Investment in Research & Development in Mexican Agribusiness Companies

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Abstract

The aim of this study is to determine the differences between companies that invest in R&D, and those that do not, in relation to the cultural capital held by staff, the technological position they have achieved in comparison to competitors and strategies used to implement activities of continuous improvement and innovation. We surveyed 111 manufacturers in the agro-industrial sector of the city of Celaya, Guanajuato, Mexico. The results show that companies that allocate a budget to continuous improvement activities and innovation are those with greater cultural capital in its staff, maintain a better technological position and used to a greater extent, tangible resources as a basis for their innovation activities. Implications for the academic, business and government sectors are presented.

Keywords: R&D Investment, cultural capital, technological position, innovation, agribusiness.

Introduction

The competitiveness of a company is based on its ability to use the necessary resources to implement improvements to its products and processes. Even the companies that have achieved a competitive advantage must develop strategies based on innovation if they want to maintain their position in the long term. That is to say, companies wishing to obtain higher yields and ensure growth are those that develop a culture of innovation (Organización para la Cooperación y el Desarrollo Económico, 2005).

In some studies by Lopez, the author shows that companies are interested in developing technological and innovation capabilities but are not always willing to allocate financial resources to develop them. In fact, expenditure on Research & Development (R&D) in Mexico is 0.4% of GDP (2011)[1], the majority of which being public investment, this is indicative that companies are still unaware of the importance of investment in R&D.

Companies should start by appointing a budget for continuous improvement activities if innovation is desired. In this regard, it is important to analyze the factors that differentiate the companies that invest in R&D from those that do not, to understand the characteristics that underlie and promote innovative activity.

[1] The average spends on R&D in OCDE countries is 2.4%.

Although several studies have been developed on R&D, few have focused on determining the factors of the level of investment made by the company in continuous improvement activities and R&D. Therefore, the objective of this paper is to analyze the differences between the companies investing in continuous improvement and R&D, and those that do not invest, in relation to the cultural capital they hold, its technological position and the strategies they use to implement continuous improvement activities.

2. Literature Review

2.1 Capacity for innovation

Innovation is defined as a complex process in which new products are created, existing products are improved, new processes are incorporated into an industry, a new market is created, and changes are introduced in business management or new supply sources for raw materials (Schumpeter, 1934). There are two types of innovation, technological and non-technological. According to Guzman and Martinez (2008), technological innovations refer to innovations in products or processes, and non-technological innovations refer to changes in the way of managing and organizing the company. According to Hong, Kim &Cin (2015: 977) "technological innovation is the application of technologies and solutions that better meet customer and market demands". Bravo and Herrera (2009) consider innovation capacity as the result of four processes, knowledge creation, knowledge absorption, knowledge integration and reconfiguration of knowledge and these processes are supported by four types of resources: staff, leadership, and the structures and systems of organizational culture, as shown in Table 1.

Table 1: Good practices associated with innovation

Resources	Associated good practices
Actors / Human Capital / Staff	• Staff with different training and experience • Participatory and motivated employees • Employees capable of working work in an unconventional atmosphere • Fluid communication between project teams
Leadership	• Experienced managers • Long term relationships with networks of innovation • Good management skills of leaders • Stimulation of research activities • Creating processes for the evaluation of ideas • Broad involvement in the processes of strategies
Culture	• The freedom to explore issues related to the core competencies • Open attitude towards the scientific community • Predisposition to creativity • Absence of departmental identification • Promotion of dialogue and interaction • Frequent, informed, direct and open communication • Knowledge sharing communities *online* with customers and employees
Structures and systems	• Setting up teams for different functional areas • Individualized project area and global responsibility • R&D Groups • Continuous collection and evaluation purposes • Incentive system • Absence of interdepartmental barriers • Global participation in the decision-making process • Free time for experimentation • Using technology for knowledge transfer • Codification of knowledge within a system • Human resource development and training programs • Continuous learning • Database procedures • Customer involvement in the innovation process

Source: Adapted by the authors with information Bravo and Herrera (2009).

Fostering an innovative culture strengthens the capacities of cohesion, loyalty, and adequate activities and behaviors (Nemeth, 1997) in emerging and fast-growing sectors achieve competitive advantages and create conditions for the permanence of the enterprise (Molina, 2008).

