research and transfer of research results, third Section, Article 112 states:

The Technical University of Madrid will promote the creation of and participation in technology-based companies based on its research activity, in whose activities its staff may participate on a paid basis, [...] coordinating its action with the other Universities and Research Centres in specific actions, or through the creation of centres or mixed structures. The creation of this type of companies, as well as the authorisation of the participation of teaching and research staff in their activities, shall require the agreement of the Governing Council of the Technical University of Madrid, following a report from the Council of the Department to which the professor belongs.

The regulation and development of these provisions contained in the statutes of the UPM are translated into the document «Regulations on technology-based companies and technological services of the UPM» [56] which, although relatively old (2005), is a key factor for the development of a greater number of TBCs based on the research results obtained in the departments and institutes of the UPM.

This regulation develops the Statutes of the UPM by addressing the most important aspects related to the creation of TBCs by the UPM and the aspects derived from the participation of its staff in them. Special importance is also given to the aspects of technology transfer to the TBCs and those derived from their financing.

Next, the key aspects of the structure of the UPV document are detailed.

PARTICIPATION MECHANISM. The UPM, directly or through companies in which it holds a majority percentage of the share capital, may create or participate in the share capital of any type of limited liability commercial company, public limited company, or European Economic Interest Grouping (EEIG) with other public and private entities, in order to carry out specific activities of a temporary nature: 1. The UPM may participate directly in the share capital of the TBCs with both minority and majority percentages, or even with the total share capital, to the extent that these participations mean the best fulfilment of the purposes of the UPM. 2. Likewise, its participation may consist of the contribution of goods, rights or services in kind, suitably evaluated, in accordance with the provisions of the Social Council.

KNOWLEDGE TRANSFER. The regime of protection of industrial and intellectual property in the TBCs dependent on the UPM is governed by the following rules:

Contributions. The contributions corresponding to the UPM's participation in an TBC, both in the initial share capital and in subsequent increases, may be made in direct monetary contributions, or through personal or material means, or on the basis of the technology contributed to the TBC.

The valuation of the rights over such technology may require a non-binding report issued by a specialised entity jointly agreed by the UPM and the TBC, which shall comply with the provisions of the Social Council.

The UPM may agree to convert the technology transferred to an TBC into shares in the capital stock of the TBC, and this conversion shall be regulated by means of a specific agreement.

Protection of technology. The UPM shall promote the protection of technology that may be incorporated into an TBC dependent on or linked to the UPM by supporting, with its own industrial and intellectual property aid programmes, this protection prior to the creation of the TBC.

Assignment and use of technology exploitation rights. The UPM may agree with the TBCs the assignment of rights to the economic exploitation of technologies owned by the UPM, or the conditions for the assignment of technology to an TBC and from the latter to third parties, within a process of support for the commercialisation of research results under the terms established by the Social Council.

The benefits of the exploitation shall be agreed with the UPM, which shall determine the subsequent use of the same in accordance with current intellectual and industrial property regulations.

PROCEDURE. The UPM will participate in the share capital of an TBC by agreement of the Governing Council, at the initiative of the Rector, with the approval of the Social Council, in accordance with the rules established for this purpose by the Community of Madrid. The participation, as defined in the subsection «Participation mechanism» above, shall entail the equivalent presence of UPM representatives in its management bodies, as well as the presidency of the Rector, when they are the exclusive instrument of the UPM, or the participation in the presidency, when they are mixed, under the protection of the provisions of the regulations in force regarding incompatibilities. The Social Council shall approve the annual accounts of the TBCs dependent on the UPM within the same deadlines as the latter, without prejudice to the commercial or other legislation to which such entities may be subject depending on their legal status.

The proposal for UPM participation in the share capital of an TBC shall be accompanied by a memorandum of justification containing at least the following sections:

- (a) Proposed statutes.
- (b) Business plan.
- (c) Programme for the financing of its activities during the implementation period. implementation period.
- (d) Technologies or knowledge contributed by the UPM and their degree of protection.
- (e) Involvement of UPM staff in the promotion of the TBC. TBC.
- (f) Benefits for the UPM from its participation in the TBC, and justification of the UPM's percentage shareholding in its share capital.

The justification report shall be submitted to the Rector through the Vice-Rectorate for Research.

As the last provision of these UPM regulations, it is established that the «UPM Programme for the Creation of TBCs» [41] will be approved, which will finally detail the phases to be completed by the entrepreneurial teams and the services to be provided to them, as well as all the administrative procedures for the creation of companies and for the implementation of these regulations. This document defines some other aspects of the ASO creation procedure for the UPM, as detailed next.

OBJECTIVE. The UPM Business Creation Programme aims to exploit research results and innovative ideas through the creation of companies with high growth potential. To this end, it develops its work around four fundamental pillars: the business idea, the team, the support resources and the business model that defines the viability of the project.

This programme of the Vice-Rectorate for Research is aimed at the entire UPM community, professors, researchers and students, as well as any external party that forms a team with members of the Polytechnic University.

SERVICES. The services offered by the UPM Business Creation Programme are:

- Advice in all phases of project development, from the initial idea to the constitution of the company.
- Guidance in the drafting of the business plan.
- Training actions oriented to the specific needs of the team.
- Support in the search for financing.
- Visibility to potential investors and clients.
- Physical location in the UPM business centres.

For the provision of these services, sessions and conferences are organised in the different centres of the University, as well as an annual Business Creation Competition with prizes for the best ideas and the best business plans, which introduces the concept of development of the business project in phases.

