

<https://doi.org/10.23913/ride.v14i27.1736>

*Artículos científicos*

**Retos y oportunidades para el desempeño profesional de la  
ingeniería civil desde la óptica de los empleadores**

***Challenges and opportunities for the professional performance of civil  
engineering from the perspective of employers***

***Desafios e oportunidades para a atuação profissional da engenharia civil na  
perspectiva dos empregadores***

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## Resumen

Conocer los requerimientos del mercado laboral es un elemento clave para la gestión de la educación superior y, particularmente, para las instituciones comprometidas con la pertinencia de su oferta educativa. Por ende, este estudio busca conocer cómo evalúan los empleadores el desempeño laboral de los egresados del programa de licenciatura en Ingeniería Civil de la Universidad Michoacana de San Nicolás de Hidalgo.

Desde un enfoque mixto y a partir de la lógica del estudio de casos, se analizó la información recopilada mediante una encuesta en un grupo focal de empleadores. Se concluye, por una parte, que el desempeño laboral de los egresados del programa educativo mencionado, en general, es bueno, y su valoración mejora al compararse con graduados de otras instituciones educativas. Asimismo, los empleadores aprecian tanto las competencias específicas como las genéricas con que cuentan los egresados, aunque también señalan que en estas últimas es donde se debe prestar más atención para la formación integral de futuros profesionales de la ingeniería civil.

**Palabras clave:** estudios de egresados, educación superior, mercado laboral, empleadores, ingeniería civil.

## Abstract

Knowing the requirements of the labor market is a key element in the field of higher education management and, in particular, for institutions committed to the relevance of their educational offer. This study seeks to know how employees evaluate the work performance of graduates of the Civil Engineering Degree program of the Universidad Michoacana de San Nicolás de Hidalgo.

From a mixed approach and under the logic of the case study, the information collected through a survey and a focus group with recipients was analyzed and it is concluded, on the one hand, that the job performance of the graduates of the educational program under study, In general, it is good and its evaluation improves when compared with graduates of other educational institutions. Likewise, users will appreciate the generic skills that graduates have as much as the specific skills; However, when highlighting the main areas of opportunity in which attention should be paid for the comprehensive training of future generations, there seems to be a general opinion that it is the generic competences where it can be said that the University has a greater debt with the labor market of civil engineering professionals.

**Keywords:** Graduate studies, higher education; working market; employers; civil Engineering.

## Resumo

Conhecer as exigências do mercado de trabalho é um elemento chave para a gestão do ensino superior e, particularmente, para instituições comprometidas com a relevância da sua oferta educativa. Portanto, este estudo busca saber como os empregadores avaliam o desempenho profissional dos egressos do curso de bacharelado em Engenharia Civil da Universidade Michoacana de San Nicolás de Hidalgo.

A partir de uma abordagem mista e com base na lógica do estudo de caso, foi analisada a informação recolhida através de um inquérito a um grupo focal de empregadores. Conclui-se, por um lado, que o desempenho profissional dos egressos do referido programa educacional, em geral, é bom, e sua avaliação melhora quando comparada com a dos egressos de outras instituições de ensino. Da mesma forma, os empregadores apreciam tanto as competências específicas como as genéricas que os licenciados possuem, embora também apontem que é nestas últimas que se deve prestar mais atenção à formação integral dos futuros profissionais de engenharia civil.

**Palavras-chave:** pós-graduação, ensino superior, mercado de trabalho, empregadores, engenharia civil.

**Fecha Recepción:** Agosto 2023

**Fecha Aceptación:** Noviembre 2023

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## Introduction

The challenges arising from the COVID-19 pandemic have placed new demands on higher education institutions (HEIs), which must adapt to change and take effective measures immediately. According to a recent study by the United Nations Educational, Scientific and Cultural Organization (UNESCO) on the global impact of the pandemic on higher education, administrators, students and academic staff at HEIs have worked on adaptation to their new realities. Despite the depth and diversity of the changes experienced, it is evident that these institutions are reconsidering their importance in promoting the well-being of their surrounding communities (Unesco, 2022).

One way in which HEIs can contribute to development in their environments is through the training they provide to students and its relevance to their future employability after graduation. Therefore, understanding the requirements established by the labor market

is essential in the management of higher education, especially for those institutions committed to the relevance of their educational offering.

Following these principles, this study aims to evaluate how employers perceive the job performance of graduates of the bachelor's program in Civil Engineering at the Universidad Michoacana de San Nicolás de Hidalgo (hereinafter, Universidad Michoacana). In addition, it seeks to identify the strengths and weaknesses in the training of these graduates in order to obtain feedback that contributes to improving the educational practice of said academic program.

It is worth mentioning that this work is a continuation and, at the same time, a complement of a previous study in which we sought to have “an approach to the first job of Civil Engineering graduates from the Universidad Michoacana” through the analysis of the information collected. with a survey of graduates of said educational program (Vega and García, 2023, p. 1).

According to Mier (2015), the degree in Civil Engineering is one of the oldest courses at the Universidad Michoacana, as it appears since the decree creating the institution on October 15, 1917. However, it was not until 1930 that it began to operate. as a Topographical and Hydrographer Engineer, and in 1949 he turned towards civil engineering. Since then, enrollment has ranged from 664 students (in 1994) to its all-time high of 2,056 (in 1980); Currently, it has remained more stable, with an average of 1,600 students in the last four years, but the most notable variations have coincided with periods of economic crisis in the country and delays in infrastructure.

From the first generations, graduates of this career have contributed to the construction of civil works for the growth and development of the state of Michoacán. In fact, over time, the study plans have also incorporated themes defined by the international agenda, such as environmental care. As an example of this concern to address the central issues of development, we can mention the creation of the Department of Sanitary and Environmental Engineering in 2001 and its respective laboratory in 2002 (Mier, 2015).

In the current global context, in which various demands are pressing both in the economic, social and environmental spheres, the Faculty of Civil Engineering of the Universidad Michoacana has seen the need to establish multiple mechanisms to keep its study plans current and to provide feedback to the professional profiles you are forming. For this reason, this study aims to provide information that guides decision-making to move towards the social relevance contained in its institutional mission.