However, innovation is costly, long-term, and requires thorough planning (Munuera, 2011). Chesbrough and Teece (1996) established two types of innovations, autonomous innovations, which are obtained independently of other innovations, and systematic innovations, which are those that are achieved in combination with other innovations and will complement each other. Some authors, such as Valdes (2002),Stamm (2003), and Bassand & Tidd (2007) argue that innovation can be incremental or radical and at the same time, subdivided into innovation in processes, products, market positioning and business concept (Table 2).

Table 2.Radical innovation vs. incremental innovation

Dimension	**Radical**	**Incremental**
Validity	Long term, usually more than ten years	Short-term, 6 to 30 months
Development Trajectory	Discontinuous, iterative, expensive, high levels of uncertainty	Step by step from the conception of the idea to the market, high levels of uncertainty
Idea generation and opportunity recognition	Ideas often come from unexpected sources; purpose and goal can change on the fly	The continuous flow of incremental improvements, critical events anticipated with time.
Process	It is a formal and structured process, this may hinder rather than help	Formal and generally set in stages
Resources and skill requirements	There is difficulty in predicting the competencies and skills required, additional expertise may be required, as well as flexibility	The competencies and skills tend to be within the team; resource location follows a standardized process.
Players	Can be assigned to a functional team with clearly assigned and understood roles, the emphasis on skills makes things happen	Skills are required, players can come and go, the skills required are often in informal networks, such as flexibility, persistence and willingness to experiment
Development structure	Usually, an inter-functional team works within a business unit	They tend to originate in R&D and are usually managed by the person proposing innovation

Source: Stamm (2003).

Table 4: Technological innovation strategies based on technological positioning.

Author	**Dimensions**	
Ansoff and Stewart (1967)	Pioneer	Application Engineering
	Follow the leader	Low cost, follower
Little (1981)	Technology Leader	Development of technological niche
	Technological follower	Technological rationalization
	Joint - Venture	
Frohman and Bitondo (1981)	Technological Inventor	Technological application
	Technology innovator	Technological avoider
Hambrick (1983)	Prospector	Reactor
	Defender	Analyzer
Porter (1983)	Leadership	Follower
Cooper (1984)	Technologically directed	Technologically poor
	Balanced	Conservative (low-budget)
	Diverse (high-budget)	
Martin (1984)	Pioneer	Imitative
	Follower, defensive	Absorbent
	Application Engineering	Provider
	Harvest	
Freeman (1986)	Offensive	Imitator
	Defensive	Dependent
	Opportunist	Traditional
Maidique and Patch (1988)	Pioneer	Market segment
	Second on the market	Last on the market, minimizing costs
Manu (1992)	Innovators in the product	Last incoming, not innovative
	Innovative in the process	Original pioneers

Source: Adapted by authors from information by Donate and Guadamillas (2008) with information from Adler (1989).

Ojeda García and Torres (2014) identified in the work of Abernathy and Clark (1985), Henderson and Clark (1990), Tushman, Anderson and O'Reilly (1997) and Chandy and Tellis (1998), who use the quadrants paradigm to try to explain a model of innovation that generally contain the dimensions of technology and knowledge, and make them interact to explain the phenomenon of innovation (Table 3).

Table 3: Innovation models

Abernathy & Clark Model				**Henderson and Clark model**			
	Technological Capacities				Architectural Knowledge		
Market Knowledge		Preserved	Destroyed	Knowledge of the Components		Increased or improved	Destroyed
	Preserved	Regular Innovation	Revolutionary innovation		Increased or improved	Incremental innovation	Architectural Innovation
	Destroyed	Innovation segment or niche	Architectural innovation		Destroyed	Modular Innovation	Modular Innovation
Tushman model, Anderson and O'Reilly				**Chandy & Tellis Model**			
	Technology (R&D)				Satisfying Customer Needs		
Market		Incremental	Radical	Technology Innovations		Low	High
	New	Architectural innovation	Most innovative product or service		Low	Incremental innovation	Progress on the market
	Existing	Incremental product innovation, service or process	Greater innovation process		High	Technological progress	Radical innovation

Source: Ojeda Garcia and Torres (2014).

In terms of the conceptualization of innovation, there is a general agreement among authors, but the debate is centered on how to implement and make innovation operational within organizations, especially because resources are needed to implement any innovation activity.

2.2 Investment in continuous improvement activities, research and development

The innovativeness of enterprises depends largely on the ability to generate, collect, transmit and acquire knowledge, which, in turn, is a function of the learning capacity of the company. Any innovation activity requires financial, human and technical resources to support their development; therefore, companies must allocate part of their budget to continuous improvement activities and R&D.