In order to minimise risk and optimise the value proposition, this document specifically details a series of phases established in the development of the business project(see Figure 11):

- **Phase I.** The promoter team must be able to describe its idea in a dossier of approximately two sheets of paper. This is a document with a predetermined format in which the value proposition

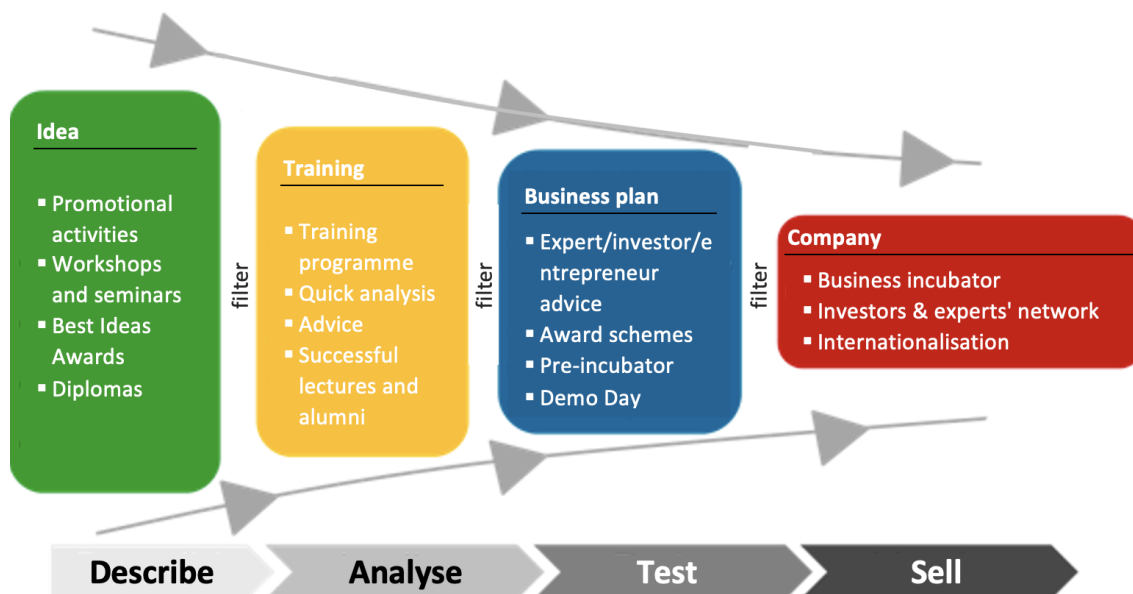


Fig. 11 Schema of the TBC creation procedure from the Technical University of Madrid [5] (own translation and adaptation).

can be shown. The definition of potential customers and competitors, as well as the details of the competitive advantage of the project are some of the aspects to be highlighted.

- **Phase II.** If the project shows signs of sufficient potential and viability, the preparation of a business plan that demonstrates the opportunity and viability of the business project begins. the opportunity and viability of the business project. Market research, marketing plan or economic-financial analysis are some of the areas that are addressed in its design. Depending on the degree of maturity of the project, a series of support tools are made available to the team to help them draw up the plan.
- **Phase III.** The objective of the previous phases is none other than to obtain sufficient information for decision-making. At this point, sufficient data should be available to decide on the next steps and the possible establishment of the company. From this point on, other initiatives are developed, such as support in the communication of the project and the attraction of clients, the search for financing and the analysis of the location in the business centres of the university.

5.1.1 Key aspects to highlight of the UPM regulation for ASOs creation

An interesting characteristic of this first document analysed is that it explicitly mentions that the «Regulations on technology-based companies and technological services of the UPM» [56] document itself stems from the UPM's own general statutes [6]. In this sense, it is important to note that, for many of the universities analysed (those finally included in this study, and many others analysed but not finally included), the vast majority of initiatives in relation to the creation of ASOs are only reflected in the universities' general statutes. This does not mean that there are no norms or regulations regarding the creation of ASOs, but only that, if they exist, these documents are not public (or, at least, are not easily accessible).

It is also worth noting that the UPM document makes an express reference to *non* technological companies (specifically in Article #3 «Other non-technological companies», within Title #1). Apart from the peculiarity of finding this article in a document entitled «Regulations on *technology-based* companies and technological services of the UPM», the paragraph of which the article is composed simply states that «the UPM may create or participate in other non-technological companies of an instrumental nature with the aim of providing a better service to the university community or to society as a whole. These companies shall also be subject to these regulations in all aspects relating to authorisations and staffing, which must be included in the report to be attached to the ASO creation proposal».

Finally, it can be said that the document shares many similarities with the rest of the documents analysed, especially in terms of structure, topics covered and also in terms of timing (the UPM norm dates back to 2005).

5.2 University of Santiago de Compostela

At the University of Santiago de Compostela (USC), it is the Valuation, Transfer and Entrepreneurship Area (AVTE), dependent on the Vice-Chancellor's Office for Research and Innovation of the USC, the service in charge of the integral management of the transfer process of research results and of the dissemination and promotion of the entrepreneurial culture among the university community. AVTE's mission is to multiply the social and economic impact of research results and promote university entrepreneurship. Therefore, one of its main functions include to support and advise on initiatives to create companies based on research results (spin-offs).

The USC concentrates its normative on ASO creation in a single document («Regulation for the creation of technology-based companies (TBC) of the University of Santiago de Compostela» [4]; a relatively updated document, from 2017). The document also covers academic start-ups (ASP), both under the umbrella of the TBC concept (recall these definitions in Section 2).

The ASO normative from the USC has a classical structure, with a set of sections quite aligned to each of the *desired contents* of the ideal regulation document as addressed in Section 3.2 (it particularly addresses **WHAT** are those **processes** involved in ASO creation –and maintenance, etc.–, and **HOW** they are supported).

Next, the key aspects of the structure of the USC document are detailed.

OBJECTIVES. The document clearly defines the main objectives that regulates the activity of the University of Santiago de Compostela in the creation of TBCs. Specifically, «the procedures, means and instruments that facilitate the provision of this social service by USC are regulated». In particular, these objectives can be grouped into three sets:

- **Facilitation** of the transfer of research results through the promotion and encouragement of the creation of university spin-off companies.
- **Promotion** of the viability and survival of the TBCs created.
- **Regulation** of **(1)** the participation of staff belonging to the University Community in the TBCs, and of **(2)** the conditions of access by TBCs to USC facilities and services.

