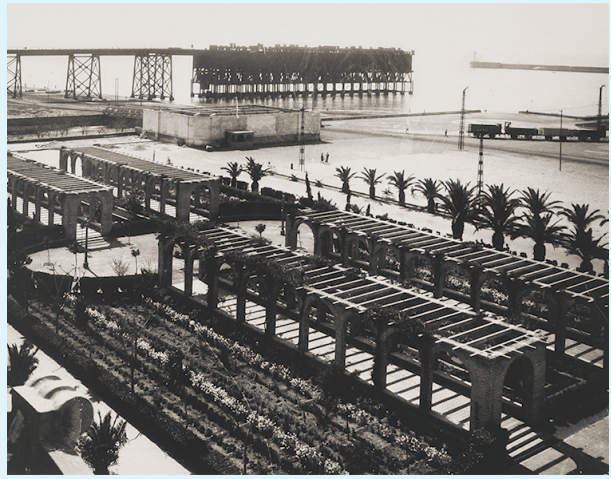
I.S.S.N.: 0213-7585

REVISTA DE ESTUDIOS REGIONALES



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SUMARIO

UNIVERSIDADES DE ANDALUCÍA

REVISTA DE ESTUDIOS REGIONALES Nº 121, I.S.S.N.: 0213-7585 (2021), PP. 137-164

The effect of intellectual capital in the profit of andalusian technology-based spin-offs

El efecto del capital intelectual en el beneficio de las spin-offs de base tecnológica

María Amalia Trillo Holgado
Roberto Espejo Mohedano
Universidad de Córdoba
Manuel Fernández Esquinas
Consejo Superior de Investigaciones Científicas, Instituto de Estudios Sociales Avanzados (IESA)

Recibido, Abril de 2019; Versión final aceptada, Enero de 2020.

KEYWORDS: Management, knowledge Transfer, Intellectual Capital, TBFs, Spin-off.

PALABRAS CLAVE: Gestión, Transferencia del conocimiento, Capital intelectual, EBTs, Spin-off.

JEL Codes: M10, D83

ABSTRACT:

The transfer of knowledge from universities to companies is relevant in the European Innovation politics, being the technology-based spin-offs an essential element. This paper analyzes the strategic effect of intangible assets on the profit of these companies, with reference to those which are included in a public program of Andalusia. We conclude that the organizational and technological capital has the most significant weight since it mobilizes other capitals, and the social capital is the most weakened one. According to that, guidelines are determined for the management of the concerned institutions to achieve a growth that contributes to a regional development.

RESUMEN:

La transferencia de conocimiento universidad-empresa resulta clave en las políticas europeas de innovación, siendo las spin-off universitarias de base tecnológica un elemento fundamental. Se analiza el efecto de los activos intangibles sobre los beneficios de estas empresas tomando como referencia a aquéllas que se acogen a un programa público para el impulso a los emprendedores académicos en Andalucía. Se concluye que el capital organizativo y tecnológico tiene el peso más importante, ya que moviliza a

los demás capitales y el capital social es más débil. Así, se determinan directrices para la gestión de las instituciones concernidas en aras del desarrollo regional.

1. INTRODUCTION

Together with the traditional types of knowledge transfer from the university to the society, a new type of transfer which has been promoted in recent years is the creation of companies where university professors or lecturers and researchers are directly involved (spin-off companies). For such purpose, those individuals combine, at least for a while, their positions as professors or lecturers or university researchers and that of entrepreneurs and promoters of a company (Ortín et al. 2007).

Knowledge transfer from the university to the company is one of the main axes of the European Innovation policy (Rubiralta, 2004). Relating to this, we frequently assume that the development of new technology is transferred to the society through technology based university spin-offs which, within a regional development context, can entail a significant wealth creation which is worth managing as described by Ramírez (2010).

Due to these assumptions, many policies supporting the creation of companies from the university area have arisen, boosted by regulations and programs issued by national and regional governments. Among these, we find in Andalusian region a significantly outstanding example due to the number of supported companies and to the solution to certain existing problems regarding the regulation of such entrepreneurial movement. However, it shows some problems and gaps worth clarifying, as it offers significant implications to the studies on spin-off companies in general.

Due to their own nature, spin-off companies stand out due to the fact that they are intensive regarding knowledge as compared to other companies whose competitive advantage lies on other resources. Besides, their relationship and support structure is another determinant factor for their good performance. All in all, there are many intangible aspects which lie on the base of the growth and success of those spin-off companies. Due to this fact, an important challenge for the spin-off support programs lies in the difficulty to assess the intangible assets of their projects.

Nowadays, the intangible side of companies becomes crucial to compete in a changing, competitive market (Szopa, 2013) which is undergoing one

of the most important crises in history. It is not in vain that the international community has developed intangible measurement models (CIC 2003) which have been applied in different contexts, although most of these studies do not establish any relationship with the profits or the good performance of the company, which is where the interest of its assessment lies. An interesting related study is due to Junping and Li (2008), who analize the key impact of intangible factors on value creation.

