

Martín Rojas, Rodrigo; González Álvarez, Nuria; García Morales, Víctor J.; Garrido Moreno, Aurora

## Article

# The use of technology to improve organizational performance through corporate entrepreneurship

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## **THE USE OF TECHNOLOGY TO IMPROVE ORGANIZATIONAL PERFORMANCE THROUGH CORPORATE ENTREPRENEURSHIP.**

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**ABSTRACT:** Nowadays, corporate entrepreneurship is becoming the key source to develop firms in order to improve their results. In this way, technology plays a similar key role so as to obtain higher organizational performance through more efficiently corporate entrepreneurship in the firm. In this regard, the aim of this paper is to introduce how organizational performance on the organization is enhanced by corporate entrepreneurship; which is influenced by technology, through different assets, such as top management support to technology, technological skills, technology acquisition, technological integration and a technological infrastructure.

**Key words:** Corporate Entrepreneurship, Organizational Performance, Technological Assets.



## 1 Introduction

One of the most important strategic decisions management faces in today's globally competitive environment surrounds the issue of technology development (Jones *et al.*, 2001). Decisions concerning technological variables are essentials for a firm's overall competitive strategy and positioning (Zahra, 1996).

Assessing the value of technology has never been easy. However, with technology, firms can introduce some systems to reduce costs and evaluate these systems in terms of their success (Ross *et al.*, 1996). The value of these initiatives lies in their contribution to a firm's competitiveness, which is often unquantifiable and uncertain (Ross *et al.*, 1996). Recent developments in technology, particularly in micro-electronics and computer systems, have heightened awareness of technological skills impact and led to a reconsideration of the links with technological integration change, technological infrastructure development and other dimensions of organizational life such as technological acquisition (Larsen *et al.*, 1991; Byrd and Turner, 2001; Zahra and George, 2002). This technological framework is possible thanks to the support from top managers to technology (TMS in advanced) (Byrd and Davidson, 2003; Stone, 2006).

In addition to this, the presence of highly technologically integrated incumbents may create opportunities for new firms that pursue more flexible and responsive impartation strategies (Barreyre, 1988). Entrepreneurs identify such opportunities through the discovery and creation of knowledge, technology, and ideas which are critical raw material for innovation (Alvarez and Barney, 2007). Successful innovation may be measured by observing growth and change in technology; consequently relative levels of investment from managers permit technology to facilitate, by a knowledge process, innovation inside a company (Heffner and Sharif, 2008). Furthermore, knowledge and technologies are integrated to develop entrepreneurial competencies.

Subsequently entrepreneurial dimension is enhanced by the integration and acquisition of the technological knowledge into the technological infrastructure; since they all incentive systems

which establish a structure for science and innovation by having acquired and integrated technology in the firm (Burger-Helmchen, 2008).

All these technological assets let develop innovation capabilities and encourage corporate entrepreneurship what creates an environment for investments in scientific and technological endeavors, develop innovation capabilities and ensure the sustainable growth of corporate entrepreneurship (CE in advance) (Koh, 2006).

Finally, we will analyze CE as a means for renewing established organizations, to innovate and increasing their ability to compete in global markets.

To develop all these constructs we structure the paper in different sections. In the theoretical background section all the concepts and hypothesis are explained. Firstly, we develop the influence of TMS on technological skills, technological acquisition, technological infrastructure and technological integration. Secondly, we explain the influence of technological skills on technological acquisition, technological infrastructure and technological integration. Thirdly, we explain the influence of these technological variables on CE. Lastly, we fix the influence of CE on organizational performance in technological companies. Finally, the implications, limitations and future research are explained in the conclusion section.

## **2 Theoretical background and main focus**

### **2.1 The influence of TMS on technological skills, technological acquisition, technological infrastructure and technological integration**

TMS is one of the most often-cited concepts in the technology literature (Ghosh et al., 2001). It “reflects, in many ways, the importance that top management executives place on technology” (Byrd and Davidson, 2003, p. 246). For Leonard-Barton and Deschamps (1988, p. 1254), TMS is a “perceived powerful source”. Omerzel and Antoncic (2008) studied managerial support in technology and concluded that one person is usually in charge of organizational learning, combining both knowledge ownership and the managerial skills. For them, the main manager is the person who provides employees with a technological ability by means of an organizational

learning process and consequently includes the facilitation of technology transfer throughout the firm. Then, personal commitment from top managers is a key factor for a successful business (Omerzel and Antoncic, 2008; Georgiadis et al., 2012).

On the other hand, Leonard-Barton (1992, p. 113) defines skills as “one of four dimensions that distinguishes and provides the knowledge set needed to enable a core capability. This skills dimension encompasses both firm-specific techniques and scientific understanding”. It provides the basis for a firm’s competitive capacities and sustainable advantage in a particular business (Teece, 1986). If we apply this understanding to technological issues, Leonard-Barton (1992) emphasizes that technological skills constitute the entire technical system, which usually traces its roots back to the firm’s first products. Technological skills define the roots of a firm’s sustainable competitive advantage, since the capabilities comprise patents protected by law, technological knowledge, and production skills that are valuable and difficult to imitate by competitors (Lee et al., 2001).

Regarding the relationship between TMS and technological skills, Stone (2006) affirmed that TMS is identified as an important core value that can be used to demonstrate commitment and enhance the potential for employee participation. It is manifested in terms of consistent decisions in support of organizational learning programmes. Managers should understand company culture and values, and they should maintain what is good and promotes technological skill creation through an organizational learning process. This can be achieved if the manager is willing to observe and talk to employees, to recognize obstacles, problems and success, and to train employees (Stone, 2006; Leonard-Barton, 1992). Top management characteristically requires different knowledge and skills in different growth periods and thus continuously develops its organizational learning process so as to obtain that knowledge (Omerzel and Antoncic, 2008). Based on these arguments, we formulate the following proposition:

***Proposition 1: Top management Support influences positively technological skills development.***

Based in the study of innovation capabilities scholars have found that TMS to technology strengthen technological acquisition in a company (Petroni and Panciroli, 2002). Technological

acquisitions indicate “the firm’s capability to identify and acquire externally generated knowledge that is critical to its operations” (Zahra and George, 2002, p. 189).

