

## ARTÍCULOS ORIGINALES

# To The link between universities and companies

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**ABSTRACT** The lack of scientific production from university professors and the weak relationship between students and teachers cause poor student motivation to investigate topics that tend to better production in companies. This, coupled with the limited library infrastructure and the lack of financial support to access national and foreign journals and scientific reviews that not only serve as student support but also as a way to encourage them to generate new ideas, leads to a scientific research deficit in Mexico. When comparing Latin American countries, Argentina, Chile and Brazil have higher research levels than the Aztec country. This research is aimed at finding new ideas that should be taken into account in order to improve this country's low research levels.

**KEYWORDS** company, science, education, research, method.

### HISTORY OF THIS PAPER

The original version of this paper was written in Spanish. This English version is published in order to reach a wider audience. To cite this paper, please refer to its original version, as follows:

### HOW TO CITE THIS ARTICLE?:

Pérez-Cazares, M. E. (2017). La vinculación universitaria con las empresas. *Perspectiva Empresarial*, 4(2), 37-46. <http://dx.doi.org/10.16967/rpe.v4n2a4>

RECEIVED: July 30, 2017

APPROVED: August 25, 2017

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## La vinculación universitaria con las empresas

**RESUMEN** La falta de producción científica en las universidades por parte de sus catedráticos, y una escasa vinculación entre estudiante y maestro, produce una pobre motivación en el alumnado para la investigación de temas que tiendan a un mejor desarrollo en la producción de las empresas. Esto, aunado a la escasa infraestructura en bibliotecas y la falta de apoyo económico para tener acceso a revistas de otras universidades, tanto nacionales, como extranjeras, así como revistas científicas que sirvan no solo de apoyo al estudiante, sino de aliento para generar nuevas ideas, conlleva en gran parte al déficit en la investigación científica en México, a fin de generar ciencia. En una comparativa latinoamericana, países como Argentina, Chile y Brasil tienen mayores niveles de investigación en relación con el país azteca. En la presente investigación se busca encontrar ideas nuevas que se tomen en cuenta en el propósito de robustecer la insuficiente investigación de este país.

**PALABRAS CLAVE** empresa, ciencia, educación, investigación, método.

## O vínculo universitário com as empresas

**RESUMO** A falta de produção científica nas universidades por parte dos seus professores, e um escasso vínculo entre estudante e docente, produz uma pobre motivação nos alunos para a pesquisa de temas que tendem a um melhor desenvolvimento na produção das empresas. Isso, somado à escassa infraestrutura nas bibliotecas e à falta de apoio econômico para ter acesso a revistas de outras universidades, tanto nacionais quanto estrangeiras, assim como revistas científicas que sirvam não só de apoio ao estudante, senão que de inspiração para gerar novas ideias, implica em grande parte no déficit da pesquisa científica no México, a fim de gerar ciência. Em uma análise comparativa latino-americana, países como a Argentina, o Chile e o Brasil têm maiores níveis de pesquisa em relação ao país asteca. Na presente pesquisa busca-se encontrar ideias novas que sejam tidas em conta com o objetivo de fortalecer a pesquisa no México, que hoje é insuficiente.

**PALAVRAS CHAVE** ciência, educação, empresa, método, pesquisa.

### HOW TO CITE THIS PAPER? ¿CÓMO CITO EL ARTÍCULO?

CHICAGO:  
Pérez-Cazares, Martín Eduardo. 2017. "La vinculación universitaria con las empresas". *Perspectiva Empresarial* 4(2): 37-46.  
<http://dx.doi.org/10.16967/rpe.v4n2a4>

MLA:  
Pérez-Cazares, Martín Eduardo. "La vinculación universitaria con las empresas". *Perspectiva Empresarial* 4.2 (2017): 37-46. Digital. <http://dx.doi.org/10.16967/rpe.v4n2a4>

## The connection between education and research

A connection is conceptualized as the relationship established between two people with similar general or specific interests either in terms of goods or purchases. A connection implies mutual influence to fulfill certain common objectives (Enciclopedia Jurídica Mexicana, 2012, pp. 988-990).

University connection is the relationship established between the university and the productive goods or service sectors (either public or private), with the purpose of establishing similar interests and achieving significant progress in the dissemination of knowledge.

In this second decade of the 21st century, when free enterprise and free competition are firmly rooted in the minds of governments through liberalism, a closer relationship between universities and companies is necessary in order to know the needs of enterprises and thus train professionals accordingly with the appropriate study programs for each area of services or goods production.