This paper focuses on the effects of intangible assets on the results of the technology based university spin-off companies. In particular, the following research objectives are proposed:

- To develop an operational research scheme which allows us to assess the intangible aspects of the new spin-off companies, adapting the approach of the intellectual capital to the specific characteristics of these companies.
- To find out which aspects from the intellectual capital contribute to the generation of profit in the spin-off companies.
- To develop an index to establish the relevance of intellectual capital in technology based university spin-offs and to categorized that kind of firms through it.
- To obtain useful implications for management taking into account those intangible factors which affect the good standing and performance of the technology based university spin-offs, as well as for the universities and public institutions which implement programs to promote this type of companies.

The contribution of this paper lies in the adaptation of the perspective of the researches on intellectual capital to the specific case of the technology based university spin-off companies, as the scientific literature has not applied such perspective to that sector many times.

In order to do so, the data from the survey mentioned on Fernández et al. (2010) are used, as is explained on the Methodology section. This survey was performed on those companies created under the Programa Campus that is referred to the Spanish region of Andalusia. The statistical treatment of data has been implemented applying a correlation analysis of variance (ANOVA), creation of indexes and clusters.

The main discovery, explained throughout the document, lies in the fact that in the generation of profit for the spin-off companies, the organizational and technological capital is the most important one, since it mobilizes all the rest of capitals, whereas the social capital is the most weakened one. The dynamic abilities of these companies could be described through the whole of all of the elements of the intellectual capital, which could just contribute to explain the profit of the company if working together. According to this, some guidelines for the management of the concerned companies, universities, and public institutions are determined so as to promote their growth, which would, as a return, contribute to the development of the whole region.

2. LITERATURE REVIEW

2.1. Spin-off Companies and Intellectual Capital

2.1.1. The Concept of Spin-offs

As regards the concept of a spin-off, the term is not clearly defined (Garvin 1983; Pirnay 1998; Condom 2003; Beraza and Rodríguez 2012). On the other hand, the definition of university spin-off is also vague (Meyer 2003; Pirnay et al. 2003; Valmaseda and Hernández 2012), although, due to its special characteristics, it has been particularly analyzed in the literature.

Beraza and Rodríguez (2012) highlight the fact that, to refer to the spin-off companies, some of the most commonly used terms are: university spin-offs, academic spin-offs, spin-offs based on knowledge, or technological spin-offs. The terms spin-out and start-up are also used instead of spin-off. Due to this, according to these previous authors, "the fact that different terms are used to refer, in some cases, to the same phenomenon and others, to different ones increases the confusion and makes their analysis more complicated". Besides, as most of the university spin-offs are technology based ones, they sometimes receive such name, although the only fact of being based on scientific knowledge does not place them within the category of technological companies. They could be better called scientific or technological knowledge intensive companies.

Sheen (2002) states that start-up is a generic term including the concepts of spin-off and spin-out. That is to say, it refers to that company

which is free of links with the university but created by students (spin-out) or linked to the university due to the exploitation of technologies which have arisen from academic researches (spin-off). Other authors such as Smilor et al. (1990), Doutriaux (1992) or Bellini et al. (1999) consider that a spin-off can be founded by professors or lecturers, researchers, students, or other groups as university graduates.

Due to this diversity of nuances, as mentioned by Rothaermel et al. (2006), and taking into account the previously mentioned references of the scientific literature, we consider in this work the concept of university spin-off in its widest sense, referring to the companies created within an academic sphere, either in universities or public research centers, aimed at the commercial exploitation of the results of the research or at other goals, regardless of whether they are founded by professors, students, or other members of the staff. In this sense, the technological nature is taken for granted, as it is essential for these companies to be eligible for the Programa Campus, as is explained below.

2.1.2. Intangible Assets in Spin-offs

In the specialized literature, it is possible to note a concern over the factors which affect the sustainability and the growth of the companies which arise within the university sphere or over some other factors related to scientific research. On this regard, a common research question focuses on the characteristics of the companies which affect their economic sustainability.

Those researches based on the role of the resources of the entrepreneurial organization (which allow the development of capabilities) are particularly relevant (Barney 1991; Hamel and Prahalad 1995; Shane and Stuart 2002; Bower 2003; Heirman and Clarysse 2004). These works focus on those resources of the company which make it different from its competitors and which represent a source of competitive advantage. Valmaseda and Hernandez (2012) classify empirical researches in several classes according to the resources which can explain the behavior of the newly created companies. Among them, the following resources can be found: financial resources (Mustar 1997; Wright et al. 2004), technological resources (Autio 1997; Hindle and Yencken 2004; Heirman and Clarysse 2004), human resources (Fontes 2001; Shane and Stuart 2002; Pirnay et al. 2003), and social resources (Autio 1997, Nicolaou and Birley 2003; Lindelhof and Losten 2004).

A significant number of the aforementioned studies suggest that the key factors for the feasibility of the business are to be found in the combination of several of these critical components. However, one of the difficulties of the research is the measurement of the different resources. Due to the small size of spin-off companies as regards both their economic capital and their infrastructures and also due to the knowledge and technology intensive character of these companies derived from the university character and from the individuals working in them, we can see that the competitive advantages of these companies are usually intangible ones.