## **Imbalances in the labor market: the requirements for employment and the skills acquired in university studies**

The dynamics that govern the labor market and higher education are different and independent (Planas, 2013). Perhaps one of the first differences has to do with the fact that the rationality of the agents involved in both spheres does not obey the same interests. In the case of the demand for higher education, the decision of young people about entering higher education is not a function of macroeconomic behavior and does not depend on the requirements of labor demand, but rather on personal aspects such as their desires and beliefs. , the symbolic value of education and the conception of education as a facilitating element for social mobility (Navarro-Cendejas, 2014). Likewise, the rationality of employers is not governed by the profiles provided by higher education institutions, but by the technological or scientific needs of the production market.

In addition to the differences in terms of rationality, temporality emerges as another distinctive factor, since, on the one hand, individuals must invest several years in their training and qualification, and, on the other, the labor market experiences rapid and constant changes due to the technological progress and globalization, which makes synchronization between these two domains difficult (Planas, 2013).

In this context, with the intention of preparing graduates to meet the requirements of the world of work and achieve an effective alignment between higher education and the labor market, the educational system has adopted the “skills” approach, since It has been considered that these could be fundamental when employers select their candidates. Competencies include both the knowledge acquired and “the ability to use that knowledge in a given situation, in other words, being able to transcend learning within the classroom to solving problems in different contexts” (Correal- Cuervo *et al .* , 2021, p. 106).

Planas (2013) points out that the word *competence* was incorporated into competency-based teaching (CBE) with a totally opposite approach to that which gave it sustenance, since it is associated with the certifications obtained in formal education, which “far from serving to To clarify information about people's skills, the EBC artificially standardizes them, generating, de facto, misinformation in the labor market and in the educational system” (p. 75).

Obviously, these discrepancies have had consequences in terms of the perspectives with which higher education is viewed. On the one hand, there is an optimistic vision that conceives it as a fundamental element to achieve the economic and social development of

countries. On the other hand, there are pessimistic positions that consider that universities constitute spaces in which future unemployed people are formed (De Vries and Navarro, 2011).

This second approach is based on the fact that many professionals work in spaces that are not related to their career or even that require lower degrees of qualification (that is, they are overeducated ); However, Hernández *et al.* (2012) point out that this can be understood as a displacement of less qualified graduates by more qualified ones, which could occur due to “the insufficiency of quality jobs, or could also be the result of poor preparation and schooling of graduates [ ...] that prevents them from performing the highest quality occupations in the labor market” (p. 203).

In this regard, De Vries and Navarro (2011) point out that, although, to a certain extent, there is an oversupply in some careers, university studies offer the possibility of accessing a job with better income than what one could have if not there will be higher education. From the perspective of these authors, success in job placement is influenced by the economic development of the country, the type of institution in which they completed their higher education (graduates from private institutions enjoy better conditions of access to employment), the socioeconomic origin of graduates and gender (although more and more women have access to better jobs than previous generations had, they still find it more difficult than men to enter the labor market successfully).

On the other hand, the same authors point out that it is not a general situation that graduates are employed in activities that do not require the training acquired in higher education; Although a certain shift of these towards less specialized sectors of the economy is observed, the reality is that the professional labor market is characterized by offering very differentiated salaries, a situation that is accentuated for certain areas.

Based on what De Vries and Navarro (2011) conclude, we can point out that the failures in the labor market of professionals in our country are not due to poor academic performance or a lack of skills to cover the profiles required by the different jobs , but to social factors that, in turn, make higher education seen as a space that legitimizes social inequalities.



## **The job performance of civil engineering graduates from the perspective of employers**

According to the context described in previous paragraphs, one of the most significant challenges of higher education is to guarantee that graduates have the training that allows them to access the labor market and occupy positions that meet their expectations and ensure their professional development. To do this, HEIs must establish communication channels with the companies or institutions that will be their employers, so that they can know what requirements they request to incorporate university graduates. In this way, they will be able to constantly rethink the profile of the proposed graduation and adapt the curricular contents of their academic programs, as well as the evaluation methods of the learning acquired (Bañuelos *et al* ., 2020).

not be forgotten, of course, that one of the essential topics of higher education is quality assurance, which is of interest both to the different groups of HEIs (administrative staff, academics and students) and to external actors. (public and private sector) (King-Domínguez *et al* ., 2018). Therefore, institutional academic planning must emphatically consider the relevance of carrying out studies of graduates and employers to have the necessary feedback for the design and updating of the study programs that make up its educational offer.

In this sense, the insertion of university graduates tests, in some way, the quality and relevance of the training they received during their time at the HEIs, which is expressed by employers in terms of the evaluation they make of the performance of graduates in the position for which they were hired (Sosa *et al* ., 2018).

Various studies on graduates and employers carried out in the last decade in different countries found that there are differences in the perception that these two actors have regarding the level of skills or qualifications shown in the labor market (table 1).

**Table 1.** Main findings in different studies on university graduates and employers carried out in the first decade of the 21st century

Author(s) of the reviewed studies	Findings
Jackson (2012), Velde (2009) and Kellermann (2007)	They reflect the distance between the skills acquired during university training and those required by the labor market.
Jackson (2012)	The perception that students have regarding their skills development is above that recognized by employers.
Velde (2009)	There is a significant gap between the demands of companies and the training offered in the educational system, which means that the level of expectations of employers, regarding the competencies of graduated students, is low.
Alonso <i>et al.</i> (2009) and Freire <i>et al.</i> (2011)	It would be necessary for the Spanish university system to improve the skills training of graduates.
Parris and Saville (2011)	Improving the practical training of students and their development of skills involves adopting three types of measures: carrying out internships in companies, strengthening ties with the world of work and increasing the presence of aspects linked to professional practice in the study plans. .

Source: Own elaboration based on Cabrera *et al.* (2016, p. 70)

In more recent years, studies on graduates that incorporate the perspective of employers have proliferated and demonstrated very interesting results. For example, in a study by the Polytechnic University of Tlaxcala, Mexico, with employers of graduates of the Industrial Engineering program, the mastery that they have of the English language to perform at work was analyzed. In the opinion of employers, the level they show is low, which constitutes an important limitation for accessing positions or larger companies, since said language is essential not only to interact with clients, suppliers and colleagues from other countries, but also also to operate machinery and equipment (Sosa *et al.* , 2018).