The choice from top managers to invest in technology and knowledge acquisition may be the result of a deliberate and conscious strategic decision (McLoughlin et al., 1985). In this sense, apart from investments exist top managerial strategies for introducing new technologies in the company, may be seen as the outcome of a process of social choice and political negotiation (Cohen and Levinthal, 1989; Narayanan, 1998; Haro-Domínguez et al., 2010). Consequently, both financial and strategic top management support improve technology acquisition and knowledge so as to bring product or process development (Petroni and Panciroli, 2002).

This idea is shared by Jason et al. (2010), who on its study of space technology, a field where acquiring technology is really difficult, demonstrated that managers had to support technological acquisition to underpin economic growth and development. However, this support was not only a financial support but it is necessary a technological infrastructure skills, knowledge and human resources to create a sustainable environment (Jason et al., 2010). Consequently, top management support to technology motivates technological acquisition in different ways.

In a study about DaimlerChrysler, it was found that internal development is needed in a company; however the managerial support in the firm also let knowledge and technology acquisition, what enhanced the company to be more dynamic and competitive in the current struggling environment (Göker and Roth-Berghofer, 1999).

Park and Ghauri (2011) give solid arguments to show that top managerial support is completely needed so as to promote foreign technology and know-how, since technology and knowledge acquisition is highly dependent on support of managers and on communication, appreciation and mutual reliance among employees (Park and Ghauri, 2011). In this regard, organizations with top management support to technology promote technological acquisition and diffusion of ideas, solutions and know-how throughout innovation systems (Doloreux and Melançon, 2009).

These companies which support innovation have a more systematic focus by providing a knowledge platform for learning (Doloreux and Melançon, 2009; Ferreira & Fernandes, 2011). In these companies learning by doing and R&D investments were indispensable so as to change the ancient methodology of production and acquire new technology which enables the firms to shift to a different technology frontier with the improvement in the competitiveness and the market share of the firm (Narayanan, 1998). In other way, these companies, which invest in R&D, also develop and maintain their broader capabilities to assimilate and exploit externally available information. Likewise, many scholars have found that managerial efforts are one of the most important means in acquisition of technology (Cohen and Levinthal, 1989; Narayanan, 1998). Based in all these arguments we make the following proposition:

***Proposition 2: Top Management Support positively influences technological acquisition.***

The organization must have a robust technological infrastructure on which the frequently changing strategy and tactics of a contemporary company can be built quickly (Byrd and Turner, 2001). This technological infrastructure is defined as “the enabling foundation of shared technology capabilities upon which the entire business depends” (Byrd and Turner, 2001, p. 42). The infrastructure is a set of shared, tangible technological resources that form the foundation for business applications (Duncan, 1995). It is part of the organization’s capacity that is intended to be shared and, thus, a flexible technological infrastructure is the new competitive weapon crucial to developing sustained competitive advantage (Byrd and Turner, 2001) and it has been cited as an extremely valuable resource by many researchers (e.g. Rockart et al., 1996). An effective infrastructure is a pre-requisite for doing business globally, where the sharing of information and knowledge is vital (Rockart et al., 1996; Ferreira and Fernandes, 2011). On the other hand, as we mentioned above, TMS is one of the most often-cited concepts in the technology literature (Ghosh et al., 2001) and it is a “perceived powerful source” (Leonard-Barton and Deschamps, 1988, p. 1254).

Top management support influences technological infrastructure development since technological infrastructure demands strong and committed top management to guide the

initiative and develop a working environment that supports technology (Ghosh et al., 2001). Top management support aims to create a technological infrastructure with ever-improving software modules, developed and shared by all those concerned with company (Overeem et al., 2013). The results of the Van de Ven's (1993) study provide some evidence on the contribution of managerial skills to the infrastructure variables.

A large number of studies have found that technological skills may be seen as a hindrance to technological infrastructure development (Van de Ven, 1993; Rockart et al., 1996; Ross et al., 1996). Nowadays, at Universities a greater appreciation of technological skills, competencies and knowledge permits a well-built infrastructure which let advantages and benefits in this competitive global technological environment (Byrd and Turner, 2001; Capuano et al., 2008). The advantage of the firm is directly related to technological skills, competencies and knowledge (Capuano et al., 2008). And the more technological skills, competencies or knowledge teachers - managers on their case- have the more suitable advantage the firm will obtain. Based on these arguments, we proposed the following proposition:

***Proposition 3: Top management support influences positively technological infrastructure.***

Technology integration consists of “the set of knowledge building activities through which novel concepts are explored, evaluated and refined to provide the foundation for product development” (Iansiti, 1995, p.521-522). The technology integration process frames the project, providing a critical road map to guide design and development activities. This technological integration enables the design and development of architecture which enable technological innovative communication and corporate entrepreneurship (Antoncic and Hisrich, 2001; Zhao et al., 2010).

The process of technological integration is determined by top managerial support to technology (Iansiti, 1995). TMS is not only a function of effective planning at the strategic level but it ensures technology integration in appropriate fashion to provide the right foundation for product development activities (Iansiti, 1995).

A large number of studies (Cooper 1985; Leonard-Barton and Deschamps, 1988; Iansiti, 1995; Burger-Helmchen, 2008) assert that to be successful, an entrepreneurial firm must technologically integrate links such as Science-based firms or technological institutions, other firms in the industry, customers, products optimization and services and must be able to tie and support them together (Burger-Helmchen, 2008). That is to say, all these elements have to be taken into account to incentive technological integration. Furthermore, TMS is required so as to obtain successful attempts at technological integration, which will move towards a new product/process development (Smith and Offodile, 2008; Georgiadis et al., 2012).