As a result, some significant research questions arise: which kind of intangible resources are particularly relevant? Which are the possible combinations of these resources which contribute to the success of those companies? Empirical research in this field makes it difficult to take into consideration all relevant variables without using detailed observation methodologies. From this point of view, the intellectual capital perspective offers an analysis framework which allows us to theoretically frame these concepts and to integrate the obtained results.

2.1.3. The Relevance of Intellectual Capital in Business Management

Nowadays, the intangible side of the companies is essential to be able to compete in a changing, competitive market which is undergoing one of the most important crises in history. However, no work with this application approach on the study of spin-offs has been found, although there are complementary approximations such as the ones by Chesbrough (2003) or Clarysse et al. (2011).

Within the concept of intangible assets, the concept of intellectual capital becomes a key issue. In fact, there have been many attempts to properly define it (Trillo and Sánchez 2006), pointing out its assimilation to intellectual assets of the company (Guthrie 2001), to intangible distinctive basic competences (Bueno 1998), knowledge or intellectual capital (Lev 2001), and a combination of human, organizational, and relational resources (Cañibano et al. 2002). As a result, there are many models for measuring and managing the intellectual capital in the international scope, described on Table 1. Through them, the intangible assets of the company can be measured. These aspects are not included from an accounting point of view but, however, are an essential source of creation of value. In this sense, some large companies

such as Microsoft, American Airlines, and the insurance company Skandia (Edvinsson and Malone 1997), among others, use their own models.

TABLE 1
INTELLECTUAL CAPITAL MODELS

Skandia Navigator (Edvinsson, 1993)
Technology Broker (Brooking, 1996)
Model of the University Western Ontario (Bontis, 1996)
Model of the Canadian Imperial Bank of Commerce (Saint Onge, 1996)
Intangible Assets Monitor (Sveiby, 1997)
Model Nova (Camisón, Palacios and Devece, 1998, cited in Camisón et al., 2000)
Model Intelect (Euroforum, 1998)
Model Intellectus (CIC, 2003, 2011)

Source: Prepared by the authors on the basis of CIC (2003, 2011).

From the review of the aforementioned models, it is possible to find out that most of them are organized around three perspectives: the human perspective, the organizational perspective, and the relational perspective. However, model Intellectus (CIC 2003) details these last two perspectives by making a wider division, describing in total five capitals or perspectives, although CIC (2011) perfects the model by including the entrepreneurial or innovation capital as well.

Besides, it is currently very interesting to highlight the social relationships moving around the companies which are being studied and the innovation as a key factor in the survival of those companies (Trillo and Fernández, 2013; Presutti et al. 2016; Inchausti, 2017). Spin-off companies are to be found in social networks both from a university sphere and outside it. Hormiga et al. (2011) have analyzed six hypotheses regarding a possible positive relationship between the relational capital of start-up companies (in general, innovative newly created companies with a risk profile but with many growth possibilities) and their success in the first years of operation. Besides, the innovative technological efforts derive from the shared action among the organizational units of the company, as well as from the relationship which can be developed with the customers, allies, suppliers, and rest of agents (Delgado et al. 2011).

Strategic planning is inseparable from the management of any organization. When managing and preparing the strategic planning of any company, together with considering the resources and capacities of such company, many of them derived from its intellectual capital, other management variables and the recent past of the company must be analyzed.

The consideration of the intellectual capital as a management tool makes it necessary to relate it with the strategic planning of the company, which needs to take into account the immediate past and the resources and skills of the company, being many of these contained in its intellectual capital. On the other hand, the success of the companies not only depends on their strategic planning, although those which have obtained better results had carried out a good previous strategic planning.

In summary, the theoretical perspective of the intellectual capital offers a global vision of the topic which is to be studied and is easily adaptable to the special nature of spin-off companies, although all these young business initiatives are subject to a critical initial period from the beginning of the operations of the company until it begins to obtain positive results from its business operations. As a result, a correct management of the companies during this period is a key issue.

Together with the previously mentioned perspectives, from the point of view of the management of any company and of this type other aspects which affect their results must be taken into account.

2.2. The pioneer Spanish Program from a global comparative perspective

The support programs for new university based companies in Spain are created under a series of legislative reforms directed to widen the action possibilities of university institutions. Spanish Organic Law 6/2001 on Universities is the first one regulating in Spain the technology based academic spin-off companies so as to spread and exploit the research results generated by the university. Later, Organic Law 4/2007 became the true promoter of the creation of technology based companies, including the topic of hiring university staff by means of a temporary leave of absence. However, such law does not cover the legal uncertainty entailed by the sentence “the Government will regulate the conditions for the establishment of the technological nature of companies” (Vargas, 2011).

In this context, in order to promote the creation and the development of technology based companies, the Regional Department for Innovation, Science, and Companies of the Government of Andalusia, through its IDEA Agency and the Andalusian universities, established the so called Programa Campus, created in 2003. The last Incentive Order applicable to such law is the one dated December 9th, 2008, with a multiannual character, which establishes the regulatory bases of an Incentive Program for the Promotion of Innovation and the Development of Businesses in Andalusia, covering years 2008 to 2013 (Andalusian Official Gazette no. 249). In particular, the Programa Campus is developed under article 13, section 2.3.