PROCEDURE. The procedure of creation of an USC's TBC is clearly explained in the regulation document; it offers a sequential approach with several phases (see Figure 12):

1. **Identification of business opportunity based on USC research results.** This could be done by personnel from the research group or the AVTE of the Vice-rectorate of Research and Innovation.
2. **Feasibility analysis: elaboration of the business plan, including:**
 - **Description of the innovation:** origin of the knowledge; degree of protection and degree of maturation (TRL – Technology Readiness Level); possible applications and problems it solves.
 - **Business model**, including identification of products/services to be sold, potential markets, income generation, etc.
 - **Development plan** detailing both the technology maturation process and, if applicable, the production process and business plan.
 - **Work team**, defining profiles, responsibilities and development program.
 - **Financial needs**, both for the technical development process and for the productive and commercial phase. The participation of the USC as a partner in the company allows the promoters to be granted compatibility in order to have more than 10% of the share capital, to form part of the administrative body and to be contracted to carry out certain activities in the company, in accordance with the procedure and requirements established in the Spanish science law².

² Particularly, in the Additional Provision 24 of LOU 4/2007 and Article 18.2 of Law 14/2011 on Science.

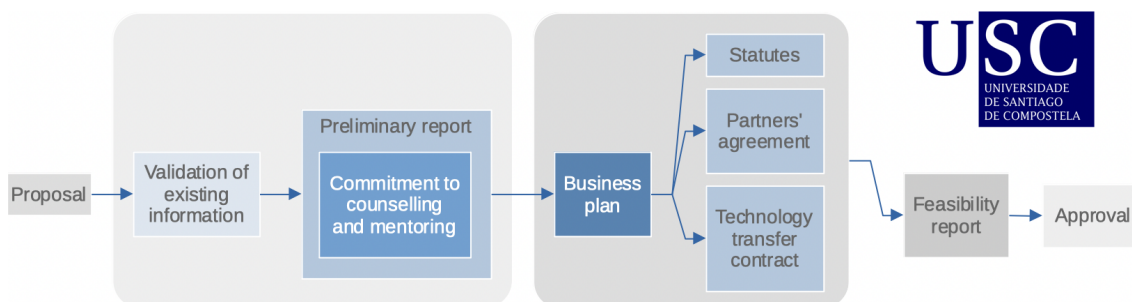


Fig. 12 Schema of the TBC creation procedure from the University of Santiago de Compostela (adapted from [4]).

If at the end of this process of analysis and possible reformulation the conclusion is reached that there is a **Viable Business Plan**, the **documentation** for the creation of the TBC and **approval** by the Governing Council and the Social Council will be prepared:

- **Viable Business Plan**, including initial capitalization table and first investment rounds.
- **Declaration of authorship** of the researchers generating the knowledge to be transferred.
- **Knowledge transfer agreement** from USC to the TBC.
- **Partners agreement**.

3. Submission of proposal for approval of the TBC to the Governing Council and Social Council. The AVTE prepares a report with a proposal for the approval of the company in which all the information required by regional legislation and the USC's own regulations will be gathered.

The same report, if approved by the Government Council, will serve as the basis for its approval by the Social Council.

USC's investment will be done through the an intermediary society (*Sociedade Xestora de Interese da Universidade de Santiago de Compostela – UNIXEST*), which will also be informed of the approval from the Government Council and the Social Council.

As shown in Figure 12, the procedure explained in the USC regulation document is aligned to the general procedure as explained in Section 3.2.1 and depicted in Figure 3.

OBLIGATIONS. The duties expected for the recently created ASOs are in line with the general requirements to accomplish, as explained in Section 3.2.2. These are: **(1)** comply with the requirements required by the legislation (regional, country, European, etc.), as well as the contracts or agreements signed between USC and the ASOs; **(2)** present an annual report on compliance with the purposes for which the entity was created (as well as annually submit the annual accounts and a report of the management developed); **(3)** communicate any relevant corporate changes and any statutory changes; **(4)** allow USC to carry out external, economic or technological audits, in order to determine the financial and technological situation of the ASOs; and other minor obligations not under the scope of this work.

PARTICIPATION MECHANISMS. According to its regulation document, USC may contribute to TBC activities through one or more of the following modalities:

1. Share capital. Participating directly in the share capital of the TBC through contributions of any nature (directly or through UNIXEST).

Participation in the share capital will determine the appointment and presence of representatives, from USC or UNIXEST, in the corresponding company bodies. Changes in the share capital due to the purchase or sale of shares in the part corresponding to USC must be approved by the Social Council.

In the event that USC has a majority in the company's capital, it must approve the annual accounts of the TBCs within the same terms and procedures as USC. In addition, ASOs must comply with the accounting regulations on consolidation of accounts.

2. **Patent licensing.** Assigning or licensing patents or any other title of industrial or intellectual property that allows the exploitation, by means of remuneration, of the patrimonial rights of the USC.
3. **Services use.** Authorizing the use of university services, in accordance with the rules that govern them, as well as the university support services of the companies that are created.
4. **Other.** Through the contribution of goods, rights or services in kind, previously valued, in accordance with what is established by the Social Council.

USC's participation in the TBCs created is considered temporary, and the USC's ways out of the TBC must be guaranteed. The AVTE will periodically inform the competent Vice-Rector's Office of the status of USC's participation in the TBCs and will reasonably recommend, if necessary, the total or partial sale of said participation.

ASO DEVELOPMENT PROMOTION. Regarding promotion measures, it is important to note that the USC regulation addresses two different concepts. On the one hand, it defines those that deal with the mechanisms necessary to encourage the *appearance* of ASOs, which seek to encourage university personnel to create this type of initiatives (and, as already mentioned, these mechanisms are outside the scope of this work). On the other hand, the USC norm also deals with the mechanisms to *promote* the development of the ASOs, that is, once their creation has been decided.