On the other hand, Paredes and Ortiz (2019) interviewed owners of companies that employ graduates of different careers from the National University of Asunción (Paraguay) and found that it is vital for any university student to have a solid academic training, professional experience in their area. (specific competencies) and generic competencies, that is, those that “favor people's adaptation to the context and unforeseen circumstances, improving the probabilities of success, and at the same time encourage the most ethical, comprehensive and human behavior” (Salazar, 2021, p . 73).

In this regard, various studies highlight these competencies (called *generic* , *transversal* or *soft* ) as a key element that employers consider when hiring. In this sense, Correal-Cuervo *et al.* (2021) interviewed local, national and international employers of



graduates from the University of Boyacá, Tunja (Colombia), in order to analyze generic skills, training and performance. The authors found that employers perceive that the relationship between training and professional performance of graduates is high and they highlight assertive communication, research and observation, information processing and synthesis ability, leadership and teamwork, as well as change management.

*et al* were found . (2019) in a research carried out in Valparaíso and Santiago (Chile). This study studied the most important competencies linked to management *for* the training of civil engineers, among which leadership, effective communication, emotional intelligence, proactivity, planning and control, use of technological platforms, commitment management and problem resolution. This constitutes a very positive aspect because they are skills and competencies highly valued by specialized accrediting organizations and makes it easier for graduates to successfully enter projects of greater scope in the labor market.

Another study with similar results was that of Navarro and Blandón (2020), which investigated the perception of employers of civil engineers who graduated from the National University of Engineering (Nicaragua). The authors highlight that attributes such as the ability to integrate into teamwork, initiative and the ability to analyze, as well as the care and protection of assets are highly valued by private sector employers.

For their part, Gálvez *et al* . (2022) point out that soft skills are where the main weaknesses in the training of graduates of the Mechanical Civil Engineering degree at the University of Tarapacá (Chile) are located. In this sense, the authors explain that communication and personality are the main characteristics that must be improved, even though it is recognized that practitioners generally have good performance, show high responsibility and are proactive.

In that same sense, Ramírez and Ramírez (2018) worked with students who were doing professional internships in Civil Engineering at a Colombian university, and found that business tutors highlight technical knowledge as strengths and as areas of opportunity those linked to the conception of the engineer. as a reflective professional.

Likewise, Navarro and Blandón (2019), in an essay where they compile the main research findings from different countries, state that the main requirements have to do with the ability to solve real problems in the local, regional and national environment.

Finally, Salazar (2021) also found that the competencies with the lowest degree of development among civil engineering professionals in Oruro (Bolivia), according to

employers (civil engineers, construction companies and consulting companies), are generic ones, particularly the ability to formulate and manage projects.

## Methodology

This research work was exploratory in nature and was approached from the perspective of case studies, with a mixed approach, since it sought to collect information that, in this exploratory phase, would allow for a balance between the depth and breadth of understanding of the phenomenon. in study.

The case that was analyzed was the degree program in Civil Engineering at the Universidad Michoacana. In the first, quantitative phase, the results of a survey of 37 employers were analyzed, who were identified through a form that the Universidad Michoacana applies to graduates of all the educational programs it offers and who must respond at the time they are carrying out procedures for titling. In this survey, they are asked the name of the company or institution in which they work at the time of answering the survey, as well as the country, state and municipality where it is located and the contact information of the immediate boss (telephone number and email).

For the purposes of this study, the database of graduates of the degree in Civil Engineering was available and the records corresponding to graduates who entered the program between 2009 and 2013 and who graduated between 2014 and 2018 were considered, that is, generations that took their credits with the immediately previous study plan.

Of a total of 122 records located according to the indicated criteria, it was possible to request the participation of only 49 employers due to reasons such as the following: a) the contact information provided by the graduates was incomplete, incorrect or omitted when answering the question. survey; b) when trying to communicate using the data provided by the graduates, it was not possible to establish contact, either because the number had been changed, was not available or they did not respond on different occasions when communication was attempted, and c) because at the time of communicate with them they did not agree to answer the survey.

The first contact established with employers was via telephone . Through a call, they were informed of the objective of the study and the importance of their participation. Once they agreed to participate in the survey, they were asked if it could be sent to them via email

or WhatsApp. The link to a Google form containing the instrument was then shared with them.

Of the 49 cases that initially agreed to collaborate, only 9 responses were achieved, so it was necessary to contact them again to give them a reminder. In this way the number increased to 17. In a third moment of the strategy to collect the information, institutional support was requested from the Directorate of the Faculty of Civil Engineering. In this way, it was possible to send the survey to the members of the Advisory Council of said agency to request that it be filled out by employers in the public and private sectors related to civil engineering. Thus, it was possible to increase the number of responses to 37, which closed the information collection phase that took place during the month of July 2023.

It should be noted that although the studies of graduates that were taken as a reference in the background review show results from a statistically representative sample of the population, these are inquiries that derive from institutional graduate monitoring programs; That is, the studies cover all the programs offered by a university or university center that had the institutional support of the IES to make the contact and request attention to the survey. In other words, they are descriptive works developed with a quantitative approach, which differs substantially from the present research.

Indeed, as mentioned, this is an exploratory study in which convenience sampling was used due to difficulties in accessing information, even though an institutional database of graduates was used to identify and contact their employers. and there was support from the Management of the Faculty of Civil Engineering of the Universidad Michoacana, as well as the Advisory Council to request the participation of employers in the survey. For this reason, it is stated that the limitation of the results of the study is that they are not applicable or generalizable to the entire universe of employers. However, the incorporation of qualitative analysis allowed a substantial complement to have a first diagnosis regarding the evaluation of the performance of the graduates of the academic program in the labor market.

The instrument used in the survey was made up of 19 questions divided into five blocks: i) identification data of the company or institution; ii) characteristics of the company or institution; iii) linkage of the company or institution with the Faculty of Civil Engineering of the Universidad Michoacana; iv) formal requirements and desirable characteristics for hiring professionals , and v) satisfaction with the professional performance of the graduate.