In general, TBC (technology based companies) are considered to be those companies which meet any of the following requirements:

- They are aimed at exploiting new products from results from a scientific and technological research.
- They are able to generate technology by using and taking advantage of knowledge in order to spread and transfer such knowledge to their environment.
- They base their activity in the intensive use of scientific and technological knowledge.

According to the previously defined concept, the Programa Campus is destined for researchers who develop generation projects for new knowledge, either scientific or technological, in the area of the Andalusian universities. The projects need to end up in an innovative idea which can be applied in the business and industrial area and which entails a technological breakthrough for obtaining new and better products or processes. The program is in line with a series of initiatives which intend to mobilize the knowledge accrued in the R&D public sector, establishing a series of incentives directed to lessen the barriers in the incorporation and sustainability of the companies during the initial years, adapting to the university area, as sometimes they do not have many incentives for their business activities. In this sense, the logic of this program is reflected in highlighted initiatives both on a regional and on an international level[1].

1 The dimensions of the Programa Campus can be checked in the reports of the R&D plans for the Region of Andalusia. http://www.agenciaidea.es/. Through this program, around 180

In Spain, there are significant similar programs in Barcelona and Madrid. In fact, these two cities have participated in the PAXIS Program (The Pilot Action of Excellence on Innovative Start ups) which promotes the commissioning and development of innovative companies such as the spin-off companies through the European Union so as to promote work related, social, and economic growth. PAXIS was launched in 1999 and integrates 22 European cities.

On the other hand, the Spanish Association of Regional Development Agencies (Spanish ADR, according to its initials in Spanish) is created in October 2007 with the participation of public and regional bodies which had been in collaboration since 2001. This association aims at addressing problems related to the business sector and the ADRs, mainly in the area of entrepreneurs, advanced financing, innovation, ICT, international cooperation, internal management, client support and training, etc. Today there have been other advances in Spain, especially regional ones, but there are still legislative loopholes, as indicated by Vargas (2012).

On a Latin-American level, in October 2011 in Lorca, the Latin-American ADR Platform is created, working as a first step for the creation of the Latin-American Association of Regional Development Agencies. There are also some other significant initiatives, such as OEA, MERCOCYT, or the Bolivar Program.

In Europe, there are also programs cofinancing this type of business initiatives. Among them, the Erik Action Program (2007-2013) is worth mentioning. This program is a European inter-regional cooperation project financed by INTERREG IVC to improve the effectiveness of the development of the regional policies in the area of innovation and knowledge economy and, in particular, the increase of the innovation capacity of the companies. These programs describe the difficulties for the creation of businesses related to the organizational and financial resources of the entrepreneurs. In the same way, the Pro Inno Europe (2006-2012) reports pay special attention to the problems of these companies, particularly in the outermost regions of Southern Europe, due to the fact that the environment is usually very different to the

companies have received help between 2003 and 2012. The latest initiative of the Programa Campus, known as Campus Plus (2008-2013) offers an international perspective, as it includes the collaboration of the EU Business and Innovation Centers (EU/BICs) as regards non-financial support to the participating companies and, as regards financing, it collaborates with the European Regional Development Fund.

one of the innovative regions which lead to the creation of high technology companies. The companies incorporated thanks to these programs usually share the scarcity of financial resources and of dimensions to access the technological markets. Due to this, it is important to grant access to them so as to help those companies overcome the lack of competitive advantages.

A common issue of the mentioned policies is the difficulties to assess their effectiveness, in particular, to find the factors, most of them intangible, which contribute the most to make the companies economically sustainable. In this sense, the analysis through the Programa Campus can be useful to report the actions of other programs facing a similar problem.

Moreover, it is important to consider how the literature analyses the impact of the different programs that support spin-offs since it depends on the countries, the industries or the founders. It is possible to find some relevant examples in Beraza y Rodríguez (2015) who study the effectiveness of university spin-off support programs in Latioamerica; Beraza and Rodríguez (2014) related the comparison of support programs in United Kingdom and Spain; Toole and Czarnitzki (2009) who considers the US Small Business Innovation Research (SBIR) program as a policy fostering academic entrepreneurship in biomedical area and Lerner (2009) who want to highlight the weakness of some public effort.

3. METHODOLOGY

The population under study consists of the set of Andalusian university spin-offs which had received support from the Programa Campus[2] until year

2 The data used in this work result from the development of a project called "Creación de empresas y actividades de transferencia de conocimiento en el sistema público de I+D de Andalucía" (Creation of companies and knowledge transfer activities in the public R&D public system in Andalusia), carried out in the IESA- CSIC and financed by the Department of Innovation, Science, and Corporate Issues of the Regional Government of Andalusia. Among other issues, it intended to characterize in a structural and organizational way these companies, and to study their creation processes, the individuals taking part in them, and the influence of the established relationship networks, analyzing at the same time some of their competitiveness indicators. The main results of the project, the questionnaire, and the descriptive results of the survey can be found in Fernández et al. (2010), being also mentioned and justified in Valmaseda y Hernández (2012).