Regarding this development promotion, the USC regulation just mentions a small set of the potential services to provides (as address in Section 3.2.2). Mainly, those involving support services in the matter of technological monitoring and foresight and intellectual and industrial property. It also includes advising TBCs on compliance with the administrative requirements for the creation of companies and compliance with the regulations of their area of activity.

Other services include **(1)** the promotion of the existence of agreements and conventions with entities dedicated to the support of entrepreneurial people to facilitate the start-up of companies (this also considers agreements with financial, venture capital or business angels to facilitate access to financing for USC TBCs), **(2)** the use of incubation services for technology-based university companies (also boosting the presence of TBCs in science and technology parks), and **(3)** location services (offering spaces and premises allocated within the USC).

RETURNS. In addition to the collection of dividends for participation in the share capital, the norm contemplates several other forms of return in favour of the USC. So the USC support to ASOs may use one or more of the following formulas:

- (a) Compensation collection for university technology.
- (b) Collection for the use of university assets.
- (c) Preferential hiring of the USC for all types of consultancy and realization of works of R&D.
- (d) Admission of students in internships.
- (e) Possibility of carrying out academic work and doctoral theses in the field of company.
- (f) Agreements for the temporary mobility of university staff and researchers in training.

Finally, the USC regulation includes other initiatives (such as, for example, those related to the promotion of the participation of teachers and researchers in the ASOs) that are aligned with the applicable legislation (regional, national or European), so do not contribute with any innovation to the context of ASO regulation.

5.2.1 Key aspects to highlight of the USC regulation for ASOs creation

Not as outdated as the UPM document (2005), the regulations for the creation of ASOs at the USC are among the most recent ones: 2017. With a structure similar to that one from the UPM (objectives, participation mechanisms, etc.), it is, however, more vague and less specific in its content.

It is perhaps for this reason that USC authorities themselves have published and made public another document («Creation of research-based companies at the USC» [7], from 2020) which complements the original regulation with specific details on the process of ASOs' creation and, in addition, with information on the impact of the USC policies into ASOs' creation.

5.3 Universitat Politècnica de València

The procedure for the creation and recognition of ASOs within the UPV is established in the *Regulations for the Creation of UPV Technological-based Companies* (adopted by the UPV Governing Council of 15 May 2008) [2].

For the UPV, ASOs are those entrepreneurial initiatives in which the promoter belongs to any of the University's departments, Public Research Centres and Public Research Bodies (professors, technical or administrative staff and researchers), and is created on the basis of knowledge or technology developed and owned by the institution, which is transferred to the company for operation. So the **essential elements** are:

- Product arising from research results transferred, with sufficient maturity or proximity to the market to sustain the activity of the company.
- A good business plan with growth and financing forecasts.
- A promoter team committed to the project and with a well-defined management function from the onset.

In this context, a UPV ASO is that company that:

1. Initiates and develops its creation process in the regulatory framework on the creation of technological companies of the UPV; that is, according the document *Regulations for the Creation of UPV Technological-based Companies* [2].
2. Has UPV researchers among its promoters.
3. Its main economic activity will be based on the operation of intellectual property rights (IPR) owned by and transferred to the UPV.
4. The UPV can participate as a partner.

Next, the key aspects of the structure of the UPV document are detailed.

SERVICES. The services that the UPV offers for the creation of ASO are articulated through the collaboration between different units of the UPV that play an interface role with companies and institutions. The organisations involved in the provision of these services are:

- **Ideas Institute**, in charge of advising promoters on the creation process, as well as tutoring and subsequently evaluating the business plan.
- **I2T**, in charge of assessing the technology to be transferred and negotiate the form of transfer and the participation of the UPV in the company, as well as to provide legal support until the incorporation of the company and subsequent follow-up of the same.
- **CPI Foundation**, in charge of managing areas at UPV's Business Development Centre.

PROCEDURE. Relying on the services offered by the organisations mentioned above, the process established by the regulations at the UPV requires reflection, negotiation and formalisation according next steps:

1. **Communication** in the Ideas Institute of the business project.
2. **Identification of results** transferable by I2T: they must be properly identified and registered in a UPV internal database of *Capabilities and Results (Patents, Software and Know-How)* called CARTA Application.
3. Presentation of the **Business Plan** of the company in the Ideas Institute. This business plan has to reflect and develop the business model in which the company will base its economic activity and the operation of technology. It is the tool that will allow the UPV to position the company in relation to real market parameters, which means knowing, calculating and minimising the risks of its implementation, assuming them in a controlled manner.
4. **Negotiation** between I2T and promoters of the terms of the UPV-ASO relationship, including:
 - Share capital stake.
 - Technology and brand licenses between UPV and ASO.
 - Partnership Agreement.

5. The Ideas Institute **report** to government bodies on the Business Plan and a TBC certification of the company to become UPV ASO.
6. Preparation of **legal documents** (corporate statutes, partnership agreement, transfer agreement and trademark license agreement) by I2T, to be endorsed by the General Secretary's Office. It should be noted that the UPV enforces its relationship as a partner in the company through an essential agreement, the Partnership Agreement, a document that regulates the relationship between partners, and between them and the company, in certain aspects that allow to protect economic and relationship issues, for the best possible performance of the company.
7. **Approval** by the Governing Bodies: Commission of Inquiry, Governing Council and Social Council.
8. **Public deed** in the presence of a civil law notary.

PARTICIPATION MECHANISMS. The UPV will be able to participate as a partner in the company within the framework provided for by current Science, Technology and Innovation laws. To do so, the three elements initially defined (ABC) must be taken into account; in addition, in the decision to participate, the effective exploitation of the transferred technology, the future R&D relationship between the UPV and the company, and the development and growth forecasts contained in the Business Plan, together with a solid management component, will be assessed.

In the event that the UPV does not participate as a partner, but if the three elements initially defined (ABC) are present, the UPV may formally recognise the company as a spin-off and grant it a free licence to use the Spin-off UPVTM brand.