Resources and competencies in network structure, communication and co-ordination needs to be maintained by top managers (Cooper and Stephenson, 2012). These top management assets enhance technological integration in the company with the purpose of gaining visibility across their extended network, responding quickly to changing business conditions and getting better results in the firm (Zhao et al., 2010; Cooper and Stephenson, 2012).

The importance of industry's technological integration as an opportunity creator is supported by studies that managers who leave existing firms to form high-technology companies (Cooper, 1985) might eliminate technology barriers to entry by the knowledge they gain in previous positions and by the availability of venture capital (Florida and Kenney 1988). Consequently, TMS is required to obtain technological integration in the company. We argue that the effective top management support to technology is founded on a set of managerial skills and routines that help the technology integration transfer. Taken into account this previous literature we formulate the following proposition:

***Proposition 4: Top management support influences positively technological integration.***

## **2.2 The influence of Technological Skills on technological acquisition, technological infrastructure and technological integration**

Leonard-Barton (1992) emphasizes that technological skills constitute the entire technical system, which usually traces its roots back to the firm's first products. Technological skills define the roots of a firm's sustainable competitive advantage (Lee et al., 2001).

On the other hand, one of the most important strategic decisions management faces in today's globally competitive environment surrounds the issue of technology acquisition or development. In the past, firms typically relied on internally developed technical and innovative capabilities or acquired those capabilities in part or in total when acquiring or merging with another firm. External technology acquisitions indicate the firm's capacity to identify and acquire externally, the knowledge generated by other firms that is crucial for a particular firm's activity (Zahra and George, 2002).

The decision to develop technology and innovative capabilities internally or acquire them via external means is a central component of any technology strategy (Zahra et al., 1994). There has been much evidence in recent years that firms do not trust exclusively in their internal resources to maintain their technological competitiveness (Narula, 2001). Rapid technological development, the complexity of products and services, and their high costs are making firms increasingly conscious of the limitations involved in exclusive internal development of their technology (Haro-Domínguez et al., 2010). Acquiring technology through external sources may facilitate rapid development and deployment of commercial technologies and products while gaining access to state of the art technology, but it can also undermine the need to maintain and upgrade internal capabilities. Firms must carefully weigh the advantages and disadvantages of acquiring technology internally or externally to ensure the ability to compete effectively in today's market.

External technology sourcing strategies may be seen as a means of complementing and leveraging internal skills, a concept expressed throughout the technology management literature (Jones et al., 2001; Zahra and George, 2002). This is especially important for those firms with high technological skills, as they must react rapidly to the changes that occur. This belief can justify the greater preference of managers of these firms show toward external acquisitions of technology in order to maintain the level of technology and innovation of their firm (Eisenhardt and Schoonhoven, 1996). The intensity and speed of firm technological skills to identify and gather knowledge can determinate technology acquisition. The greater firm technological capabilities the more quickly the firm will acquire technology (Zahra and George, 2002). The



direction of accumulated knowledge can also influence the path that the firm follows in obtaining external knowledge. These activities vary in the richness and complexity, highlighting a need to have different areas of expertise within a firm to successfully import external technologies. Firms with technological skills might well combine their technology with other complementary assets providing from external technological acquisition. Technological capabilities provide firms with the high levels of internal variety that are necessary to address external technological acquisition (Giarratana and Torrasi, 2010). Based on these arguments, we can propose the following hypothesis.

***Proposition 5: Technological skills influences positively technological acquisition.***

Nowadays, knowledge in companies is important as it will motivate scientific organizations and employers so as to develop key competencies and professionally significant personal qualities (Martin-Rojas et al., 2011; Mayorova, 2011). In this regard, these key competencies and personal qualities let us analyze an infrastructure on technology, which is improved by technological knowledge (Azzone and Maccarrone, 1997).

A flexible technological infrastructure is developed by a large number of factors such as data transparency, compatibility, application, connectivity, technological skills, boundary skills, functional skills, and technology management (Churchill, 1979). And Byrd and Turner (2001) studied that managerial technology skills were a structural capability that seems to make a difference in a technological platform or infrastructure. Consequently these higher technological skills let a strong motivation of employees to obtain a consistent and significant fundamental technological knowledge; that is to say technological infrastructure is stronger (Churchill, 1979; Mayorova, 2011).

This assertion is not only typical in the field of technology firms; in the tourism sector technological skills are undoubtedly needed to outstand over the competitors (Bordoni, 2011). In hospitals, it has been shown that skills based on technology let a better management of technological infrastructure (Wainwright and Waring, 2000). This study was characterized by preoccupation with technological issues, standards and procurement procedures which would

allow separate technological applications to communicate and share information (Wainwright and Waring, 2000).

Similarly, at the University, the place where future employees are trained; technology is being really developed in order to increase its technological infrastructure (Mayorova, 2011). The students more innovative, with higher technological skills, formed a stronger technological infrastructure. The higher technological skills of alumni at the university require a development and improvement of technical or technological infrastructure (Mayorova, 2011).

On the opposite way it has been found that the low level of technological skills in the company was translated into one of the most common weaknesses for technological knowledge in the firm, as there might be less support in the phase of implementation of innovation and training (Azzone and Maccarrone, 1997). Consequently, the lower the level of technological skills is the weaker technological infrastructure a company has.

To sum up, the higher availability of general technological skills let a wider infrastructure in technology for any particularly specialized expertise (Wainwright and Waring, 2000; Byrd and Turner, 2001; Mayorova, 2011). Then, we formulate the following proposition:

***Proposition 6:*** *Technological skills are positively associated with technological infrastructure.*

It has previously shown that if managers have better technological skills their meaningful participation will enable the technological integration undoubtedly needed in order to alleviate the adverse effects of uncertainty and promote employee participation in this current technological change process, what reduces uncertainty (Larsen et al., 1991).

It has been showed that the more effective organizations dedicate substantial resources to the execution of distinct and explicit technology integration activities, which are based on the broad impact of novel technological skills of employees and managers (Iansiti, 1995). Furthermore, technological integration process thus affects all members of an organization, but may have

special relevance for managerial personnel, who carry particular responsibility for introducing and implementing new technological developments (Larsen et al., 1991).