2009. Due to the fact that the number of registered companies amounted to a total of 157 (whole population), we decided to collect information from all of them, obtaining a response rate of 77.07% (121 companies). Those imply a representative sample of the Andalusian university spin-offs.

A semi-structured interview was performed, according to a previously established questionnaire, to the manager, director, or person who had taken place in the process of the incorporation of the company and knew the most relevant elements of its evolution. From the questionnaire, the variables which make up the different dimensions of the intellectual capital according to the main variables extracted as common issues from the review of the models of Table 1 were selected. This selection is shown in Tables 2 to 4, together with the following descriptive analysis, taking into account just those which are relevant in the analyzed sector, as they present percentages which offer a meaning in the interpretations.

The statistical treatment of data has been implemented through the SPSS program for Windows V. 17.0., applying different statistical analysis techniques: bivariate correlations procedure (Pearson and Tau-Kendall), to analyze the numerical (and ordinal) relationships between the elements of the model; t test and ANOVA one way, to detect differences between the different levels of the factor variables considered; Pearson's contingency and chi-square tables, to determine the existence of a relationships between the factor variables considered; and finally cluster analysis to identify groups of similar companies. To analyze data it has not been considered measurement scales, we have taken into account the information related to each item and from that we are built a particular index concerning each item according to Trillo and Espejo (2008). With respect to the mentioned indicators, the values of the averages and standard deviations are respectively: human capital 0.6576 (0.1473), organizational and technological capital 0.6901 (0.1983) and relational capital 0.5911 (0.1464). These indices can be considered acceptable according to the classification of Trillo and Espejo (2008).

4. RESULTS

4.1. Dimensions of the Intellectual Capital in Spin-off Companies

4.1.1. Human Capital

The human capital perspective, for our specific case, must be observed in a different way to the one mentioned in the generic intellectual capital models. That is to say, on one hand, it is necessary to deal with the characteristics of the founding team, which is determinant, as it provides some characteristics to the company which can remain during the first years of operation and, on the other hand, with the staff or non-founding members.

The implemented analysis shows how 30.27% of the founders of the studied companies are permanent members of the staff of a university, that is to say, Profesores Titulares or Catedráticos (senior lecturers or professors). The next group of founders is formed by graduates (13.91%), whose percentage is quite similar to the lecturers without a permanent state-dependent position, but with a work contract (13.50%) and with other staff of companies related to the scope of the created spin-off (13.09%). There are other types of founders, but their percentages are much lower.

In accordance with this, 38.97% of the founders have third cycle studies (doctorate), although 18.69% are graduates or undergraduates. Together with their level of education, 74.4% of the founders states that they have experience working in the private sector, being this experience specific in management in 48.8% of the cases and in consulting in 56.2% of the cases. The average age of the founders is 36, being 79.92% of them men and 20.08% women, which is similar to the current working situation, although more marked as regards gender.

After the first year of all companies, the situation of their staff, without including their founders, refers to 46.9% of the employees having higher education studies, 19.2% with short degree or mid-level university studies, and 14.9% of the staff with a PhD or doctorate. Despite this, 31.4% of the spin-offs state that they do not have enough specialized human resources, although 98.3% of them indicate that their employees show an adequate attitude of compromise and involvement for the achievement of the objectives of the company.

In conclusion, the members of the companies under study have high education, either university, as many of them are doctors, or acquired through their work experience in management or consulting. As a result, their human capital seems to be of a high level as regards education and experience, as it was also said by Román and Gómez (2014). This contrasts with the research by Shane and Khurana (2003) on more than thirteen hundred American spin-off companies, where just 21% of the entrepreneurial teams had at least one member with previous experience in management tasks. In this case, the experience is much more significant, which positively contributes to increasing the profit of the company, as explained by Ortín et al. (2008), who prove that university spin-offs with founders who do not have any experience in management tasks have significantly lower growth rates than other university spin-offs or other technological based companies.

According to the previously stated facts, the considered variables and indicators on the human capital are specified as shown by Table 2.

TABLE 2
VARIABLES OF THE HUMAN CAPITAL

	Variables	Indicators
Founding team	Knowledge	Levels of knowledge of the founding team.
	Experience	Different work experiences of the founding team.
	Skills (knowledge)	Current training of the staff of the company.
Staff	Capabilities (know-how, learning)	Training received during the last year. Specialization of human resources.
	Values and attitudes (being)	Compromise and involvement of the workers.

Source: Created by the authors.

4.1.2. Organizational and Technological Capital

As regards the organizational capital of the spin-off companies, 68.6% of the companies are well structured in areas or departments, with a clear division of the work in 81% of them. On the other hand, 33.9% state that there is a lack of information on bureaucratic and regulatory aspects, and 25.6% reports not having enough skills as regards management. 36.4% of the companies mention problems regarding the suitability of the premises,

equipment, and materials, which is deemed to be related to the problems of financial resources, a complaint of 62.8% of the spin-offs.

As regards technology, 90.9% of the companies consider that they have suitable technical capacity for the development and/or improvement of products, technology, or provision of services, not finding any problems for the protection of intellectual property in 75.2% of the cases.