KNOWLEDGE TRANSFER. The UPV will transfer the intellectual and industrial property rights owned to the company, by means of a license, for their operation.

The **Transfer Contract** is an essential document in the relationship between the UPV and the ASO, since it includes the licenses of the transferred IPR and regulates preferential rights of access to the UPV's R&D. It establishes the economic conditions that the UPV will receive in exchange for the licenses, whose valuation will be made at market price and taking into account the degree of maturity of the technology and the company's development forecasts as reflected in the Business Plan.

ASO MONITORING. **Regarding the corporate relationship**, the UPV does not intervene in the management of the company within the administrative body, but exercises the rights granted by its partner and those established in the Partnership Agreement in the General Meeting of Shareholders, where the Director of the I2T represent the UPV.

Regarding the transfer and R&D relationship, as agreed in the Partnership Agreement and as regulated in the Transfer Contract, a Joint Commission UPV-ASO is established, which shall monitor the operation of the results transferred and the R&D relationship between the UPV and the company. The mission of this Joint Commission is to ensure the proper management of the conflict of interest that may arise in this area. It consists of the Vice Chancellor for Research, Innovation and Transfer, the Director of the research structure to which the promoters belong and the Director of I2T on behalf of the UPV, and whom the company designates for its part, having at least one promoter researcher.

5.3.1 Key aspects to highlight of the UPV regulation for ASOs creation

Once again, this is a rather outdated regulation (2008) which follows a rather similar structure and content to the two documents analysed above (the UPM and the USC).

As a secondary remark, it is worth mentioning that this regulation seems, perhaps, more «legalistic» than the previous ones; this is in the sense that it makes much more formal references to the laws that must be complied with (mainly Organic Law 6/2001, of 21 December, on Universities, and Organic Law 4/2007, reforming Law 6/2001; but also Law 53/1984, of 26 December, on Incompatibilities of Public Administration Staff).

5.4 Other universities analysed

Other universities have been analysed, namely the Polytechnic University of Catalonia (UPC), the University of Oviedo (UNIOVI) and the Autonomous University of Barcelona (UAB). However, for these universities the amount of openly accessible information (i.e. through the public web) was not sufficient to be incorporated in the present document. Nevertheless, some interesting aspects of the documents obtained and the research carried out are highlighted next for each of them.

5.4.1 *Universitat Autònoma de Barcelona*

In order to promote the transfer of knowledge through the creation of companies whose aim is the commercial exploitation of research results, the regulations on research of the Universitat Autònoma de Barcelona (UAB) include the Title V: «Creation and participation in companies for the commercial exploitation of UAB research results» (extended in 2014) [12].

The above document is a revision of the original UAB regulations on the creation and participation in companies for the commercial exploitation of the results of UAB research, which was the result of several revisions and updates carried out in 2009, 2011 and 2013 [13].

Therefore, in the case of the UAB, it can be considered that there is a single framework for the regulation of the creation of ASOs.

5.4.2 *Universidad Carlos III de Madrid*

The Carlos III University of Madrid (UC3M) also promotes the creation of companies among its research staff as a way of transferring knowledge from research results.

The University promotes the creation of spin-offs and offers support to research staff in the processes of viability and market opportunity analysis, setting up the spin-off, finding funding, market access and business consolidation.

The University may participate in the share capital of its spin-offs to contribute to their business development. This minority and temporary participation is articulated in accordance with the «Regulations for the creation of knowledge-based university companies» [40].

Therefore, in the case of the UC3M, it can be considered that there is a single framework for the regulation of the creation of ASOs.

5.4.3 *UNIOVI*

As for the vast majority of the universities previously analysed, the University of Oviedo (UNIOVI) does not have a specific document that regulates the process of creating TBCs, but rather it is a process distributed among various documents and, of course, among the know-how of the university's employees.

UNIVERSITY STATUTES. Among these documents, again as for other universities, it is worth highlighting UNIOVI's own statute [1] (2010) where, in its Title IV of «Functions of the University», some articles related to the creation of TBCs are detailed.

Specifically, article 136 establishes «Other structures and entities for research» where, in section #2, it establishes the possibility of «creating or participating in technology-based companies or foundations by agreement of the Social Council, at the proposal of the Governing Council [...]». Likewise, the University may create centres, companies or other structures with public and private bodies for research, innovation and connection with the productive system». This article, but in section #3, establishes the rules for the incorporation of its staff into this type of company.

OTHER SUPPORTING DOCUMENTS. Two other documents are worth highlighting that demonstrate UNIOVI's support for the creation of this type of companies.

One of them is the «Brochure on spin-off creation at the University of Oviedo» [34], an informative brochure where the concept of ASO and contextual issues such as why to create an ASO, its benefits, forms of participation, compatibility regime, etc. are explained. Due to its informative but not regulatory orientation, further analysis of this document is beyond the scope of this work.

There is also a «Model business plan» [35], which highlights the importance of this kind of documents in the conception and formalisation of ASOs.

However, from the information published on the UNIOVI website, it has not been possible to determine its specific procedure for the creation of ASOs.

6 Conclusion

Although the proposed methodology is considered adequate to achieve the objectives of this research, however, its implementation has encountered two major obstacles, the first functional, i.e., operational, and the second more conceptual.