In this regard, technological skills facilitate technological integration in training process, which will promote increased interaction across disciplines and improve workers' knowledge in using technology in their subject specific areas of specialization (Aburime and Uhomoibhi, 2010).

An effective integration in technology is not only a function of effective planning at the strategic level and strong project management, but success is also linked to technological skills which ensure an organization's knowledge base (Iansiti, 1995). The depth of knowledge needed to understand technological skills will suppose a stronger technological integration in the company, what enable a competitive advantage difficult to imitate (Iansiti, 1995).

In the field of education, it has been shown that a large number of barriers impacting technological integration such as the absence of teacher's technological skills which do not let develop technological integration at schools (Ertmer et al., 2012). As main solution they propose to promote teachers' and student's knowledge through technological integration. Consequently, the higher technological skills teachers or students obtain, the better technological integration may well be obtained in a company (Capuano et al., 2008; Ertmer et al., 2012).

On their project EMBLEMA at Salerno University it was found that the optimization of business technological integration processes took into account technological skills among other capabilities (Capuano et al., 2008). The advantage was obtained because of the technological integration processes which were transmitted by technological skills, knowledge or competencies that managers possessed. Consequently, technological skills facilitate technological integration processes so as to obtain a more suitable and personalized advantage (Capuano et al., 2008).

Likewise, Ertmer et al., (2012) have found that managers who worked with less technological skills struggled to achieve higher levels of technology integration. That is to say, managers who were engaged in exemplary, innovative or best skills were related to more technology integration. They also found that the technological attitude and beliefs and technological

knowledge and skills were the strongest contributing factors to their abilities to integrate technology (Ertmer et al., 2012). Then the managers' possession of specific technological skills makes a technological integration process more easily than processes with managers who do not possess them (Larsen et al., 1991). With all this previous literature we can formulate the following proposition:

***Proposition 7:** Technological skills are positively associated with technological integration.*

### **2.3 The influence of technological acquisition, technological infrastructure and technological integration on corporate entrepreneurship**

Corporate entrepreneurship refers to “the process by which firms notice opportunities and act to creatively organize transactions between factors of production so as to create surplus value” (Jones and Butler, 1992, p. 735). Corporate entrepreneurship can be considered important for organizational survival, profitability, growth and renewal (Zahra, 1996). In this way, attracting resources from external providers is critical to the survival and growth of an entrepreneurial venture (Shane, 2003). The decision to develop technology and innovative capabilities internally or acquire them via external means applies both to the corporate-sponsored venturing efforts as well as new venture efforts undertaken by independent entrepreneurs (Zahra 1996). Firms must consider the trade-offs and associated risks inherent in this decision. Developing technology internally ensures greater control over its distribution and serves to maintain a viable technical capability for the firm but may require greater resources than the firm is willing or able to commit. However, acquiring technology through external sources may facilitate rapid development and deployment of commercial technologies and products while gaining access to state of the art technology, but it can also undermine the need to maintain and upgrade internal capabilities. Firms must carefully weigh the advantages and disadvantages of acquiring technology internally or externally to ensure the ability to compete effectively in today's market (Haro-Domínguez et al., 2010; Jones et al., 2001).

Entrepreneurs can take existing knowledge through technological acquisition that allows firms to identify potential market opportunities, and then act upon them (Woolley, 2010). So,

technological acquisition opens an opportunity space for new entrants to develop a nascent technology. Technological acquisitions also provide opportunities for entrepreneurs to exploit nascent innovations. Entrepreneurs identify such opportunities through the discovery and creation of knowledge, technology, and ideas (Alvarez and Barney, 2007). Without the identification of opportunities, entrepreneurship is ‘fruitless’ (Dean and Meyer, 1996: 110). And while opportunity recognition may be subjective, an entrepreneur identifies the opportunity and its potential value (Shane and Venkataraman, 2000) or creates an opportunity and exploits it. Thus, the opportunities must be not only discernible as a viable market business, but also attractive. For a firm it is beneficial to use its internal and external sources in the pursuit of a competitive advantage by engaging in entrepreneurial activities (Zahra, 2008).

***Proposition 8: Technological acquisition influences positively corporate entrepreneurship.***

In an industry with a well-established infrastructure, where knowledge and technologies are clearly joined and enforceable (Van de Ven, 1993); a new entrepreneurial venture is easier to be launched and the strategy maybe more successful to achieve a competitive advantage (Antoncic and Hisrich, 2001; Byrd and Turner, 2001; Van de Ven et al., 2007). Consequently, technology, among other features, is a key component of infrastructure to obtain more entrepreneurship (Van de Ven, 1993).

A large number of studies confirm this direct relationship between technological infrastructure and corporate entrepreneurship (Haug and Ness, 1992; Venkataraman, 2004; Koh, 2006; Van de Ven et al. 2007; Burg et al., 2008). Burg et al. (2008) support the idea that infrastructure is a well developer of spin-off ventures, which reinforce corporate entrepreneurship (Antoncic and Hisrich, 2001) by providing venturing skills and new entrepreneurial knowledge.

In a similar way, it has been shown that technology-based infrastructure not only shapes the firm’s technological competencies but it is also effective in incorporating them into the firm’s organizational context, making them apparent on all organizational levels and giving meaning to all learning processes (Leonard-Barton, 1992; Martin-Rojas et al. , 2011). Furthermore,

technological infrastructure is related not only to technological knowledge but to more in-depth corporate entrepreneurship (Byrd and Turner, 2001).

In a Dutch University of technology, Burg et al. (2008) opened a bridge between managerial practices and academic research as they found that the framework with scientific knowledge proposed by spin off ventures was link to the development of corporate entrepreneurship in a company, by the pragmatic and creative work of practitioners (Burg et al., 2008).