The fact that this organizational and technological capital are the strongest and has a high level is in line with the opinion of Trillo et al. (2012), who remark that its effect is decisive when it comes to empowering the rest of the business intangible assets. That it, in case the organizational and technological capital is not adequate, workers could not work in good conditions and the company could not be stablished productive relationship since, it would be an obstacle to it.

The variables and indicators of the organizational and technological capital are shown by Table 3.

TABLE 3
VARIABLES OF THE ORGANIZATIONAL AND TECHNOLOGICAL CAPITAL

Variables	Indicators
Structure	Existing areas or departments within the company. Clear division of the work. Suitability of the premises, equipment, and materials.
Organizational-process learning	Suitability of the management. Adjustment of the technical skills for the development and improvement of the product and/or for the provision of the service. Availability of information on bureaucratic and regulatory aspects.
Innovation	Protection of intellectual property. Availability of financial resources.

Source: created by the authors.

4.1.3. Relational Capital

The collaboration relationships established with the university by the companies under study are just maintained in 47.1% of the cases. Other collaboration relationships are established with customer companies (29.8%) and with non-customer companies in 14% of the cases. The most frequent

types of collaboration with the university are related to informal cooperation relationships (78.5% of the cases), to the contracting as apprentices of scientific and technical staff (69.4%), and to the implementation of research projects (66.1%).

As regards the consequences or results obtained from these cooperation agreements, the answers of the spin-off companies are very similar regarding the following facts: 39.7% of those companies think that the cooperation activities contribute both to improving the productivity of the company and as an increase of the results for the investment in R&D. 35.5% consider that having a profile on the social networks has been very important for the creation of the company and 30.6% of them state that it is a significant factor related to the result of the activity in general. Lastly, 24% states that it is exclusively essential for the survival of the company.

As regards the knowledge and image of the spin-off companies in their markets, 87.6% consider that their company has a good image, and 84.3% also think that their company is well known within their market. As regards the comprehensive surveillance of the market and of the clients, 76% declare that they systematically monitor the market, 48.8% have this type of mechanisms to find out the needs and the level of satisfaction of their clients, and 43% receive, analyze, and manage any complaints or claims.

In line with this perspective, some problems arise to find new markets (47.1% of the cases), due to not having the desired relevance in those markets (42.1%), and also regarding the difficulty to find new partners to carry out specific cooperation operations.

The relevance of these relationships is reflected on the scientific literature on the network models (Hakansson (1982); Johanson and Mattsson (1988); Hakansson and Johanson (1992); Halinen and Tornroos (1998); Andersen and Buvik (2002); Aldrich and Ruef (2006); Fletcher (2008); and Johanson and Valne (2009)), which describe the relationships held by the companies with the different stakeholders, and thanks to which they access the necessary information and resources to implement their activity and to achieve a higher success in their activities, many of them international, depending to a great extent on their ability to build and maintain such relationship network.

The relational capital is integrated by the following variables and indicators (Table 4).

TABLE 4
VARIABLES OF THE RELATIONAL CAPITAL

Variables	Indicators
Relationships with institutions	More frequent collaborations. Types of cooperation with other universities or public research centers. Consequence of the collaboration relationships.
Image and knowledge of the company in the market	Knowledge of the company by the market. Image of the company.
Commercial and social management.	Surveillance of the market. Comprehensive research on the client. Claim management. Difficulties to find new markets. Lack of visibility within the market. Difficulties to find partners for cooperation activities.

Source: created by the authors.

4.1.4. Other Management Related Variables

The strategic planning of the considered spin-off companies highlights the fact that 95% of them implement SWOT analyses (Strengths, Weaknesses, Opportunities, and Threats), 83.5% have a strategic plan, 65.3% have planning, review, control, and improvement systems or their internal processes, and 34.7% have one or more than one quality certifications.

In this case, and for the period covering from the incorporation of the company until the moment of the collection of the data, a growing evolutionary trend can be seen as regards human resources or increase of personnel (63.6%), turnover (62.8%), cooperation activities for research (52.9%), investments in R&D (52.1%), and exports (20.7%).

As regards profit, it can be seen that its evolution from the incorporation of the companies has followed an increasing trend in 41.3% of the cases.

The management related aspects are described through the variables of Table 5.

TABLE 5
MANAGEMENT VARIABLES

Variables	Indicators
Evolution of the company from its incorporation	Invoicing. Exports. R&D investments. Cooperation activities for research. Human resources.
Strategic planning	SWOT identification. Availability of a strategic plan. Quality certifications. System for the planning, review, control, and improvement of internal processes.
Profit	Evolution of the profit since the incorporation of the company. Obtained profit.

Source: created by the authors.

4.2. Does the intellectual capital affect the profit of the companies?

4.2.1. An Overview of the Influence Model in the Profit of Spin-offs

To answer this question, in the case of the university spin-offs, the following statistic variables, which refer to the items previously mentioned on Tables 2 to 5, have been considered: past (evolution of the companies from their incorporation), strategic planning, profit, evolution of profit, and intellectual capital (sum of the human capital, organizational capital, and technological and relational capital). Except in the case of the profit and its evolution (where the following levels have been taken into consideration: none, it has decreased, it has stayed the same, or it has grown), the considered statistical variables have been obtained by adding, for each of the variables, the information of the corresponding indicators (collected through the questions of the research questionnaire included in the Fernández *et al.* (2010) report) as additions and weighed both as regards the number of questions and the number of indicators.