It is important to highlight that the questionnaire applied is an adaptation to the context of the present research based on the work developed by Valencia *et al* . (2004) at the University of Sonora, where employer studies have been carried out between 2004 and 2020

(Moreno *et al.* , 2021). In turn, said instrument was designed taking as reference the basic scheme for graduate studies (National Association of Universities and Higher Education Institutions [ANUIES], 1998).

To guarantee the reliability of the instrument adapted for the purposes of this work, review of the content by experts on the subject was requested; For this, we had the support of two members of the International Association of Experts in Monitoring and Linking with Graduates (AIESVE), who provided suggestions in the validation phase of the instrument. Likewise, Cronbach's alpha was estimated using SPSS *software* ( Statistical Package for Social Sciences ), version 27, resulting in a value equal to 0.914, which indicates strong consistency, since acceptable values for said indicator range between 0.7 and 1.0 ( Tuapanta *et al.* , 2017) (table 2).

**Table 2.** Reliability statistics of the instrument applied through a survey

Cronbach's alpha	# of elements
0.914	46

Source: Own elaboration based on estimates made in SPSS

In the qualitative phase of the study, the information collected was analyzed by conducting a focus group with employers, who were invited to participate in a panel of employers within the framework of the forum *The relevance of civil engineering in the labor market in the face of global challenges.* , carried out in September 2022, at the facilities of the Faculty of Civil Engineering (FIC) of the Universidad Michoacana. This participation was guided by four core questions:

1. What have been the linkage mechanisms carried out between the FIC and you as an employer and how did those links begin to be forged?
2. What are the most important characteristics that you consider when hiring Civil Engineering graduates?
3. What do you consider to be the strengths and weaknesses of FIC graduates who work in your company?
4. What do you consider to be the current challenges of civil engineering and what recommendations can you make to the FIC to prepare its students and graduates?

Four employers in the field of construction and civil works participated in the panel, both from the public and private sectors, who have several years of experience in hiring civil engineers who graduated from the Universidad Michoacana; Furthermore, all of them

graduated from the same Faculty of Civil Engineering of this university (participant 1, deputy area director in the Morelia Drinking Water Sewer and Sanitation Operating Agency [OOAPAS]; number 2, head of unit in the Ministry of Communications and Transportation [SCT]; number 3, owner of a company dedicated to construction, with regional presence, and number 4, general manager of a company dedicated to construction, also with regional presence).

The responses of the forum participants were contrasted with those collected through the employer survey with the intention of having a more comprehensive vision of the objective of this research work. Likewise, to avoid individual identification of the employers who participated in the forum, they were labeled as “informants” in the section corresponding to the description of findings (for example, informant 1).

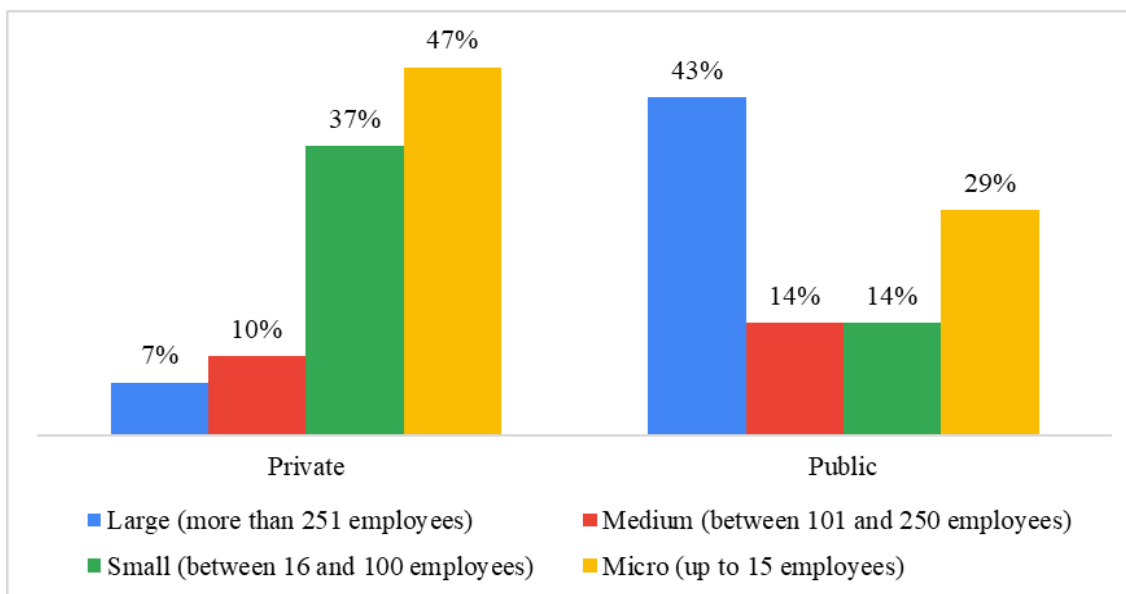
### **What do employers say about the job performance of graduates of the degree in Civil Engineering at the Universidad Michoacana?**

Of the 37 employers that participated in the survey, 84% are located within the state of Michoacán - most of them in the capital (88%) -, 3% in Zamora (one of the most relevant cities in economic terms) and the rest in Aquila, Tarímbaro, Coeneo and Pátzcuaro (3% in each municipality); These last three are adjacent to the city of Morelia. Other employers are companies or institutions that operate in Jalisco (8%), Baja California Sur (3%), Guanajuato (3%) and Mexico City (3%).

Regarding the legal regime, 81% belong to the private sector and 19% to the public sector; In the first case, the majority are microenterprises, while the employers that correspond to the public sector are mainly large institutions (figure 1).

The economic activity to which the majority of these employers (76%) is dedicated is construction; But companies and institutions that provide professional, scientific and technical services were also surveyed (8%), others that carry out activities within the legislative, governmental, administration of justice and international and extraterritorial organizations (5%); from the educational sector (5%); of retail trade (3%) and the rest are aimed at the generation, transmission and distribution of electrical energy, supply of water and gas through pipelines to the final consumer.