However, not all companies are aware of the positive effects of investing in innovation activities, especially small businesses, who in times of recession, reduce or eliminate any budget for continuous improvement and innovation in order to reduce costs. On average, companies spend between one and two percent of its total revenue to innovation activities (Lopez, 2015). This is a reality in the company even though several studies have shown a positive relationship between R&D and business growth. In this regard, it has been found that companies that invest in R&D experience sales growth (Coad and Rao, 2008; Yasuda, 2005), greater ability to survive (Lefebvre, 1998; Hall, 1987), greater labor productivity (Del Monte and Papagni, 2003) and improved ability to export (Roper, 1997). Therefore, it is important to analyze the factors affecting the level of investment that companies intend for continuous improvement activities and R&D.

2.3 Cultural Capital

Cultural capital is understood as "the set of capabilities that people involved in organizations have at the individual level (owners, managers and workers) with reference to the level of education ...., experience in the field ... the technical capacity or knowledge to make or solve certain tasks and skills "(Contreras, Lopez and Molina, 2011, pp.15-16).

Lopez and Contreras (2008) argue that the cultural capital can somehow potentiate the employer, i.e.:

"It is a resource that has some power in a kind of specific social market where the distribution and exchange, nuanced differences formations of knowledge, skills, attitudes and values of people and allows them in a social field take equity positions and relative representation in power relations "(Lopez and Contreras, 2008: 3).

In this sense, cultural capital, improves the capabilities of synthesis, analysis and problem solving, as the body of knowledge and experience that builds up over time helps implement better decision-making. Cultural capital includes productive and creative capacity of a set of people working in the company; it refers to the organizational and business culture of the owner, and his/her ability to perform tasks, establish agreements and communicate. Cultural capital is of great importance to organizations because it allows the use of a wealth of knowledge because it depends on the ability to operate efficiently, select the best strategies to compete, and facilitate innovation culture in organizations.

Muñoz and Lira (1990) argue that there is a strong influence of cultural capital in the skills of entrepreneurs to rationally manage the challenges and opportunities of the environment. In developing cultural capital, sources of information play an elemental role and are based on knowledge and learning that is acquired over time. In a study developed by Contreras, Lopez& Estrada (2015), the authors found 26 sources of information used in Celaya SMEs to learn about their activity and grouped into seven categories: inter-organizational logic, expert sources and ICT, formal sources of knowledge, organizational sources, media and advertising, means of communication and advertising, informal sources of communication, the experience of the entrepreneur and a lack of information or knowledge.

In this respect, companies that have a greater wealth of knowledge are better able to generate innovation and continuous improvement actions in products and processes and are better able to learn and solve problems; and therefore, companies that invest in continuous improvement activities and R&D have more cultural capital in relation to companies that do not. Hypothesis 1 states that:

H1: There are significant differences between the companies that invest in continuous improvement activities and R&D, and those that do not, in relation to the cultural capital they hold.

2.4 Technological Position

The technological position is related to the ability to innovate technologically to generate a competitive advantage (Gómez, Gongora y López, 2012) and this capability requires close cooperation between the various groups and individuals within the organization, as well as joint development activities. The results of this interaction are often uncertain, so encouraging them carries a degree of risk, plus there is a cumulative activity that is subject to historical variables (Pavitt, 1990; Dossi, 1982) of individual, group and organization. The various representative bonds generated in the dynamics of a technological innovation system make it clear that it is necessary to propose strategies to develop these dynamics, which should have the objective of inserting the organization in a globalized and competitive economy while at the same time, revitalize the key factors to strengthening the innovative process (Willis, Dolder and Plastino, 2000).The management of technological innovation that generates positioning is a complex task, which cannot be subject to improvisation (Kanter, 1996) and should answer questions such as how to innovate, or what knowledge is the basis for this innovation (Christensen, 1995).

There are many views about how to develop strategies to help improve the technological position (Table 4).

Table 4: Technological innovation strategies based on technological positioning

Author	**Dimensions**	
Ansoff and Stewart (1967)	Pioneer	Application Engineering
	Follow the leader	Low cost, follower
Little (1981)	Technology Leader	Development of technological niche
	Technological follower	Technological rationalization
	Joint - Venture	
Frohman and Bitondo (1981)	Technological Inventor	Technological application
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Martin (1984)	Pioneer	Imitative
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Source: Adapted by authors from information by Donate and Guadamillas (2008) with information from Adler (1989).