One of the greatest challenges for any country is to promote education and research in order to address social problems in a systematic way and, above all, to offer relevant and viable solutions. It is important to highlight the mission of those who teach at the undergraduate, master's or doctoral level in order to train human resources and to generate new research aimed at solving social needs through new knowledge that will reduce production costs and achieve greater competitiveness in the globalized markets. This is because new challenges and demands are faced every day with the emergence of new forms and social customs that require a rigorous effort in terms of research and, of course, teaching, while trying to look for constructive means that tend to create new production mechanisms to improve coexistence.

According to Rodríguez, Rojas & Lobato (2015, p.18):

The university-business interaction has been strengthened in many countries by increased government support to research and knowledge production centers, the determined interest of some private companies in establishing interdisciplinary teams for research and development processes required for their businesses and the change in mentality among the leaders of academic institutions. That is why today there is a profound change in

social models with respect to the traditional management of universities, moving from a purely academic vision to a complementary business vision.

Therefore, the student should have a broad overview of the problems faced by the researcher in order to delimit and define the set of problems that can be investigated and the management and use of knowledge by different social sectors that represent research topics for the development of scientific knowledge, as well as practical solutions that could be offered with the support of government and private initiatives.

In this sense, the triple helix model emerges as a response to the growing need to relate the productive and technological scientific activities in order to face market demands (Chang, 2010, p.86). González (2009) states that in this model mutual relations between universities and scientific environments are analyzed in the first helix. The link between companies and industries constitutes the second helix and the relationship between administrations and government represents the third helix.

The current conditions pose the challenge of knowing if the ideas used to analyze the new realities are the most appropriate or not. From this perspective, it is clear that it must be assumed that in the field of knowledge, and in relation to university education, many of our concepts, which were useful until recently, are now unable to explain the events that occur in both areas. This requires a radical and courageous attitude to shift completely and venture new expectations of knowledge (Larrauri, 2006, p.64).

Recruiting the academic staff through open calls and on a merit basis as well as creating a strong execution system in the management of universities are measures to improve teaching practices and guarantee quality in the investment and training of human capital, based on an education model that is adapted to company needs to satisfy the acquisition of knowledge that the country requires for a competitive global economy.

Faced with competitiveness, universities in Mexico should apply the teaching of methods and techniques as fundamental in each class taught, in order to later apply the methods and techniques to production processes in companies. In this sense, the university is seen as a supplier of human resources. If the university delivers a high quality and competent product to the business

community, it will strengthen the quality and quantity of production in companies.

This can only be possible with government support through the creation of public policies for the development of knowledge. Hence the importance of a close link between government, universities and companies, which are vital for the transfer of knowledge.

### The application of methods at universities

At first glance, when talking about methods of knowledge, it seems that reference is made only to the knowledge produced in laboratories, academies or institutes. However, if we reflect on it for a while, we can see how even the most ignorant person is applying all these methods. The thing is that the person does it without being aware of it.

Now, human cognitive capacity is possible through the use of general concepts. This is what allows us to compare and relate, so that useless repetitions are avoided and, when the time comes for the student to build or elaborate on a concept, he will not forget it. In this sense, induction and deduction are mutually related methods, because it is through experience that humans begin to draw up general principles that can later be used to handle subsequent particular events. Consequently, human knowledge is composed of a series of general principles that teach humans how to use concrete facts. This, in turn, allows us to broaden those general principles and so on.

Based on the above, it can be argued that all practical and theoretical knowledge is possible given the situations experienced by humans throughout history. Even learning logical, mathematical and geometric principles is based on concrete examples. Science and culture have been passed on from generation to generation and previous knowledge is overcome with new analyses and studies to create new theories and make new discoveries. From primary school, students learn general principles through practical exercises assigned by the teacher. Although their abstract nature allows their apprehension, the truth is that in everyday life a syllogism is required, since concrete problems constitute minor premises and their solution is achieved through the subsumption of that minor premise within the major premise (general concept).

Therefore, it can be stated that all human knowledge is feasible and possible through the use of concrete cases. All disciplines have used the practical management of cases in order to penetrate and expand the knowledge of their general laws and in this way obtain better learning results.

Hence, universities in our country must adapt their study programs to business needs through the use of specific cases in teaching, which leads the students to practice before entering the labor market. However, it should be noted that while in the natural sciences the major and minor premises are accurate from the beginning, the situation is very different in technical industrial systems, since given their practical nature and their nature as exact sciences or not, depending on each company's industrial area, whenever it comes to subsuming the production system to the social needs within the general norms of production there will be new aspects that had not been previously understood, as well as new ways of producing and new forms of products that make everyday life easier.