**Figure 1.** Legal regime and size of the company/institution



Source: self made

The main links that have been woven between these employers and the Faculty of Civil Engineering are the hiring of graduates, social service and professional practices (figure 2). These answers completely coincide with those obtained during the employers' forum, when they were asked the question “what are the linkage mechanisms that have been carried out between the FIC and you as an employer and how did these links begin to be forged?” .

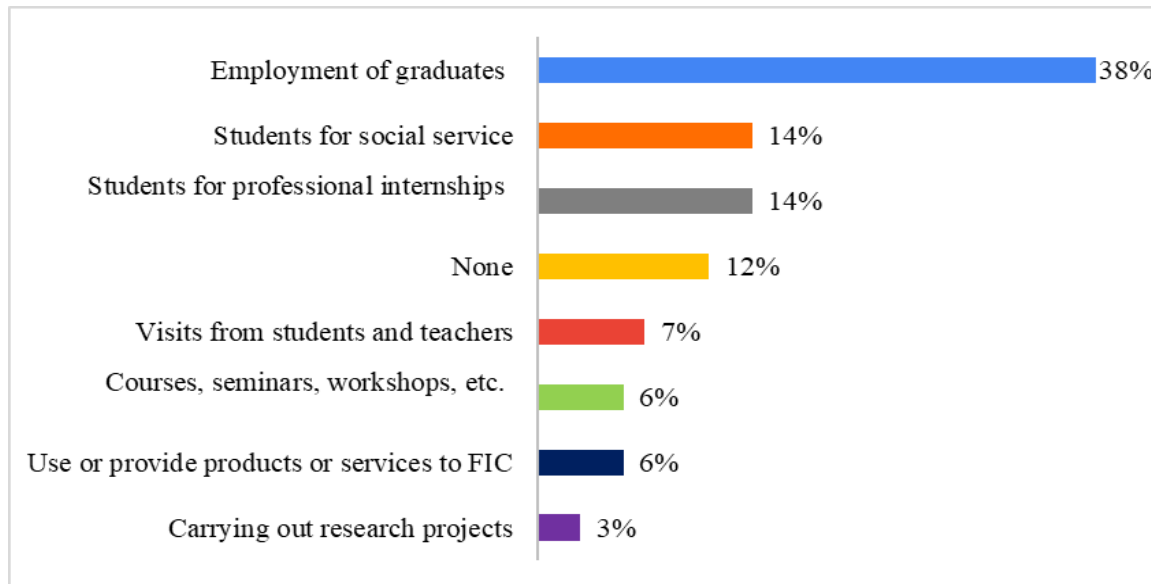
*The link that has existed between the faculty and the [OOAPAS] is basically [due to] the internships that [...] the students have carried out, but the most important thing has been that they come to know a little more in depth the function of the drinking water and sewage networks (informant 1).*

*The relationship has always been close, a large part of the engineers who work [at the SCT] are professors at this faculty and the mechanism [through which] the relationship has been closer is to recommend engineers to provide their social service (informant 2 )*

*We have been linked to the faculty for 43 years [...]. Whenever I need an engineer [...] I ask [some professors at the Faculty] to help me by recommending graduates [...] with the characteristics I need [...]. We do not have personnel doing social service, yes, we do internships, but they have really been very few [times] (informant 4).*



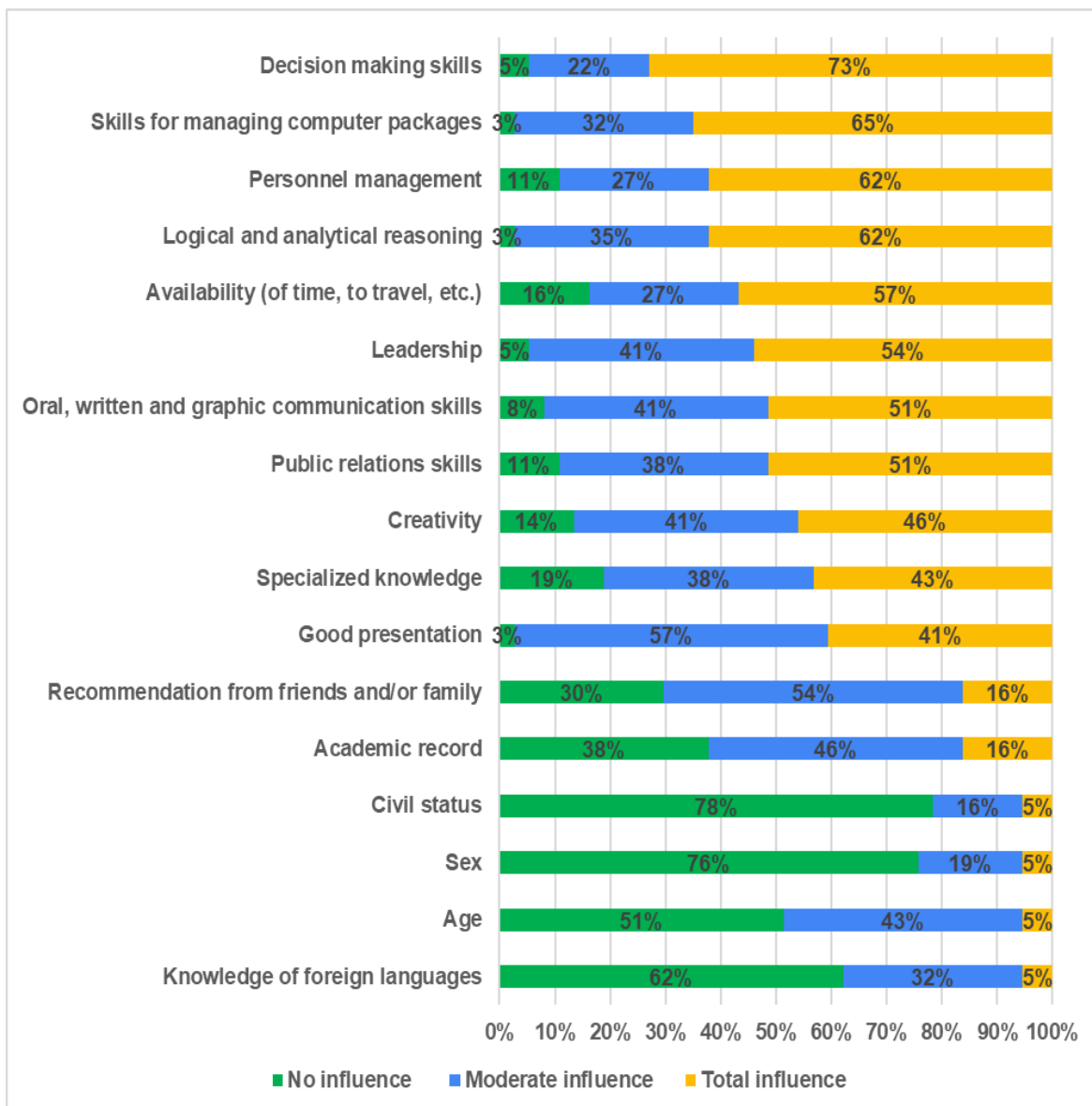
**Figure 2 .** Means of connection between the Faculty of Civil Engineering and the company/institution