New knowledge together with existing knowledge generates new knowledge, and this relationship also occurs in the opposite direction; the innovation process generates explicit knowledge that input and integrates processes and products that, through the process of tacit knowledge, are renewed and add to the knowledge base of the organization (Nieto, 2001).

Knowledge management of the organization affects this technological position, a position of technological leadership will be rewarded if efforts to develop and explore knowledge are consistent with those of the organization, as well as proper management and development of the knowledge base, which will enable the organization to gain a technological edge that will lead to success in the market (Donate and Guadamilla, 2008).

Therefore, companies are determined to improve their technological position, either through the acquisition of technology or innovation of a process or product, and are willing to allocate resources to achieve it. That is, companies investing in continuous improvement activities and R&D have more efficient technology in relation to companies that do not. Therefore, Hypothesis 2 states that:

H2: There are significant differences between the companies that invest in continuous improvement activities and R&D and those that do not, in relation to the technological position they hold.

2.5 Tangible and intangible resources in the development of improvements and innovations

The ability of a company to succeed in an increasingly large market depends basically on the company itself (Fernandez, 1992). According to the theory of resources and capabilities, companies have a unique set of resources that are the source of organizational capabilities. Resources are defined as "stocks of available factors that are owned or controlled by the firm" and capabilities are "firm's capacity to deploy resources, usually in combination, using organizational Processes, to effect a Desired end" (Amit & Shoemaker, 1993: 35). Resources can be tangible or intangible. According to Hitt, Ireland &Hoskisson (2009: 79) "tangible assets are assets that can be viewed and quantified", while intangible assets "often have deep roots in the history of the company and have accumulated with the passage of time"(2009: 79).

The combination of resources is what determines competitive advantage (Barney, 1991), but several authors agree that intangible resources have greater potential to generate and maintain a competitive advantage because they are developed as part of the organizational routines within the organization, which is difficult for competitors to identify, analyze and imitate (Hitt et al., 2009; Garcia, Mareo, Molina and Quer, 1999, Barney, 1991). When companies implement strategies to improve existing products and processes, they develop technology and/or innovate, making use of the skills they possess, which may be based on tangible resources such as technical analysis of competing products, reverse engineering, patent analysis, imitation of products or processes, and licensing agreements; or they may be based on intangible resources such as creativity of the production staff exchanges with universities, personal exchanges, formal agreements with suppliers and customers.

In this regard it would be expected that companies allocate enough funds to continuous improvement activities and R&D, using strategies based on intangible resources to take full advantage of the knowledge and creativity of its personnel, use their capital with customers, suppliers and other contacts in the industry that can provide insider information, in order to generate innovations or improvements. According to the above, the third hypothesis is the following:

H3: There are significant differences in the companies they invest in continuous improvement activities and R&D and those that do not, in relation to the resources used for the innovation strategy.

3. Method

The focus of this research is quantitative, through data collection the hypotheses raised will be tested to determine the differences between companies that invest in R&D and those that do not in terms of the factors that determine the technological capacity of a company. The research is correlation. A total of 111 companies in the manufacturing sector of the food industry were surveyed in the Laja-Bajío[2] region. The National Chamber of Industry (CANACINTRA) of the city of Celaya, Guanajuato, Mexico, through the Knowledge Consortium[3]provided a directory of approximately 200 companies in the food industry. From this directory, the first contact with the companies was conducted via telephone, email and through visits to their establishments in order to make an appointment for the implementation of research instrument.

[2]The Laja-Bajío includes the municipalities of Apaseo el Alto, Apaseo el Grande, Celaya, Comonfort, Cortazar, Jaral del Progreso, Santa Cruz de Juventino Rosas, Tarimoro y Villagrán.

[3]Association in charge of generating a culture of innovation in companies through ties between companies, research centers, and universities, through the elaboration of innovation and technological development projects.

Companies that agreed to participate in the research were accepted as the selection criteria were: a) belong to the food industry and 2) be willing to participate in the study. The application of the questionnaire was in person and by telephone during 2013. Research subjects were business owners, general managers and company staff of middle managers.

The research question to address was: What are the differences between companies that invest in continuous improvement activities and those that do not, in relation to cultural capital, technological position and strategies used to implement improvements?