According to this, the results obtained in Table 6 allow us to prove the existence of significant relationships (Sig. <0.05) among the specified groups of variables.

TABLE 6
BIVARIATE CORRELATIONS OF THE MAIN GROUPS OF VARIABLES

		Past	Strategic planning	Profit		Evolution of profit
Intellectual capital	Pearson correlation	.201	.314	.267	Tau-Kendall	.261
	Bilateral Sig.	.028	.001	.018	Bilateral Sig.	.003

Source: created by the authors.

As indicated by Table 6, it can be seen how the intellectual capital of the organization is a reference variable. We can observe how the relationship between the evolution of profit and the intellectual capital is significant, as well as the relationship between the past and the intellectual capital. Besides, between the strategic planning and the intellectual capital, there is a reciprocal relationship, as the implementation of the strategy contributes, at the same time, to increase the intellectual capital of the spin-off companies.

On the other hand, there is a tight relationship between the intellectual capital and the profit both from the point of view of the evolution of past profit and from the one of the current profit. Although no direct relationship has been found among the components of the intellectual capital and the profit, the former directly affect the good performance of the company as a whole, but not individually. In fact, Delgado et al. (2011) also highlight the positive joint relationship among the organizational, technological, and relational aspects.

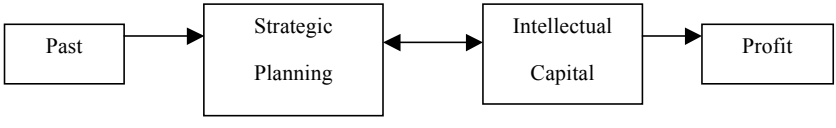
As regards the previously mentioned facts, Ortín et al. (2014) remark that the technology based university spin-offs, as compared to other independent companies of this type, present fewer essential skills, although their better dynamic skills trigger that their low levels of performance disappear after two or three years from their incorporation. In this case, the dynamic skills could be described through the set of all of the elements of the intellectual capital, which could contribute to explain the business profit only if acting as a whole.

However, it is necessary to point out the limitation of this study, as it does not have a control sample, which makes an additional research necessary to prove this. The conclusion of the previous paragraph could become a guideline for a type of management which increases the skills of the spin-offs similar to the ones under study, taking into account that Ortín et al. (2014) highlight how the scientific literature usually suggests that the

number of skills of the technology based university spin-off companies is normally lower than that of other technological companies. In the same way, it is important to consider that some university based spin-offs begin as small companies and they grow influenced by the local context and not so much due to the aspirations and skills of their founders and to the provision of resources (Harrison et al., 2010).

The commented relationships (these could be confirmed by a casual analysis through structural equations that we will develop in further investigations) can be graphically seen on Figure 1.

FIGURE 1
INFLUENCES IN THE PROFIT OF THE SPIN-OFF COMPANIES



Source: created by the authors.

By means of a one way analysis of the variance (ANOVA), considering as dependent variable the Intellectual Capital and as a factor the evolution of profit (Table 7), we can confirm that the average intellectual capital is different depending on the level of evolution of the profit, being higher in those companies whose evolution has been more favorable.

TABLE 7
ANOVA – EVOLUTION OF PROFIT

		Sum of squares	Gl.	Average of squares	F	Sig.
Intellectual Capital	Among groups	.145	3	.048	4.976	.003
	Within the group	1.047	108	.010		

Source: created by the authors.

4.2.2. Intellectual Capital Indexes and Types of Companies

In accordance to the index building methodology of Trillo and Espejo (2008), in order to establish which component of the intellectual capital is more relevant in its creation, the results obtained are those shown on Table 8. Those results indicate, just as happens in the sector study of Trillo et al.

(2012), as was indicated before, the most significant relevance of the organizational and technological capital as compared to the other two capitals, although the difference with the human capital is not very significant.

TABLE 8
CAPITAL INDEXES

Capital	Human	Organizational and technological	Relational
Media	.6576	.6901	.5911

Source: created by the authors.

Trillo et al. (2012) establish as a criterion for the classification of companies or sectors the following one: if the index is over 1, the company is considered to have a very strong development of its intellectual capital; if the index is between 0.8 and 1, it implies that it is strong; a capital developed at an average level obtains an index between 0.5 and 0.8 and, lastly, if the index is lower than 0.5, it is considered to be weak. Due to this reason, it can be concluded that the analyzed companies present an intermediate development level in each of their areas of intellectual capital, needing to promote in particular their relational aspect.