Source: self made

The main requirements for hiring professionals in the companies and institutions surveyed, according to their order of importance, are 1) having a bachelor's degree, 2) passing selection exams or an interview and 3) having experience in the area. The aspects that are most valued for the selection of candidates during the exams and interviews that are practiced are decision-making skills, management of computer packages, personnel, and logical and analytical reasoning (figure 3).

**Figure 3.** Aspects that influence the hiring of professionals



Source: self made

These responses obtained through the survey coincide with what was stated by the employers who participated in the forum, when they were asked “what are the most important characteristics that you consider when hiring graduates of the civil engineering career?” Although unlike what happened in the survey, in this case some of the participants added the issue of academic history as a relevant factor:

*We look for a positive attitude, a desire to know more, to investigate and to propose solutions to the problems that arise [...] and ethics [...]; We also look for them to have that ability to relate to others (informant 2).*

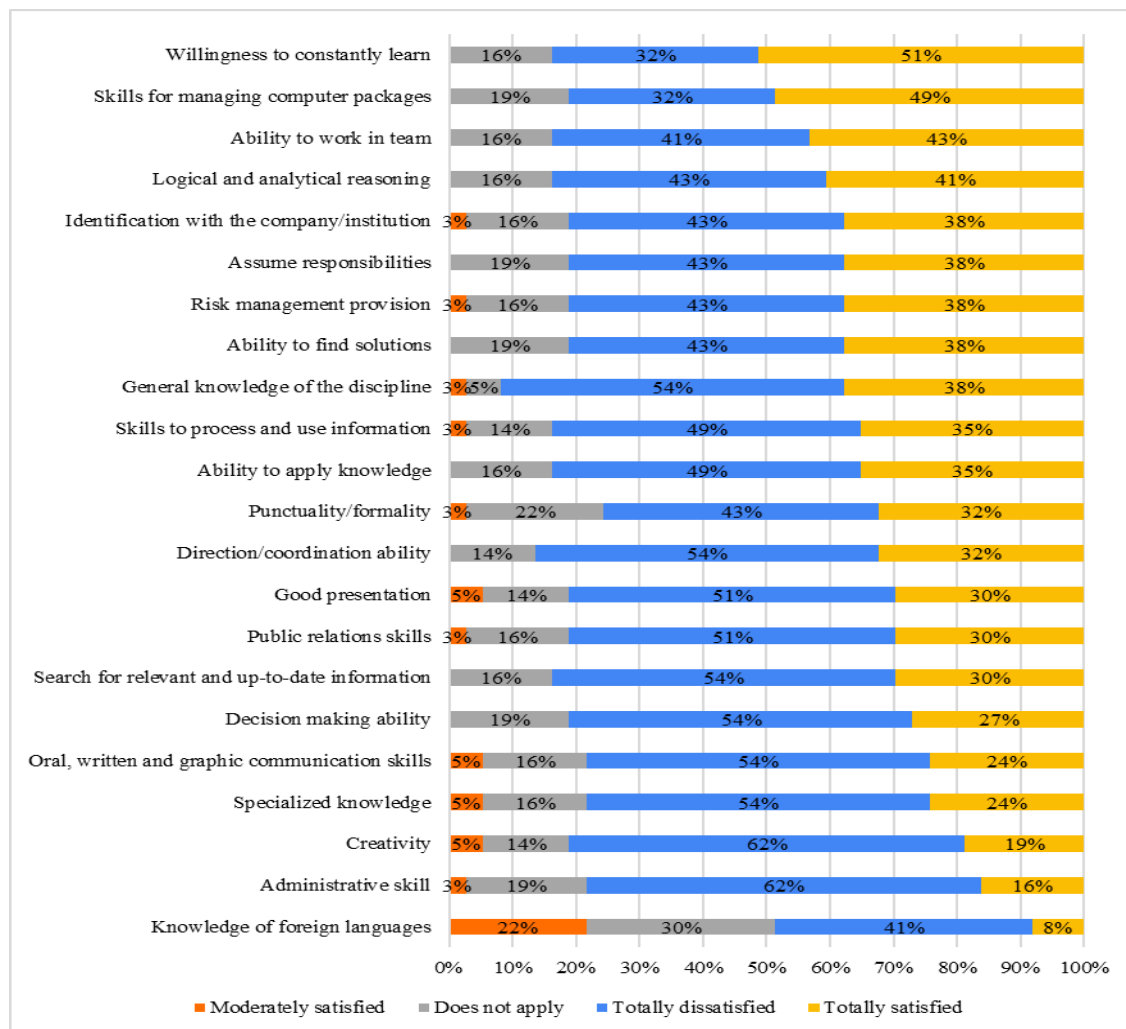
*The exam we give you is about basic knowledge [of civil engineering], issues of relationships with your classmates, [...], humanities [...], speaking and writing*

*properly [...]. Something that I especially pay a lot of attention to is that they have good grades [...], that the information they give in writing is clear, organized and has good handwriting, that they have no spelling mistakes, that they know how to express themselves, I think that speaks a lot about a person (informant 3).*

*In terms of recent graduates, [...] what I look for most is the fulfillment they had in their academic training [...], it tells me a lot about the person [about] how responsible they are; I look for them to have ethical principles with good responsibility (informant 4).*

The positions held by graduates in the companies and institutions surveyed are analyst/technician (22 %), supervisor (21%), assistant, assistant or auxiliary (21%), head of department or area (18%), manager, director or area coordinator (12%) and the rest (6%) work as a sales agent, general director, professor or academic technician, or as a non-professional employee. In such spaces, in which it is worth noting that 41% of employers indicated that the knowledge of the graduates completely coincides with the activities they carry out, the greatest satisfaction they recognize, in relation to their professional performance, is in aspects such as willingness to constantly learning, skills for managing computer packages, teamwork and logical and analytical reasoning (figure 4). These aspects coincide with those declared as most relevant for the hiring of professionals.