Firstly, it has been quite difficult to access quality source material for the research, i.e., it has been difficult to find the documents that regulate the creation, support and maintenance of ASOs (there have been cases where some information has been found, but not relevant –i.e. not sufficiently «official» information–). This issue has been key to the development of the research, to such an extent that it has determined which universities did or did not participate in the analysis of their regulations (as explained above –Section 5–, it can be considered that the three main universities included –UPM, USC and UPV– have been analysed, not only because they are the most important in terms of the number of ASOs created –which is also true–, but mainly because of the quality of their documents regulating the creation of ASOs). It is important to note here that the search for these documents has not been limited to research on the Web; in addition to searching the universities' own websites, and doing the same on the Web, in general, through general search engines and databases of academic articles, also the organisations (supposedly) in charge of drawing up and/or implementing these regulations (mainly the Technology Transfer Offices and similar) have been contacted. These contacts, always cordial, can be summarised in a large number of universities that do have procedures for the creation, maintenance, etc. of ASOs, but these are internal processes, with no public «master» document or, if so, being this too generic, more a framework of intentions rather than a detailed guide of procedures. In any case, contacts with these organisations have always been quite positive, with many of them making their internal procedures available for this research. However, it was finally decided to analyse only official and public documents.

Secondly, the difficulty in defining the effectiveness concept, which is very ambiguous [11], at least when applied to the context of the creation of ASO, has been confirmed. In fact, the objective of the study was modified due to this difficulty. In this sense, the study originally proposed a more quantitative approach: based on a specific, closed, definition of effectiveness, it would analyse the performance of certain Spanish universities, with the aim of inferring a relationship between the greater or lesser effectiveness of the companies created and the greater or lesser effectiveness of the regulatory documents of each university. The difficulty in defining the concept of effectiveness (as well as the scarcity of data –i.e., databases– on the number and characteristics of the ASOs created in each university), led the work to evolve into the current attempt: an analytical model rather than a quantitative one.

These two factors mentioned above (difficulty in obtaining regulations and difficulty in defining the concept of effectiveness) have led to the result of the research being too fragmented, so more research is needed to refine the definition of the concept of effectiveness and to be able to relate it more directly to the analysis of the regulations (perhaps by finding and analysing more quantitative information).

Regardless of that fragmentation, from the analysis carried out it is possible to discern a certain gap between the effectiveness criteria defined by the studies taken as a reference (mainly those of Bozeman [16][20]) and the implementation of the universities' own regulations on the creation of ASOs. In fact, several parts of this research point out that it does not aim at analysing regulations/norms that «foster» the emergence of ASOs (i.e. with activities to «encourage» researchers to become entrepreneurs), but analysing the extent to which these regulations/norms help in the ideation (i.e., inception, conception), (formal) creation (i.e, building) and (successful) maintenance of ASOs. In this sense, it seems that the regulations analysed are limited to «facilitating» (in the sense of «making it easier» –administratively, financially, etc.–) the *creation* of ASOs (and not so much their successful *maintenance*) but not the implementation of mechanisms to improve the

efficiency (i.e., in the sense of «making it more effective») of the technology transfer through ASOs creation (at least in the terms defined by Bozeman –political advantage, development of scientific and technical human capital, opportunity cost considerations, public value, etc.–). This gap and this tendency to «simply» facilitate the creation (and not so much the maintenance, etc.) of ASOs suggests that these norms/regulations are not fully adapted to the idiosyncrasies of such a special type of company as ASOs are, and there is still a tendency to value the effectiveness of knowledge transfer mechanisms in a «traditional» way, based on economic, productive, etc. approaches. Therefore, it has not been possible to demonstrate that the regulatory and normative frameworks analysed have been sufficiently adapted to the particular needs of this type of companies, with very particular activities, with entrepreneurs with a particular idiosyncrasy that is different from that of entrepreneurs outside academia, and with different levels of growth and uncertainty, among other characteristics.

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Annex. Cover pages of the regulations analysed



**Normativa sobre empresas de base tecnológica y
de servicios tecnológicos de la UPM**

Aprobada en Consejo de Gobierno el 28 de abril de 2005
B.O.U.P.M. num. 75, abril-junio 2005

Fig. 13 Cover of the UPM document for ASOs regulation [56].

REGULAMENTO DE CREACIÓN DE EMPRESAS DE BASE TECNOLÓXICA
(EBT) DA UNIVERSIDADE DE SANTIAGO DE COMPOSTELA
(Aprobado polo Consello de Goberno o 31 de xaneiro de 2017)

PREÁMBULO

Denomínanse Empresas de Base Tecnolóxica (EBT) aquelas que basean a súa actividade nas aplicacións de novos descubrimentos científicos ou tecnolóxicos para a xeración de novos produtos, procesos ou servizos. A importancia destas empresas, coñecidas nos países anglosaxóns como *spin-offs*, fixo que as universidades e outras institucións públicas de investigación lles dediquen unha crecente atención por ser auténticos motores na transferencia de coñecemento, dado que potencian o tecido tecnolóxico e o desenvolvemento económico, favorecen a creación de emprego de alta cualificación, achegan un alto valor engadido á contorna industrial e favorecen a inserción das mozas e mozos no mundo laboral.

A Lei Orgánica de Universidades 6/2001, de 21 de decembro modificada pola Lei Orgánica 4/2007, de 12 de abril, (LOMLOU), sinala na súa Exposición de Motivos (VII) o seguinte: “contéplanse distintos tipos de estruturas, incluída a creación de empresas de base tecnolóxica, para difundir e explotar os seus resultados na sociedade”. A redacción vixente afectou ao título VII (Art. 39 a 41) “Da investigación na Universidade”, que pasa a chamarse “Da investigación na Universidade e da transferencia do coñecemento”, subliñando o cambio de mentalidade que se espera da Universidade en materia de investigación.

En particular, a LOU refírese “á xestión **eficaz** da transferencia do coñecemento e a tecnoloxía”, e por primeira vez cualifica esta función da Universidade como prestación dun servizo social.

ARTIGO 1.- OBXECTO

A presente normativa ten por obxecto regular a actividade da Universidade de Santiago de Compostela en materia de creación de EBT. En concreto, régulanse os procedementos, medios e instrumentos que facilitan a prestación deste servizo social por parte da USC. Dítase a presente normativa de Empresas de Base Tecnolóxica con fin de:

- Facilitar a transferencia de resultados da investigación a través do impulso e incentiación da creación de empresas *spin-off* universitarias,
- promover a viabilidade e supervivencia das EBT creadas,
- regular a participación do persoal pertencente á Comunidade Universitaria nas EBT,
- regular as condicións de acceso por parte das EBT ás instalacións e servizos da USC.