Other scholars have shown that intangible assets, such as advanced telecommunications and transportation system, of technological infrastructure are a necessary prerequisite for corporate entrepreneurship in technology (Venkataraman, 2004). Then, this technological infrastructure allows the development of corporate entrepreneurship so as to facilitate access to capital and rapid productivity improvements (Koh, 2006). A favorable technological infrastructure is certainly important in ensuring the success of corporate entrepreneurship (Venkataraman, 2004). In fact, Venkataraman (2004) compared some regions of United States and observed that Silicon Valley is more successful than Central Virginia or Albany in terms of corporate entrepreneurship because of the presence and absence of technological infrastructure, among other intangible factors (Venkataraman, 2004).

In this sense, firm's technological infrastructure let develop innovation capabilities and encourage corporate entrepreneurship (Koh, 2006); since it incentives systems which establish a structure for science and innovation. Furthermore, this technological infrastructure let entrepreneurs make strategic choices on activities to undertake and achieve corporation objectives (Van de Ven et al. 2007).

Furthermore, the more developed technological infrastructure, the higher and faster corporate entrepreneurship in the firm. With all this previous literature we formulate the following proposition:

***Proposition 9: Technological infrastructure is positively associated with corporate entrepreneurship.***

The integration of innovation, adaptation and acceptance of change (technological or otherwise) hinge upon the promotion of an organizational culture and climate which encourage corporate entrepreneurship through reward creativity and risk-taking, as well as the capacity to assimilate new processes and procedures (Larsen et al., 1991; Antoncic and Hisrich, 2001).

Along the history, technology has obtained some key moments –like wireless technology around 1970’s, Internet’s birth in 1990’s or current technological era with spin off companies- in which new services has been required and completely new systems have been built. Nowadays, a demanding integration of several technologies is required. A mandate to develop such a system from policy makers including governments or corporate boards –entrepreneurs among others-are needed (Lyytinen and Fomin, 2002).

Then, technological integration creates a need to find organizational arenas in which the entrepreneurs may work in order to bring both technological and social challenges into this arena (Lyytinen and Fomin, 2002). In this regard, the integration of the firm's technology with other exiting technologies is needed so as to Science-based entrepreneurship may obtain an outstanding service (Burger-Helmchen, 2008).

This technological integration on the organization improves corporate entrepreneurship, since entrepreneurs become a critical nexus in the growth of both technological competence and the refinement of service concepts (Lyytinen and Fomin, 2002).

Furthermore, integration of technological knowledge in the firm is needed to successfully accommodate the innovative patented technology and to commercially exploit it, what is a core element of entrepreneurship in the company to make the patented technology suitable for the market sphere and develop specific entrepreneurial practices, like knowledge-based activities or microprocessors, radio and switching technologies (Burger-Helmchen, 2008).

This idea is even easier to see in dynamic industries which are highly technologically integrated industries, which increases the opportunities available to new ventures formations, and

consequently increases corporate entrepreneurship (Antoncic and Hisrich, 2001). Indeed, the presence of highly technologically integrated incumbents may create opportunities for new firms that pursue more flexible and responsive impartation strategies (Barreyre, 1988).

We thus may expect highly integrated industries to exhibit greater inertia and more new venture formations (Dean and Meyer, 1996) and consequently more corporate entrepreneurship (Antoncic and Hisrich, 2001).

In a study in The Netherlands, with nanotechnology firms, it has been found that technological infrastructures and technological integration are completely needed in order to reach an entrepreneurial organization (Robinson et al., 2007). With all this previous literature it may be proposed that:

***Proposition 10: Technological integration influences positively on the corporate entrepreneurship.***

#### **2.4 The influence of corporate entrepreneurship on organizational performance**

Corporate entrepreneurship is a strategic variable in successful organizations (Antoncic and Hisrich, 2001; Antoncic and Prodan, 2008; Zahra, 1996), since it has its consequences for organisational survival, growth and performance (Antoncic and Hisrich, 2001). Entrepreneurs who identify their firms' positions in the competitive network of the industry correctly strengthen and engage opportunities and neutralize the negative implications of threats and weaknesses, thus obtaining higher performance (Antoncic and Prodan, 2008; Martin-Rojas et al., 2011). So, companies that institute corporate entrepreneurship as a process that infiltrates and spreads throughout the entire organization tend to achieve positive results over time in the sense of improved internal efficiencies, higher employee morale and major improvements in performance.

Past research has presented much evidence for the relationships of corporate entrepreneurship to organizational growth and profitability (Covin and Slevin, 1991; Zahra and Covin, 1995; Antoncic and Hisrich, 2001; Zahra, 2008). A longitudinal study by Zahra and Covin (1995) in



which they examined the longitudinal impact of corporate entrepreneurship on a financial performance index, composed of both growth and profitability indicators, provides the best evidence of a strong relationship between corporate entrepreneurship and the performance. Antoncic and Hisrich (2001) study demonstrate that corporate entrepreneurship makes a difference on the company's performance, observed by growth and profitability. Moreover, Zahra and Garvis (2000) in their research showed that even international entrepreneurial efforts can enhance the growth and profitability of a company's performance.

Moreover, corporate entrepreneurship was found to be related to the profitability of large firms (Covin and Slevin, 1991; Zahra and Covin, 1995; Zahra, 1996). Antoncic and Hisrich (2001) found a relationship between corporate entrepreneurship and performance for small, medium-sized and large firms from various industries in Slovenia, but not in the USA. Similarly, Zahra and Garvis (2000) shows that international corporate US companies' entrepreneurship was positively associated with the firm's overall intensity, as well as its foreign profitability and growth of US firms.

For technological organizations, various current studies indicate a positive relationship between corporate entrepreneurship and organizational performance (Audretsch *et al.*, 2008; Martin-Rojas *et al.*, 2011). Audretsch *et al.* (2008) show that positive economic performance in high-tech or information and communication technology companies depend on entrepreneurship capital, the capacity of a region to support entrepreneurs. Alternatively, companies may license the use of their technology to other companies within the industry, thus creating new business and enhancing their revenue and profits. Therefore, technological opportunities in an industry are associated positively with increased CE (Zahra, 2008).