A remaining question is to know whether it is possible to establish groups of similar companies as regards the considered variables. For such purpose, and through an analysis of clusters using a k-means procedure (Table 9), three similar groups have been obtained: the first one, consisting of 28.20% of the companies, the second one, of 25.64%, and the third one, of 46.15% of the companies. The number of cases allocated to each group highlights an adequate classification, due to having similar groups as regards the number of included spin-offs. In addition, another positive aspect in this classification has been the number of iterations necessary for the convergence of the procedure, only 5. It should be noted that, for this analysis, a significant number of companies have been discarded as they did not provide, on the grounds of confidentiality, the profit data. The companies with a more important intellectual capital are the youngest and the oldest ones, being remarkable a relaxation regarding the management of such capital as soon as the company is well established. This classification also indicates that the age of the spin-off could act as a control variable, allowing the establishment of differences among the youngest companies, those of an average age, and those which have been in

the market for a longer period. Iglesias et al. (2012) also consider three cluster according to the development of the spin-off.

TABLE 9
CLUSTER

	Cluster 1			Cluster 2			Cluster 3		
Variable	n	Average	Typ. D	n	Average	Typ. D	n	Average	Typ. D
Age of the company in years	22	3.954	2.716	20	5.300	3.465	36	6.416	3.682
Intellectual Capital	22	.635	.0725	20	.515	.081	36	.711	.0710
Profit	22	10.122	25.199	20	16.750	45.021	36	31.150	59.442
Past trends	22	.520	.203	20	.793	.133	36	.836	.133
Strategic planning	22	.203	.143	20	.712	.203	36	.902	.123

Source: created by the authors.

Table 10 shows that the age control variable of the company promotes the existing relationship between profit and the intellectual capital, as when it is removed, the real relationship decreases slightly, although it stays significant. This decrease indicates that the detected relationship between the intellectual capital and the profit is not really affected by the effect of the passing of time, as could be initially thought.

TABLE 10
PARTIAL CORRELATIONS

			Profit
Control Variable			
Age of the company	Intellectual capital	Correlation	.244
		Bilateral sig.	.031

Source: created by the authors.

5. CONCLUSIONS AND DISCUSSION

In light of the data of the questionnaire, it is possible to state that the technology based university spin-offs represent a positive impact on the Andalusian regional development, as 41.3% of them present a positive trend in their evolution, and 97% of these have growth perspectives.

The analyses which have been performed allow us to affirm that the profit of the companies under study is affected in a relevant way by their intellectual capital, being this one, as a result, a series of intangible assets worth managing.

Due to all this, the following guidelines are highlighted taking in account two points of view, the political and the managerial one:

As regards the human component of the management of the intellectual capital, the knowledge of the different individuals is particularly relevant, taking into account that they need to be freed for the benefit of the company. This recommends the promotion of the degree of compromise and involvement of the individuals taking part in the spin-off companies, particularly of the university lecturers or professors.

The previous guidelines can be taken into account to determine the profile of any candidate to join the company, taking into account that, as shown by this research, finding adequate individuals can be a problem. On this regard, both the Public Administrations and the Universities could contribute in the design of their offered training.

From the point of view of the organizational capital, it is clear that there is a good deal of ignorance on the bureaucracy and the regulatory aspects which are compulsorily applicable to these companies. In that sense, the Administrations should join forces to solve these problems, offering specific training programs or even reducing or making easier the bureaucratic component.

On the other hand, although the spin-off companies state that they have sufficient technical skills, they present financial problems which derive in difficulties for the suitability of premises, equipment, and materials. On this regard, a higher collaboration among companies, universities, and public institutions for the use of premises, offices, and labs, or for the access to financial resources is also deemed to be interesting.

The relational perspective is considered interesting by all interviewed companies, focusing in several reasons: it contributes to improving productivity, it increases the results for research and development or, in other cases, is essential for the survival of the company. Social relationships become particularly relevant, being the university one of the main collaborating agents. As a result, this aspect is relevant for establishing the legal clauses governing the business cooperation, the hiring regulations, and the organization of project or exchange platforms. In the case of the Andalusian

technology based university spin-off companies, in the light of the results obtained in this work, we recommend promoting the social capital of these companies keeping the strategic relationships with other companies and with the university, which are abandoned with the passing of time in more than half of the companies under study.

The influence of the past in the strategic planning as also been confirmed, as well as the reciprocal relationship between it and the intellectual capital triggered by the profit of the company, being the organizational and technological capital the one with a larger impact and the social capital the one which requests more strategic dedication.

In conclusion, this paper highlights the advisability of paying attention to the management of the intellectual capital at all times throughout the lifespan of the businesses due to its influence over profit, generating dynamic skills, and specifically, once the company is consolidated, paying special attention to its relational capital, which seems to be the most weakened one, knowing the organizational and technological capital is the one with a highest weight, as it mobilizes the rest of capitals.

6. LIMITATIONS

The limitations of this paper are related to:

- The sample. It is strongly recommended to expand the sample and to compare the result in different context and related to different characteristics.
- Some bias. It is very important to analyse some bias such as survival bias and moreover a longitudinal analysis would interesting.
- The subjectivity of the variables since they are intangible ones.
- It could be interesting too to face the challenge of finding an appropriate control group in order to refine the recommendations addresses to the spin-offs and the public institutions.

7. ACKNOWLEDGES

We would like to acknowledge the support received from the IESA (Institute belonging to the Higher Council for Scientific Research of Spain).

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