Thus, there is a need to generate in the universities an awareness of their role and their impact on the communities where they are located, based on the extrapolation of the concept known of corporate social responsibility (Brodsky, 2017, p.15).

In educational research, studies are carried out with the intention of understanding the teaching-learning process in a better way, as well as the conditions to carry it out more effectively. This is because this process allows to discover principles, develop applicable procedures to the field of education, etc. The phenomena that are usually studied by educational research are related to the nature, effectiveness and conditions of learning, although issues related to different educational situations are also addressed (Bayardo, 1995, p. 29). These issues must also be applied by students in their jobs once they graduate, looking for the conditions to develop procedures applicable to production, no matter what kind. Hence, the research method to be taught at universities is paramount, since it will be the foundation for future professionals in their new employments.

The application of practical and operational methods and techniques should be privileged by universities, since students are not just listeners and a dictation-based education is far from ideal. Education should involve technological practices and application. This is the 21st century, where

digitalization and computer science are applicable in all fields and sciences.

From the etymological point of view, the term "method" comes from the Greek words *meta*, "towards" and *odos*, "road": "road to be followed" (Martínez, 2000, p.27). Therefore, the teaching of methods and their management and application are important, since these will be applied by future professionals in order to obtain better products at lower costs.

The method teaches students to find hypotheses, as well as new and fruitful ideas. It has some rules that lead to great scientific discoveries and creation of masterpieces (2000), so it can be said that teaching how to apply scientific methods in universities is paramount.

Thus, we can say that the goal of every science is to comprehend and explain things, as well as understand the necessary relationship that links something to its cause or principle, in order to solve a problem by identifying the cause that generates it.

Scientific education should be aimed at promoting the construction of knowledge by students, instead of repeating existing knowledge systems. This will allow to generate entrepreneurs and not just labor.

Currently, universities are centers where society disseminates knowledge and also innovation, which is one of the pillars to improve educational quality (Villanueva, 2015, p. 21).

This transmission of knowledge is carried out through research and teaching-learning processes where the method of the procedure is necessary to achieve innovation not only in education, but also in terms of patenting inventions that will later generate new companies, where student will surely become entrepreneurs.

Some of the characteristics that should be developed in the students are a constant willingness to learn, the ability to face complex and changing situations, problem solving and decision making skills, as well as being critical and responsible citizens (Sancho et al., 2007, p 418).

The transformation of local and global social, economic and cultural demands is also a key tool to successfully achieve the entry of professionals into the labor market (Alcaraz, 2009, p.13), since, in this sense, they are generators of employment and not generators of employees.

Therefore, if companies use production methods and processes, the student must be taught to apply production processes. Every trading

company wants to sell its products to the market. In consequence, it is necessary to prepare students in the area of marketing, in order to establish better sales processes. Also, the students of other scientific areas that are part of the company must be taught these contents, in order to help them achieve their social objective.

The industrial society has been overcome by the hegemony of the knowledge society, which has influenced the change and generation of reforms at the social and political level. Life-long education favors the emergence of new social profiles and strengthens the economy's competitiveness, improves the employability and adaptability of the workforce and represents an important support of cohesion and social integration policies, as well as those of market economic growth (Villanueva, 2015, p.36).

This economic growth of the market implies the development of sciences such as law and, especially, commercial law, since company sales imply commerce and the science that regulates it. Therefore, it is important that future lawyers know the commercial matter and its procedure, since its application in the business activity will be necessary.

## Companies, science and universities

Mexican companies and industries must have closer contact with universities so that the institutions can be aware of the technical and scientific needs at the moment of creating and developing their academic programs and courses.

Mexican companies must hire new professionals with the clear goal of improving quality and production; otherwise, they could disappear. For its part, the professional graduated from a university starts to work at a company with a generic vision of science, a set of knowledge ready to be applied, as well as theories, principles and models that provide solutions to business problems. This is the case of accountants, lawyers, engineers, economists, etc., who have the eagerness and will to apply the contents learned with the purpose of improving production systems or policies to optimize the results obtained by the employer up to that moment. However, that will be useless if the knowledge acquired in universities has not been put into practice.

Without an exact idea of what is sought and the possible way to obtain it, no company can succeed. This is the reason why the necessary conditions for research must be established and tools to generate science must be provided. This will lead to discoveries that help Mexican entrepreneurs to compete globally and generate better income, since new production processes or technologies will provide better results. Thus, entrepreneurs may sell, teach or include applied technology to their production processes, as for example, in the case of tortilla processing machines manufactured in Mexico that are sold abroad.