A T-test was used for independent testing in order to compare the means of the companies investing in continuous improvement activities, R&D and innovation, and companies that do not.
In Table 5, the measurement of variables shows investment in R&D, cultural capital, technological position, improvement strategies, age, and size of the company.

Table 5: Measurement of variables

Variables	**Code**	**Components**	**Definition**
Investment in R&D	INV	Research and Development (R&D)	Funds destined for research and technological development.
Cultural Capital	CUL	School staff level (EDU)	Level of knowledge a person acquired through formal education.
		Training workers (TRA)	Training process to develop skills that improve performance.
		Incentives (INC)	Stimulus granted by improvements to processes, equipment, products, creating new products or propose viable improvement projects.
Technology Position	POS	Technological level	Technological level in relation to the main competitors.
Improvement strategies	IT IS T	Tangible assets (TANG)	Tangible resources used to generate innovations, technological developments and improve the capacity for innovation.
		Intangible assets (INTANG)	Intangible resources used to generate innovations, technological developments and improve the capacity for innovation.
Age of the company	AGE	Years in the market (AGE)	Length of time company has remained in the market.
Company size	SIZ	Number of employees (SIZ)	Total employees working in an organization.

Source: Own elaboration.

Out of the 111 companies, 55% are in the stage of maturity, as they have managed to stay on the market for over 20 years. Only 9% of companies are young with five or fewer years old. Despite the experience gained over time, only a quarter of companies have ventured into export activities. 72.5% are micro and small businesses, similar to the national average proportion (see Table 6).

Table 6: Sample characteristics: size, age and export activity

Variables	Categories	%
Size	Micro	41.5
	Small	31.1
	Median	17.0
	Big	10.4
Age	≤ 5 years	8.7
	6-10 years	8.7
	11-20 years	27.2
	> 20 years	55.3
Export	Yes	23.5
	No	76.5

Source: Own elaboration.

4. Results

Just less than half (41.5%) of companies allocate a budget to continuous improvement activities, research, development and/or innovation; the remaining 58.5% did not invest in this type of activity. The majority (71%) of managers have undergraduate degrees, 57% of production managers have high school diplomas; 58% of production supervisors have a technical degree or high school level education; 65% of workers have specialized secondary education or technical training; while 74% of workers overall have lower grade levels, either primary or secondary education.

The training offered by companies focuses primarily on formal education of workers, this is due to low educational levels; training in health and safety is also present, as well as training in quality, continuous improvement in processes and products, and teamwork. However it is still a low percentage of companies that carried out training frequently (between 26% and 30%).About a third of companies offer non-financial incentives, benefits unrelated to their work and concessions. Services to employees and merit-based salary increase, incentives are used in a quarter of the companies.

These data show that the cultural capital of staff of the companies surveyed have an average cultural capital, given the levels of schooling, frequency of training they receive and the incentives granted by the company.
Regarding the technological position of firms, 42% are considered to have the same technology as their competitors, 28% evaluated their technology as better compared to the competition and 25% agreed that the competition is better positioned technologically. According to the businessmen surveyed, the most important activities for generating improvements, innovations and technological developments are patent analysis, technical analysis of competing products, licensing agreements and personal contacts. These results show that entrepreneurs use both tangible and intangible resources to improve their products and processes.

The test of equality of means (Table 7) shows that there are significant differences in the level of education of staff between companies that allocate a budget of their sales activities of continuous improvement, innovation and R&D and those that do not, the first being those with the highest educational levels. Also, companies that invest in R&D implemented a better incentive program in relation to companies that do not allocate budget to the improvement and R&D. Also, the results show that there are significant differences in cultural capital (evaluated together) level, with companies investing in continuous improvement and R&D those with higher levels of knowledge and staff training. Regarding the technological position against competitors, there are significant differences between firms that invest in continuous improvement and R&D and those that do not. Companies that do invest, using more efficient and modern in technology relative to its competitors, thus generating competitive advantages. Finally, companies that invest in R&D used to a lesser extent intangible resources such as personal contacts, licensing agreements, the creativity of production staff to implement strategies for continuous improvement, innovation and technological development, and used more tangible resources (product technical analysis, analysis of product patents and copy).