Hence, we would expect a general positive relationship between corporate entrepreneurship and performance in terms of profitability and growth as the following proposition suggests.

***Proposition 11:*** *Corporate entrepreneurship influences positively organizational performance.*

### **3 Conclusions, limitations and future research**

In this quickly changing world, technological companies are hardly competing to each other in order to reach a competitive advantage which makes them differentiate of other and obtain a good position or higher performance (Ross et al., 1996; Byrd and Turner, 2001). To arrive at that purpose, the results of this research have underlined that exploiting advantage of TMS will impact their firm's access to the technological skilled research personnel and the streams of knowledge upon which the firm will develop its specific dynamic capabilities (Leonard-Barton, 1987, 1992; Ferreira and Fernandes, 2011).

Top managers in firms invest in R&D not only to pursue directly new process and product innovation, but also to increase imported technology and accomplish the trajectory shifts (Cohen and Levinthal, 1989). Top managers may promote corporate entrepreneurship through external technology acquisition, because they try to grow beyond the limits set by the resources they currently control. This let them to acquire more technological investment in their firm.

Then, organizations with TMS to technology promote technological acquisition and diffusion of ideas, solutions and know-how throughout innovation systems (Doloreux and Melançon, 2009). Apart from acquiring technology from external sources managers also support: Technological integration so as to enhance experiential learning as a strategy for continuing personnel development (Capuano et al., 2008); technological infrastructure which enable a competitive advantage for technology and support the design, development and implementation of entrepreneurial business applications (Byrd and Turner, 2001) and technological skills which are key for development and the need for greater technological integration of learning experiences (Larsen et al., 1991).

Technological skilled people will increase and promote the creation of the excellence of the offer and make the product's special features easily recognizable to the broader public (Byrd and Turner, 2001). Then, the advantage of the firm is directly related to technological skills, competencies and knowledge (Capuano et al., 2008). These capabilities are a structural components that seems to make a difference in a technological platform and promote innovative capabilities and an organizational technological infrastructure (Byrd and Turner, 2001), what can shape the promotion of corporate entrepreneurship through government assistance, grants,

venture capital, collaborative network or new spin off ventures (Koh, 2006; Burg et al., 2008; Cooper and Stephenson, 2012).

Likewise, this technologically skilled people enable technological acquisition processes in the company, which can be measured by observing growth and change in innovative knowledge and technologies which are integrated to develop entrepreneurial competencies (Heffner and Sharif, 2008).

In this regard, a greater appreciation of the technological skills all over levels is an essential element of the technological integration process, as let advantages and benefits in this competitive global technological environment (Capuano et al., 2008).

In this sense, in The Netherlands, with nanotechnology firms, it has been found that technological infrastructures besides technology acquisition and integration processes are completely needed in order to become an entrepreneurial organization (Robinson et al., 2007). Since they incentives systems which establish a structure for science and innovation; what creates an environment for technological endeavors, develops innovation capabilities and ensures the sustainable growth of corporate entrepreneurship (Koh, 2006).

All these technological aspects enhance the creation and strengthening of a corporate entrepreneurship, because they may well improve intelligent access to local, specific cultural information so as to attract potential entrepreneurs (Bordoni, 2011). These entrepreneurs compete and make cooperation among them and take advantages of technological infrastructure (Van de Ven et al., 2007), such as social and technological volatility which is a common denominator of technological corporate entrepreneurship throughout the world and key for a supportive entrepreneurial culture (Eisendhardt and Schoonhoven, 1996).

Finally, entrepreneurs engage opportunities and neutralize the negative implications of threats and weaknesses, thus obtaining higher performance (Antoncic and Prodan, 2008; Martin-Rojas et al., 2011). Moreover, with the knowledge acquired and the organizational innovation developed in the company along with technology, entrepreneurs should be able to engage in

entrepreneurial activities and obtain higher levels of growth and profitability than organizations that do not (Antoncic and Hisrich, 2001), thereby obtaining improved internal efficiencies and major improvements in performance (Antoncic and Prodan, 2008).

### **3.1 Limitations and future research**

Firstly, this research is a preliminary work and we have no data to contrast our preposition, at the moment. This point will be solved if the research is interesting for the scientific community.

Hypotheses indicate the relationships among some technological assets and corporate entrepreneurship with organizational performance. It should be noted that other technological assets might well be taken into account, like technological organizational slack or technological distinctive competencies (Real et al., 2006; Danneels, 2008; Martin et al., 2011;). Besides, different topics such as evaluation of funding objectives (Georgiadis et al., 2012) or applications of networks to enlarge corporate entrepreneurship research (Lee et al., 2001; Robinson et al., 2007).

As well, a study of this technology in the different components of corporate entrepreneurship would be really interesting so as to observe in which point of corporate entrepreneurship the influence of technology is stronger.

## **4 References.**

- Aburime, M.O., & Uhomoibhi, J.O. (2010). Impact of technology and culture on home economics and nutrition science education in developing countries. *Multicultural Education & Technology Journal*, 4(1), 4-16.
- Alvarez, S.A., & Barney, J.B. (2007). Discovery and creation: Alternative theories of entrepreneurial action. *Strategic Entrepreneurship Journal*, 1 (1-2), 11-26.
- Antoncic, B., & Hisrich, R.D. (2001). Intrapreneurship: construct refinement and cross-cultural validation. *Journal of Business Venturing*. 16(5), 495-527.
- Antoncic, B., & Prodan, I. (2008). Alliances, corporate technological entrepreneurship and firm performance: Testing a model on manufacturing firms. *Technovation*, 28, 257–265.
- Audretsch, D. B., Bönte, W., & Keilbach, M. (2008). Entrepreneurship capital and its impact on knowledge diffusion and economic performance. *Journal of Business Venturing*, 23, 687–698.