Therefore, companies are important in the generation of knowledge and in the professional practice of future professionals. Companies must work jointly with universities.

Then, coordinating actions among all national actors (government, private sector, civil organizations, universities and educational institutions and business chambers, among others) is a priority, in order to share knowledge and information about higher education and identify the most important aspects for the design of the study and academic programs, and thus respond to the development required (Rodríguez et al., 2015, p.17).

The scientific and technological world changes rapidly, which forces educational institutions and companies to adapt to new realities, in order to compete in global markets (2015).

The interaction between the members of the government-company-university triangle guarantees scientific and technological development that tends to innovation in the educational and business sectors, since it encourages research, creativity and innovation by offering new alternatives of goods and services and fostering competitiveness.

### **From privatization to the commodification of higher education**

In university education today, educational offers are not restrained on the part of educational authorities. Therefore, higher education is increasingly interested in profit, an economic thought of educational competition without any quality. Today, in the educational market private universities offer a variety of convenient aspects to conclude a university program in a shorter time, so often it is not enough to acquire the minimum

professional knowledge required. This leads to providing quantity instead of quality to the labor market, as study times are too short for proper education of a professional student.

It is necessary to be aware of the creation of new universities that only focus on the economic aspect instead of the scientific one, so not very well qualified professionals graduate and then become part of the unemployment market. Faced with this reality, the educational authorities are responsible for the constant certification of educational quality.

Education must prioritize the teaching of knowledge that can be applied to social and business needs, which will stimulate the country's economic development. Education should not be based on the economic interests of the owners of private educational institutions.

### **Socialization of education**

The title of this section is not a political proposal and its purpose is not to politicize university education. However, it must be kept in mind so that the students understand how cooperation in education systems should be applied in the same way it should be used by companies and industries where they will work as a professional. That means that future professionals should not act on their own in any subject or research or production process, but in a collaborative way.

A country's development does not depend only on individual efforts but on the actions of all the capable individuals that unite their efforts. Achieving the ability to develop collective and cooperative work is the result of human intelligent learning (Moncayo, 1987, p.21).

Therefore, the professor should give emphasis to team work not only through collective teaching, but also through cooperative research so that cooperativism is applied by future professionals in industrial and business systems and the feeling of cooperation serves to generate better production, both in terms of quality and quantity.

Education is considered functional when the learners are trained to learn behaviors that allow them to solve everyday problems (1987, p.23). Working as a team is not only a means to master school program issues, but an end in itself. It is a practice for the acquisition of habits, skills and social attitudes (1987), with the idea of maximizing teaching, where future professionals are taught

how the productive system must strive for efficiency and, therefore, the maximization of production. All of the above considers the university as the ideal place for the training of professionals that meet the needs of Mexican companies.

It is important to teach students “what to know” and “what to do”, as these are essential aspects of professional education. Learning must be a process that involves constant revision and construction of knowledge schemes. Concerning academic content, students must be taught how to put their knowledge into practice and, at the same time, teaching must be adapted to the future labor market, whose evolution is not foreseeable. Proof of this is the financial crisis faced today, which affects the production of companies since they require less labor.

Teaching has to help establish substantive and non-arbitrary links between new content and prior knowledge. The teaching-learning situation can also be considered as a process aimed at overcoming challenges, which can be addressed by academia (Zabala, 1995, pp. 36-46).

The technological process has been modified. It went from production processes and purely physical tasks to more intellectual production tasks. Employers require a set of specific skills for each person, which confirms the relevance of qualification acquired through technical and professional training, social behavior and ability to work in teams, propose initiatives and take risks.

If the students’ personal commitment -which should be encouraged in the classroom- is included in these new demands, combined with theoretical and practical knowledge, the university-company link will become more relevant when establishing communicating work vessels between business needs and the curricula of university programs.

Today, universities must educate entrepreneurial professionals and future employers, not labor or job seekers. For this reason, university programs must become company incubators and they should also promote integrative linking processes with the productive sectors. The university should not only focus on educating and preparing future professionals, but it must also create entrepreneurial projects that become the beginning of future companies, where students can start their professional practice and generate information, studies and diagnoses about the different economic sectors that are useful for the solution of problems, the formulation of strategies and

the creation of productive policies that improve competitiveness.

It has been suggested that universities should teach students to work as a team, which is as important as establishing a close relationship with companies in order to create innovative projects, both in terms of products and services. Consequently, educational programs have to set guidelines for common projects between universities and companies.

Team work should not only occur in the classrooms. Universities should also team up with companies, which is called “strategic alliances” in marketing, in the search for continuous quality improvement.