Fig. 15 Cover of a secondary USC document for ASOs regulation [7].

NORMATIVA SOBRE LA CREACIÓ D'EMPRESES A LA UNIVERSITAT POLITÈCNICA DE VALÈNCIA A PARTIR DE L'ACTIVITAT D'INVESTIGACIÓ UNIVERSITÀRIA

(Aprovada pel Consell de Govern en la sessió de 15 de maig de 2008)

Preàmbul

La creació d'empreses de base tecnològica a partir de l'activitat universitària és en l'actualitat un dels principals mecanismes de generació de competitivitat i de renovació del teixit productiu als països més desenvolupats del món. La Universitat Politècnica de València, en endavant UPV, és conscient d'aquesta realitat i desitja contribuir-ne al desenvolupament com una de les vies per a donar eixida a l'exploració social i econòmica dels seus resultats d'investigació d'acord amb la missió i les atribucions que li atorga la llei.

A Espanya, la Llei Orgànica 6/2001, de 21 de desembre, d'Universitats, en l'article 1.2.c especifica com una de les funcions de la universitat "la difusió, la valorització i la transferència del coneixement al servei de la cultura, de la qualitat de vida i del desenvolupament econòmic." Posteriorment, l'article 41, detalla com un dels instruments per a aconseguir aquesta transferència "la creació d'empreses de base tecnològica a partir de l'activitat universitària."

NORMATIVA SOBRE LA CREACIÓN DE EMPRESAS EN LA UNIVERSIDAD POLITÉCNICA DE VALENCIA A PARTIR DE LA ACTIVIDAD DE INVESTIGACIÓN UNIVERSITARIA

(Aprobada por el Consejo de Gobierno en su sesión de 15 de mayo de 2008)

Preámbulo

La creación de empresas de base tecnológica a partir de la actividad universitaria es en la actualidad uno de los principales mecanismos de generación de competitividad y de renovación del tejido productivo en los países más desarrollados del mundo. La Universidad Politécnica de Valencia, en adelante UPV, es consciente de esta realidad y desea contribuir a su desarrollo como una de las vías para dar cauce a la explotación social y económica de sus resultados de investigación de acuerdo con la misión y las atribuciones que le otorga la Ley.

En España, la Ley Orgánica 6/2001, de 21 de diciembre, de Universidades, en su artículo 1.2.c especifica como una de las funciones de la Universidad "la difusión, la valorización y la transferencia del conocimiento al servicio de la cultura, de la calidad de vida y del desarrollo económico." Posteriormente, en su Artículo 41, detalla como una de las herramientas para lograr esta transferencia "la creación de empresas de base tecnológica a partir de la actividad universitaria."

Fig. 16 Cover of the UPV document for ASOs regulation [2].



Modificació del Títol V del text refós de la Normativa de la Universitat Autònoma de Barcelona en matèria d'investigació

(Acord del Consell de Govern de 22 de juliol de 2014)

Títol V. Creació i participació en empreses per a l'explotació comercial dels resultats de la recerca de la UAB

Capítol I. Objecte i àmbit d'aplicació

Article 77. Objecte i àmbit d'aplicació

1. Aquest títol té per objecte establir el règim jurídic aplicable als projectes empresarials sorgits de l'entorn de la recerca de la UAB en el marc dels processos de transferència del coneixement, així com establir les fórmules de participació tant de la mateixa UAB com del personal docent i investigador i del personal investigador de la UAB en aquests projectes empresarials i el marc de relació amb aquests.

2. Aquesta normativa és aplicable als tipus de projectes empresarials que siguin aprovats o reconeguts com a tals per la UAB següents:

a) Empresa de base tecnològica de la UAB (EBT): empresa basada en la tecnologia o en el coneixement científic promoguda per la UAB i amb participació directa o indirecta de la Universitat en el capital social, i oberta a la participació en aquest capital de personal docent i investigador i personal investigador de la UAB, i que té per finalitat l'explotació de resultats de la recerca de la UAB de caràcter tecnològic o lligada al coneixement científic i com a objecte social algun dels establerts a l'article 56.1 de la Llei 2/2011, de 4 de març, d'economia sostenible.

b) Empresa derivada de la UAB (*spin-off*): empresa de nova creació que té per finalitat l'explotació de resultats de la recerca de la UAB, promoguda i participada, pel que fa al capital social, per personal docent i investigador i personal investigador de la UAB, amb els límits que estableix la legislació vigent, però sense participació de la UAB en aquest capital.

c) Empresa emergent de la UAB (*start-up*): empresa de nova creació amb una alta capacitat innovadora, creada i participada per personal docent i investigador i personal investigador de la UAB o qualsevol altra persona vinculada a la UAB en els cinc anys anteriors a la constitució de l'empresa, i que no tingui per objecte l'explotació de resultats de la recerca de la UAB.

3. A aquest efecte, s'entén per «resultats de la recerca de la UAB» les tecnologies, els coneixements, els processos o els resultats que hagin estat desenvolupats o obtinguts com a conseqüència de les activitats acadèmiques, docents o de recerca desenvolupades a la UAB pel personal docent i investigador i el personal investigador de la UAB i que, com a tals, siguin de titularitat de la UAB.

Capítol II. Empreses de base tecnològica de la UAB

Secció 1a. Procediment de constitució i participació en empreses de base tecnològica

Article 78. Sol·licitud i anàlisi del projecte d'EBT

1. Per constituir una EBT dins la UAB o perquè la UAB participi en el capital social d'una EBT existent, cal l'autorització prèvia de la UAB, d'acord amb el règim jurídic previst en aquest capítol.