**Figure 4.** Satisfaction with the performance of graduates



Source: self made

Once again, the results of the survey coincide (in general) with the statements of the participants in the forum in relation to the strengths and weaknesses that FIC graduates have:

*Strengths: very good level of basic knowledge, better than another [university], very good attitude, in general they are very dedicated. Weaknesses: poor training in the humanities, average training in slightly more specific subjects (costs, for example) (informant 3).*

*I agree, the graduates of this faculty are characterized by being very cool. [...] But [...] writing a report is difficult [...]. As a strength, they have basic knowledge, but they need how you relate to others [...], that part of ethics to treat us (informant 2).*

*A strength is that they know how to apply techniques and technologies well and [...] do calculations and so on [...]. One of the weaknesses is doing a correct technical writing of the projects that are developed (informant 1).*

*In general, the graduates of the Faculty have very good characteristics; They are dedicated, they are responsible [...], they are normally looking for what [...] they cooperate the most. One characteristic that they do lack [...] is self-checking, [...] when you have to deliver something you have to check it [...] because I don't want me to deliver to a client and for it to be wrong, for it to have errors and for him to pointed them out to me [...]. Whether in a report, a calculation or a work, the [lack of] spelling is something [...] that looks very bad (informant 4).*

Finally, the fact that the majority (73%) of those surveyed evaluated the work performance of the graduates as “good” and only 16% as “very good” stands out; However, in comparative terms with graduates from other higher education institutions, there is an increase to 43% of employers who indicate that those from the Faculty of Civil Engineering of the Universidad Michoacana have very good job performance (figure 5).

In this sense, the main challenges that employers highlighted during the forum can be linked, as well as the recommendations they made to the FIC to improve the training of future generations of civil engineers:

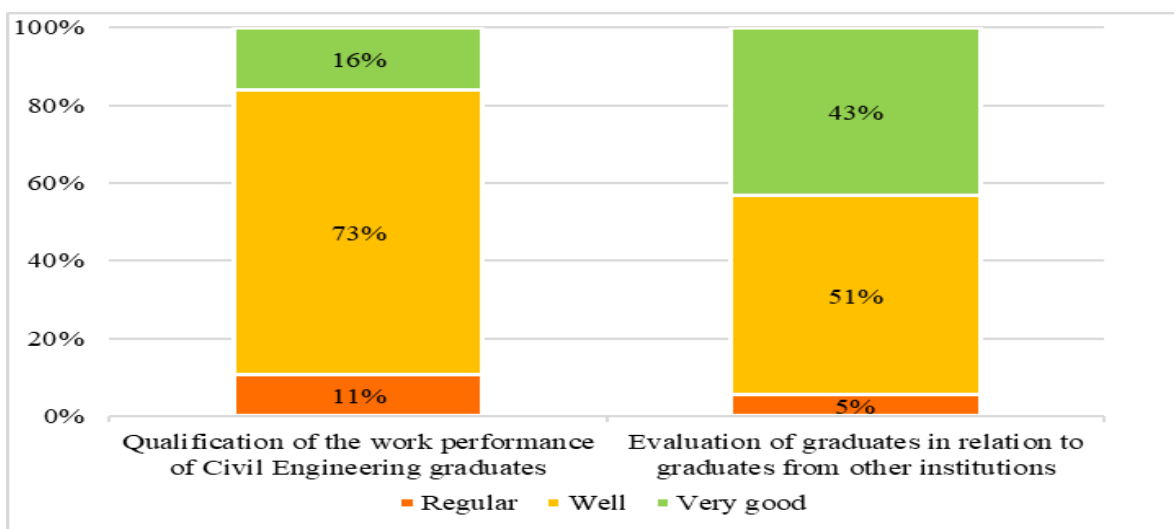
*Personal improvement... I do believe that the Faculty has the challenge of instilling that [and honesty...], the Faculty must seek to encourage students, make them interested in those areas [...]. [In addition], the Faculty has the capacity to promote practice [...]. Also one thing that I would recommend to the Faculty is [...] implement humanistic and administrative subjects; that they are really applied and taken seriously (informant 4).*

*[The] teaching [...] has to be more interactive, that is, the teacher is a little more dynamic and the students investigate and present their options. The way we express ourselves and investigate will make our reasoning improve (informant 3).*

*Well, one of the important aspects [...] is the scarcity [of water] [...]. One of the [pending] activities is for the professional to give it that importance, to value it in its use, from where we obtain it, precisely when there is no good planning, obtaining water is quite expensive (informant 1).*

*The main recommendation is to continue strengthening this part of professional practices and [...] apply social service in private companies (informant 2).*

**Figure 5.** Evaluation of the performance of FIC graduates and their comparison with other higher education institutions



Source: self made

## Discussion

From the optimistic and pessimistic views on the outlook for higher education mentioned in this document (De Vries and Navarro, 2011), public policies have been derived to address some of the problems related to imbalances between the labor market and higher education. However, current reality indicates that these have not been enough. One of the reasons why this objective has not been achieved may be that these policies have focused on meeting quality standards in terms of administrative, management and operation processes, and the concern for improving prospects has been left aside. of employment of university graduates, even though knowledge of the requirements of the labor market is a key factor for a quality educational offer with social relevance.