In the same way, universities must assume their social role, since they are the highest level of knowledge and technical training in specific fields of knowledge, which constitutes sustainable development (Brotsky, 2017, p.22).

## The socialization of companies

Mexican companies must be in permanent contact not only with universities but with society itself in order to identify the needs to be met, which leads to a unique knowledge of social reality under the idea of a business production that tends to create social satisfiers. In other words, Mexican companies or industries must provide the products required by society. For example: How many Mexican companies manufacture razors, toothpaste or containers? Why importing these products when they can be manufactured in Mexico, stimulating job creation and economic income? The production of both small and large products requires students to know extensively social needs, which is learned in university classrooms.

The companies’ full knowledge of the social reality and the production of the satisfiers required by society will create progress, hence the importance of its study in organizations whose social role, among others, is the generation of employment and progress through discoveries, inventions, transformations of goods and increased production. Let us remember that the social factor of companies is transcendental, not only in terms of the role it plays within them but also in the functions they perform. A society without companies cannot be conceived, nor companies without society.

Today, the conception according to which in addition to producing goods and services companies must meet certain social objectives is generally accepted. Talking about a socially responsible company does not only imply compliance with the law or social norms. Companies produce social stability and income to the State. 21st century companies must work together with universities in motivating and innovative projects that allow creating new expectations for future professionals.

Knowing the socioeconomic characteristics of the place where the company is located, as well as to whom the product or service is directed, will serve to know the basic demands of the society that in the end will consume the good or service offered.

In the whole world, private companies were characterized by pursuing, as a fundamental and often exclusive objective, economic profit and benefit optimization and they forgot the importance that their social responsibility acts could have (Brodsky, 2017, p. 21).

## Conclusions

The State must promote education and research, in order to address social problems in a systematic way and, above all, offer alternatives for relevant and viable solutions that tend to solve social needs. This must be done through new knowledge that allows to reduce production costs and have greater competitiveness in globalized markets, which implies a close link within the so-called "triple helix" formed by government, universities and companies.

Likewise, companies must recruit staff through open calls and based on merit, by creating a strong performance management system that must be linked to universities to then take measures that improve teaching practices and guarantee the quality of the investment and training of human capital. This is based on an education mode adapted to company needs in order to satisfy the acquisition of the specific knowledge required for country development in a competitive global economy.

Mexican universities must adapt their study programs to business needs through the analysis of specific cases in teaching, which will involve the students into practice before being part of the labor market in order to search for new and better

ways to produce, as well as new products that make everyday life easier.

On the other hand, the application of practical and operational methods and techniques should be privileged by universities. An education where the teacher is the only participant is far from ideal. Education must involve practice, the application of technologies and interaction with the student. This is the 21st century, where digitalization and computer science are applicable in all fields and sciences in search of scientific education, which should aim to encourage the construction of knowledge by students, instead of repeating existing systems of knowledge. Innovation must be encouraged, so that entrepreneurs and not only labor can be generated by universities.

Mexican companies and industries should be in closer contact with universities in order to inform them about their technical and scientific needs for the creation and development of the programs and courses required. In this sense, Mexican companies must integrate new professionals with the clear goal of improving quality and production, in order to be more competitive. Otherwise, companies will be doomed to disappear.

Companies must invest in research and provide work tools for scientists to generate science, which will result in discoveries that can be used by Mexican entrepreneurs to compete globally and generate better income. Thus, new production processes or technologies will be created and better results will be obtained, so companies can sell, teach or invest in their production processes with applied technology.

Professors must emphasize teamwork with the purpose of collective teaching and also to seek cooperation in research. In this way, future professionals will use cooperativism in industrial and business systems and cooperation will generate better production in terms of quality and quantity. Also, students must be taught "what to know" and "what to do". These two aspects must go hand in hand as an essential component of professional training. Furthermore, students must learn how to put their knowledge into practice and universities must adapt teaching to the future labor market.

Nowadays, universities must generate entrepreneurial professionals and future employers, not just labor or job seekers. For this reason, university programs should be business incubators. The university must not only limit itself to educate and prepare students. It must also create entrepreneurial projects that may be the beginning

of future companies where the students can start their professional practice. In this way, at the time of graduation, they can know all the theory and practice they require.

The companies' knowledge of the social reality and the production of the satisfiers that the society requires will create progress. Hence the importance of the companies' study of society. Also, the social role of companies, among others, is the generation of employment and progress through discoveries, inventions, transformation of goods and the increase of production. Finally, the social factor of companies is transcendental given the role they play. Society cannot be conceived without companies and companies cannot be conceived without society.

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