2. El projecte s'ha de basar en un resultat de recerca que es vol transferir; per tant, abans d'iniciar el procediment de creació de l'EBT o de participació en l'EBT, l'Oficina de Valorització i Patents de la UAB ha d'avaluar aquest resultat de recerca i establir-ne la protecció, si escau, i pot sol·licitar la informació addicional que escaigui i demanar el suport d'assessors interns o externs en la mesura que ho consideri convenient.

Fig. 17 Cover of the UAB document for ASOs regulation [13].



**REGLAMENTO DE CREACIÓN DE EMPRESAS UNIVERSITARIAS BASADAS EN
CONOCIMIENTO DE LA UNIVERSIDAD CARLOS III DE MADRID APROBADO
POR EL CONSEJO DE GOBIERNO EN SESIÓN DE 30 DE OCTUBRE DE 2014**

PREÁMBULO

La Ley Orgánica 6/2001, de 21 de diciembre, de Universidades (LOU) establece que una de las funciones esenciales de la Universidad es *“la difusión, la valorización y la transferencia del conocimiento al servicio de la cultura, de la calidad de vida y del desarrollo económico”*. Posteriormente, en su artículo 41, detalla como una de las herramientas para lograr esta transferencia *“la creación de empresas de base tecnológica a partir de la actividad universitaria.”*

Asimismo, los Estatutos de la Universidad Carlos III de Madrid, (en adelante la “Universidad” o la “UC3M”) en el artículo 145.1 establecen que *“la Universidad asume como uno de sus objetivos esenciales el desarrollo de la investigación científica, técnica y artística y la formación de investigadores y atenderá tanto a la investigación básica como a la aplicada”*. Por otra parte, de acuerdo con el artículo 151 de sus Estatutos *“La Universidad, a fin de contribuir a la vinculación de la investigación universitaria y el sistema productivo, podrá crear empresas de base tecnológica a partir de la actividad universitaria, en cuyas actividades podrá participar el personal docente e investigador”*. Adicionalmente, el artículo 146.1 establece que *“la Universidad procurará la obtención de recursos suficientes para la investigación y especialmente, la infraestructura, las instalaciones y los equipos necesarios para su desarrollo.”*

La Ley Orgánica 4/2007, de 12 de abril, por la que se modifica la Ley Orgánica de Universidades, la Ley 2/2011 de Economía Sostenible y la Ley 14/2011 de la Ciencia, la Tecnología y la Innovación completan el marco regulatorio de creación de este tipo de empresas, permitiendo a las Universidades participar en el capital de sociedades mercantiles surgidas en el entorno de la Universidad.

Atendiendo a este marco legal, la UC3M ha considerado oportuno regular los procedimientos de creación de empresas en el entorno de la Universidad, los mecanismos de transferencia de conocimiento y resultados de investigación asociados, así como los requisitos aplicables para la participación de los miembros de la Comunidad Universitaria y de la propia Universidad en estas empresas. Todo ello, con el fin de contribuir a varios de los objetivos que se enmarcan dentro de las líneas estratégicas de la UC3M, como son: contribuir al incremento de la actividad investigadora, fomentar una mayor transferencia de conocimiento al tejido empresarial, obtener retornos económicos como consecuencia de su participación en dichas empresas y potenciar la generación de empleo para los titulados de la UC3M.



UNIVERSIDAD DE OVIEDO
Secretaría General

buscar "empresa de base tecnológica" (o empresas)

Decreto 12/2010, de 3 de febrero, por el que se aprueban los Estatutos de la Universidad de Oviedo.

(BOPA nº 34, de 11 de febrero de 2010)

El Estatuto de Autonomía de Asturias, aprobado por Ley Orgánica 7/1981, de 30 de diciembre, atribuye a la Comunidad Autónoma, en su artículo 18, la competencia de desarrollo legislativo y ejecución de la enseñanza en toda su extensión, niveles y grados, modalidades y especialidades, de acuerdo con lo dispuesto en el artículo 27 de la Constitución y leyes orgánicas que la desarrollen, y sin perjuicio de las facultades que atribuye al Estado el número 30 del apartado 1 del artículo 149 y de la alta inspección para su cumplimiento y garantía.

La Ley Orgánica 6/2001, de 21 de diciembre, de Universidades, en su artículo 6.2, establece que los Estatutos serán elaborados por las Universidades, y previo su control de legalidad, aprobados por el Consejo de Gobierno de la Comunidad Autónoma. De conformidad con lo previsto en el artículo 16.1 de la misma Ley, corresponde al Claustro Universitario la elaboración de los Estatutos.

La Ley Orgánica 4/2007, de 12 de abril, modifica la Ley Orgánica 6/2001, de 21 de diciembre, de Universidades, y en su disposición adicional octava, ordena que las universidades adapten sus Estatutos a la nueva regulación en el plazo máximo de tres años. De conformidad con dicho mandato legal el Claustro de la Universidad de Oviedo aprobó la modificación de los Estatutos en las sesiones celebradas los días 30 de septiembre de 2009 y 23 de diciembre de 2009 y los ha presentado para su aprobación por Consejo de Gobierno.

En su virtud, efectuado el preceptivo control de legalidad, a propuesta del Consejero de Educación y Ciencia, y previo Acuerdo del Consejo de Gobierno en su reunión de 3 de febrero de 2010,

DISPONGO

Artículo único. Aprobar los Estatutos de la Universidad de Oviedo con la redacción que figura en el anexo del presente Decreto.

Disposición derogatoria única. Derogación normativa. Quedan derogados los Estatutos de la Universidad de Oviedo aprobados por Decreto 233/2003, de 28 de noviembre.

Disposición final única. Entrada en vigor. El presente decreto entrará en vigor el mismo día de su publicación en el Boletín Oficial del Principado de Asturias.

Dado en Oviedo, a 3 de febrero de 2010.—El Presidente del Principado, Vicente Álvarez Areces.—El Consejero de Educación y Ciencia, José Luis Iglesias Riopedre.— 2.739.

Fig. 19 Cover of the UNIOVI document for ASOs regulation [1].