- Azzone, G., & Maccarrone, P. (1997). The emerging role of lean infrastructures in technology transfer: The case of the Innovation Plaza project. *Technovation*, 17(7), 391-402.
- Barreyre, P.Y. (1988). The concept of "impartition" policies: A different approach to vertical integration strategies. *Strategic Management Journal*, 9, 507-520.
- Bordoni, L. (2011). Technologies to support cultural tourism for Latin Latium. *Journal of Hospitality and Tourism Technology*, 2(2), 96-104.
- Burg, E.V., Romme, G.L., Gilsing, V.A., & Reymen, I.M.M. (2008). Creating University Spin-Offs: A Science-Based Design Perspective. *The Journal of Product Innovation Management*, 25, 114-128.
- Burger-Helmchen, T. (2008). Plural-entrepreneurial activity for a single start-up: A case study. *Journal of High Technology Management Research*, 19, 94-102.
- Byrd, T.A., & Davidson, N.W. (2003). Examining possible antecedents of IT impact on the supply chain and its effect on firm performance. *Information & Management*, 41, 243-255.
- Byrd, T.A., & Turner, D. (2001). An exploratory analysis of the value of the skills of IT personnel: their relationship to IS infrastructure and competitive advantage. *Decision Sciences*, 32(1), 21-54.
- Capuano, N., Gaeta, M., Ritrovato, P., & Salerno, S. (2008). How to integrate technology-enhanced learning with business process management. *Journal of Knowledge Management*, 12(6), 56-71.
- Churchill, G.A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16(1), 64-73.
- Cohen, W.M., & Levinthal, D.A. (1989). Innovation and learning: the two faces of R&D. *Economics Journal*, 99, 569-596.
- Cooper, A.C. (1985). The role of incubator organizations in the founding of growth-oriented firms. *Journal of Business Venturing*, 1, 75-86.
- Cooper, T., & Stephenson, M.O. Jr. (2012). Managing Networks as Learning Organizations in the Public Sector. *The International Journal of Management Science and Information Technology*, 3(1), 1-37.
- Covin, J.G., & Slevin, D.P. (1991). A Conceptual Model of Entrepreneurship as Firm Behavior. *Entrepreneurship: Theory and Practice*, 16, 7-25.
- Danneels, E. (2008). Organizational antecedents of second-order competences. *Strategic Management Journal*, 29, 519-543.
- Dean, T.J., & Meyer, G.D. (1996). Industry environments and new venture formations in U.S. manufacturing: A conceptual and empirical analysis of demand determinants. *Journal of Business Venturing*, 11, 107-132.
- Doloreux, D., & Melançon, Y. (2009). Innovation-support organizations in the marine science and technology industry: The case of Quebec's coastal region in Canada. *Marine Policy*, 33, 90-100.
- Duncan, N.B. (1995). Capturing flexibility of information technology infrastructure: A study of resource characteristics and their measure. *Journal of Management Information Systems*, 12(2), 37-57
- Eisenhardt, K.M., & Schoonhoven, C.B. (1996). Resource-based view of strategic alliance formation: Strategic and social effects entrepreneurial firms. *Organization Science*, 7(2), pp. 136-150.

- Ertmer, P.A., Ottenbreit-Leftwich, A.T., Sadik, O., Sendrur, E., & Senderur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, 59, 423-435.
- Ferreira, J.J., & Fernandes, C. (2011). [The Role Played by Knowledge Intensive Business Services in Knowledge Economy](#). *The International Journal of Management Science and Information Technology*, 2(2): 55-80.
- Florida, R., & Kenney, M. (1988). Venture capital and high technology entrepreneurship. *Journal of Business Venturing*, 3, 301-319.
- Georgiadis N., Iliopoulou, D., Manthou, V. , & Koutsouris, D. (2012). Qualitative and quantitative methodological approach for evaluating public R&D funding. *The International Journal of Management Science and Information Technology*, 6(3): 1-26.
- Ghosh, B.C., Liang, T.W., Meng, T.T., & Chan, B. (2001). The key success factors, distinctive capabilities, and strategic thrusts of top SMEs in Singapore. *Journal of Business Research*, 51, 209-221.
- Giarratana, M.S., & Torrisi, S. (2010). Foreign entry and survival in a knowledge-intensive market: Emerging economy countries' international linkages, technology competences, and firm experience. *Strategic Entrepreneurship Journal*, 4, 85-104.
- Göker, M.H., & Roth-Berghofer, T. (1999). The development and utilization of the case-based help-desk support system HOMER. *Engineering Applications of Artificial Intelligence*, 12, 665-680.
- Haro-Domínguez, M.C., Ortega-Egea, T., & Tamayo-Torres, I. (2010). Proactive orientation and its influence for technology acquisition. *Industrial Management & Data Systems*, 110(7), 953-970.
- Haug, P., & Ness, P. (1992). Technological infrastructure and regional economic development of biotechnology firms. *Technovation*, 12(7), 423-432.
- Heffner, M., & Sharif, N. (2008). Knowledge fusion for technological innovation in organizations. *Journal of Knowledge Management*, 12(2), 79-93.
- Iansiti, M. (1995). Technology integration: Managing technological evolution in a complex environment. *Research Policy*, 24, 521-542.
- Jason, S., da Silva Curiel, A., Liddle, D., Chizea, F., Leloglu, U.M., Helvaci, M., Bekhti, M., Benachir, D., Boland, L., Gomes, L., & Sweeting, M. (2010). Capacity building in emerging space nations: Experiences, challenges and benefits. *Advances in Space Research*, 46, 571-581.
- Jones, G.R., & Butler, J.E. (1992). Managing internal corporate entrepreneurship: An agency theory perspective. *Journal of Management*, 18(4), 733-749.
- Jones, G.K., Lanctot, A. Jr., & Teegen, H.J. (2001). Determinants and performance impacts of external technology acquisition. *Journal of Business Venturing*, 16(3), 255-283.
- Koh, W.T.H. (2006). Singapore's transition to innovation-based economic growth: infrastructure, institutions and government's role. *R&D Management*, 36(2), 143-160.
- Larsen, H., O'Driscoll, M.P., & Humphries, M. (1991). Technological innovation and the development of managerial competencies. *Technovation*, 11(7), 419-428.
- Lee, C., Lee, K., & Pennings, J.M. (2001). Internal capabilities, external networks, and performance: A study on technology-based ventures. *Strategic Management Journal*, 22, 615-640.
- Leonard-Barton, D. (1987). The case for integrative innovation: An expert system at digital. *Sloan Management Review*, 29(1), 7-19.

- Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13, 111-125.
- Leonard-Barton, D., & Deschamps, I. (1988). Managerial influence in the implementation of new technology. *Management Science*, 34(10), 1252-1265.
- Lyytinen, K., & Fomin, V.V. (2002). Achieving high momentum in the evolution of wireless infrastructures: The battle over the 1G solutions. *Telecommunications Policy*, 26, 149–170.
- Martin-Rojas, R., Garcia-Morales, V. J., & Mihi-Ramirez, A. (2011). How can we increase Spanish technology firm's performance?. *Journal of Knowledge Management*, 15(5), 759-778.
- Mayorova, V. (2011). Integration of educational and scientific–technological areas during the process of education of aerospace engineers. *Acta Astronautica*, 69, 737-743.
- McLoughlin, I., Rose, H., & Clark, J. (1985). Managing the Introduction of New Technology. *Omega, International Journal of Management Science*, 13(4), 251-262.
- Narula, R. (2001). Choosing between internal and non-internal R&D activities: some technological and economic factors. *Technology Analysis & strategic Management*. 13(3), 365-387.
- Narayanan, K. (1998). Technology acquisition, de-regulation and competitiveness: a study of Indian automobile industry. *Research Policy*, 27, 215–228.
- Omerzel, D.G., & Antoncic, B. (2008). Critical entrepreneur knowledge dimensions for the SME performance. *Industrial Management & Data Systems*, 108(9), 1182-1199.
- Overeem, I., Berlin, M.M., & Syvitski, P.M. (2013). Strategies for integrated modeling: The community surface dynamics modeling system example. *Environmental Modelling & Software*, 39, 314-321.
- Park, B.I., & Ghauri, P.N. (2011). Key factors affecting acquisition of technological capabilities from foreign acquiring firms by small and medium sized local firms. *Journal of World Business*, 46, 116–125.
- Petroni, A., & Panciroli, B. (2002). Innovation as a determinant of suppliers' roles and performances: An empirical study in the food machinery industry. *European Journal of Purchasing & Supply Management*, 8, 135-149.
- Real, J.C., Leal, A., & Roldan, J.L. (2006). Information technology as a determinant of organizational learning and technological distinctive competencies. *Industrial Marketing Management*, 35, 505-521.
- Robinson, D.K.R., Rip, A., & Mangematin, V. (2007). Technological agglomeration and the emergence of clusters and in nanotechnology. *Research Policy*, 36, 871–879.
- Rockart, J.W.; Beath, C.M., & Goodhue, D.L. (1996). Eight imperatives for the new IT organization. *Sloan Management Review*, 38(1), 43-56.
- Ross, J. W., Beath, C.M., & Goodhue, D.L. (1996). Develop long-term competitiveness through IT assets. *Sloan Management Review*, 38(1), 31-42.
- Shane, S. (2003). *A General Theory of Entrepreneurship. The individual-Opportunity Nexus*. Cheltenham: Edward Elgar.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217-226.
- Smith, A.D., & Offodile, O.F. (2008). Strategic importance of team integration issues in product development processes to improve manufacturability. *Team Performance Management*, 14(5), 269– 292.

- Stone, L.J. (2006). Limitations of cleaner production programmes as organizational change agents. II. Leadership, support, communication, involvement and programme design. *Journal of Cleaner production*, 14, 15-30.
- Teece, D.J. (1986). Profiting from technological innovation: implications for integration, collaboration, licensing and public policy. *Research Policy*, 15(6), 285-305.
- Van de Ven A.H. (1993). The development of an infrastructure for entrepreneurship". *Journal of Business Venturing*, 8, 211-230.
- Van de Ven, A.H., Sapienza, H.J., & Villanueva, J. (2007). Entrepreneurial pursuits of self- and collective interests. *Strategic Entrepreneurship Journal*, 1(3-4), 353-370
- Venkataraman, S. (2004). Regional transformation through technological Entrepreneurship. *Journal of Business Venturing*, 19, 153-167.
- Wainwright, D., & Waring, T. (2000). The information management and technology strategy of the UK National Health Service - Determining progress in the NHS acute hospital sector. *International Journal of Public Sector Management*, 13(3), 241-259.
- Woolley, J. (2010). Technology emergence through entrepreneurship across multiple industries. *Strategic Entrepreneurship Journal*, 4, 1-21.
- Zahra, S.A. (1996). Technology strategy and new venture performance: A study of corporate-sponsored and independent biotechnology ventures. *Journal of Business Venturing*, 11, 289-321.
- Zahra, S.A. (2008). The virtuous cycle of discovery and creation of entrepreneurial opportunities. *Strategic Entrepreneurship Journal*, 2, 243-257.
- Zahra, S.A., & Covin, J.G. (1995). Contextual influences on the corporate entrepreneurship-performance relationship: A longitudinal analysis. *Journal of Business Venturing*, 10, 43-58.
- Zahra, S.A., & Garvis, D.M. (2000). International corporate entrepreneurship and firm performance: the moderating effect of international environmental hostility. *Journal of Business Venturing*, 15(5-6), 469-492.
- Zahra, S.A., & George, G. (2002). Absorptive Capacity: A Review, Re-conceptualization, and Extension. *Academy of Management Review*, 27(2), 185-203.
- Zahra, S.A., Sisodia, R.S., & Das, S.R. (1994). Technological choices within competitive strategy types. *International Journal of Technology Management*, 9(2), 172-195.
- Zhao, X., Zhao, H., & Hou, J. (2010). B2B e-hubs and information integration in supply chain Operations. *Management Research Review*, 33(10), 961 - 979.