Table 7: Test of equality of means

Variables	Investment in R&D				T test		
	Do Invest		Do not Invest		Mean Difference	t-Test (Sig.)	Levine's Test
	Mean	SD	Mean	SD			
Education	4.7167	.71573	4.0294	.98637	.68724	.000	5.531**
Training	2.4319	1.01697	2.7500	1.11897	-.31812	.129	.722
Incentives	.4667	.23167	.2968	.27329	.16988	.001	.954
Cultural Capital	2.5221	.32735	2.3453	.54336	.17685	.052	8.044***
Technological position	2.3043	.69505	1.81167	.72467	.48768	.001	.007
Tangible resources	2.4746	1.08296	2.8229	1.19813	-.34828	.121	1.501
Intangible Resources	2.0870	.83597	2.5286	.93431	-.44161	.012	.787
Age	27.93	15.48	22.42	21.49	5.50809	.152	.077

*** P <.01, ** p <.05, * P <.10

Furthermore, the results showed that, although the differences are not statistically significant, companies that do not invest in R&D tend to invest more in training and use tangible resources for continuous improvement activities, technological development and innovation. Likewise, no significant differences in the age of the company in relation to the activity of investment in R&D, although companies that do invest are more mature companies with regard to those that do not invest in R&D.

5. Discussion of Results

The aim of this study is to determine the differences between companies that invest in continuous improvement and in the R&D, and that do not invest in relation to cultural capital of personnel, technological position achieved in comparison its competitors and the strategies used to implement activities of continuous improvement and innovation. The results show that cultural capital is higher in companies with a culture of innovation where new products, processes and equipment are created, or existing ones improved, so hypothesis one (H1) is accepted. When the company has well-trained and highly educated personnel, they are more likely to use the knowledge and skills to generate improvements and innovations, making financial resources earmarked for these activities of innovation.

With regard to the technological position of enterprises, hypothesis two (H2) is supported, as companies that allocate funds to activities for improvement and innovation have better technology than competitors, either through acquisition or improvements. In this regard and as Donate and Guadamilla (2008) mentioned, as more knowledge is generated, the company is better able to achieve better technological position in the market to use that knowledge, implying a relationship between cultural capital and technological position.

According to the third hypothesis, companies that invest in continuous improvement activities and R & D use intangible resources to a greater extent to develop innovations, as they are the main source of competitive advantage. However, hypothesis three (H3) is not accepted because it is precisely the companies that do not allocate budget for R & D that are making use of their intangible assets. This may be due to the lack of financial resources to support the activities of continuous improvement and innovation, forcing companies to use the creativity of its staff, to obtain information from its network of relationships, especially with customers and suppliers to improve products and processes, and linked to research centers and universities.

6. Conclusions

Continuous improvement is a process of learning and re-learning, in which (explicit and tacit) knowledge of the individual, group of individuals and the organization converge, it is an iterative process, and that new knowledge is added to existing knowledge and restarts. When this knowledge generation is managed in systemic and systematic way, it is possible to achieve strategies that may lead to a technological position, resulting in competitive advantage, depending on the impact of the results of the technological position it may considered a radical or an incremental innovation.

In the agribusiness sector, it is apparent that increased investment in R & D is related with higher education levels, greater cultural capital, investing more in knowledge and training of staff, better technological positioning with respect to competition, and a greater use of tangible resources (technical product analysis, patent analysis, or copies of products). Similarly, lower investment in R&D decreased the use of intangible resources such as personal contacts, usage agreements licensing, use of the creativity of the production staff to implement strategies for continuous improvement, innovation and technological development was evident.

There were no significant differences between the companies that invest in R&D and those that do not in relation to investment in training and the use of tangible resources for continuous improvement activities, technological development and innovation. Nor is there evidence of the relationship between investment in R&D and the age of the company. This finding contradicts in part those established by Moore (2004) on innovation and life cycle of the company; however, companies that invest in R&D are more mature than companies that do not invest.

These results have academic, business, and governmental implications. Regarding the academic contribution, this research increases our knowledge of the positive effects of investing in R&D to achieve improvements in products and processes and innovation capacity. This identifies the relationship of R&D with cultural capital, technological position, and tangible and intangible resources. With regards to the business sector, managers must invest more resources in R & D if they want to maintain competitive advantage in the long term.

Companies should also consider establishing policies and programs that increase the educational level of staff and support the development skills and encourage staff to suggest improvements and innovations in the organization. Finally, the government should develop public policies that promote investment in R&D in companies, either through tax incentives, support for training and development schemes linked to suppliers and customers. Future research must address the study of other factors that determine investment in R&D companies and expand research to other industries.

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