Consequently, efforts to transform (in the sense that modernization implies) higher education institutions in Mexico in terms of the labor market have been almost null. As Brown and Lauder (2007) point out, “the problem is that [...] they continue to believe that the labor market can act as a legitimate mechanism (through the occupational division of labor) to resolve the distributional issue in capitalist societies” (p. 20). ).

An alternative vision from which one could try to reduce the imbalances between the labor market and higher education is that of sustainable local development, which promotes the importance of taking advantage of local resources, vocations and endogenous potential to outline new growth strategies ( Pérez *et al.* , 2020). From this perspective, the role that the



university plays acquires a new meaning by playing a more active role in strengthening the social fabric, in general, and the social-techno-productive fabric in particular (through the constant link with the rest of the local actors).

The adoption of this alternative vision would be justified by the fact that the production, transfer, dissemination and application of knowledge and technologies always take place in specific contexts, with their economic, cultural and evaluative singularities that must shape their priorities and development. without losing its universality at the same time. What is intended to be raised is the importance of the contribution of the university—in conjunction with the rest of the local actors—in the collaborative construction of relevant knowledge for comprehensive and sustainable development and in the transformation of employment prospects. of university graduates.

On the other hand, as could be seen in the description of the results of this study, although employers appreciate both generic and specific competencies for the job performance of university graduates, when pointing out the areas of opportunity in the that degree programs in civil engineering should pay special attention, there seems to be a general opinion that they are generic competencies. Therefore, it can be stated that in this aspect it is where the university has a greater debt with job providers, which is completely related to the findings of Ramírez and Ramírez (2018), Navarro and Blandón (2019), Gómez *et al.* . (2019), Navarro and Blandón (2020), Correal-Cuervo *et al.* . (2021), Salazar (2021) and Gálvez *et al.* . (2022), based on studies preceding this research work.

These results highlight the marked differences that exist between the dynamics of the labor market and higher education to which Planas (2013) refers, since the latter, according to the opinion of employers, has focused on developing and strengthening knowledge. technicians in the area of training of university graduates. In the words of Palmer *et al.* . (2009, cited by Cabrera *et al.* ., 2016), “it is interesting to note that in the selection made by employers the competencies that have traditionally been part of the objective of university training do not appear” (p. 83).

Finally, it is important to highlight that the study of the dynamics of higher education and work from the perspective that has been highlighted here is a factor on which the institutional planning of universities must place special emphasis. Through knowledge of the coincidences and discrepancies between “the supply—the trained people available and willing to work—and the demand for work expressed by employers through their hiring and self-employment behaviors” (Planas *et al.* ., 2019 , p. 19), universities will be able to offer

education relevant to the social and productive environment and enhance their role in contributing to sustainable local development.

In short, some of the specific implications that changes in the university-environment relationship would have under the logic of sustainable local development are the following: i) collaborate with the local community, since the university would have to establish solid, long-term relationships with governments locals, businesses and non-governmental organizations to address local challenges and opportunities; ii) focus research on topics and problems that are relevant to the local community; iii) include courses on sustainable development, environmental practices and business skills for social entrepreneurship with the intention of adapting their academic programs to an education that fosters awareness of sustainability and related skills; and iv) share their knowledge and technologies with the local community, that is, sustainable management methods or social innovations that benefit the locality.

These implications highlight the importance of universities being actively involved in the sustainable development of their local communities, working together with all relevant actors to achieve a balance between economic growth, social justice and environmental conservation.

## Conclusions

Employer studies can be understood as a complement to graduate research, as they allow for a broader vision of the relevance of educational programs to the expectations and requirements of the professional labor market.

In this sense, the analysis presented here aims to be an input that contributes to the reduction of the imbalances that exist in the civil engineering labor market and contributes to the management of the educational program to the extent of its scope. analyzed information allows it. These intentions are based on the consideration that, whenever these discrepancies between labor supply and demand can be mitigated, universities will be responding to the demands of the environment and sustainable local development, as they will provide the competencies and skills that allow their graduates. perform their tasks according to the changes that occur in the context that surrounds them.

To move along this path, of course, significant changes are required in the way universities relate to other (external) actors. In other words, to achieve social relevance and a significant impact on the environment, a great willingness to establish effective

communication channels and create specific instances and projects to work in that direction is required. This would imply (at least) sponsorship, incubation, advice, participation in ventures and co-ventures between universities and employers, social and technological innovations, and a rigorous activity aimed at strengthening social capital. This new type of relationship would have to simultaneously contemplate three lines of activities: the traditional one, referring to academic training work with students so that, once they graduate, they integrate into the localities; another that would involve research and, finally, linkage, which would not cease to have an academic meaning, but would be intended to achieve the systemic integration of these activities with the localities. Thus, we would be associating the substantive functions of universities in favor of a more favorable work environment for professionals.

### **Future lines of research**

The analysis involved in this research made it possible to identify certain information needs that could be addressed in future research.

First, a larger study could be conducted with a larger sample size that integrates a diversity of employers and with a more robust instrument. In this way, the possibility opens up for the employer to provide more detailed information regarding which criteria it uses to identify graduates with the best, average or worst performance.

Likewise, another line that could be developed—either within the same expanded study or in a different investigation—would have to do with the analysis of the international dimension, that is, a study that allows identifying what the requirements are in terms of competencies. global standards that graduates must demonstrate in the performance of their professions.

Finally, a line of research is proposed that includes the study of graduates of the graduate programs of the Faculty of Civil Engineering, as well as their employers, which could provide relevant information for the opening of new educational programs at the postgraduate level. In this way, graduates who are seeking to specialize in an area that allows them to improve their professional career could be served.

### **Thanks**

This document reports part of the work carried out within the framework of the research project entitled *Study of graduates of the degree in Civil Engineering of the*

Universidad Michoacana de San Nicolás de Hidalgo , funded by the 2022 Research Program of the Universidad Michoacana of San Nicolás de Hidalgo.

Likewise, we appreciate the collaboration of the Faculty of Civil Engineering of the Universidad Michoacana to have the database of the graduate survey, from which the employer contact information was taken, as well as the willingness to distribute the survey to employers. , which allowed quantitative analysis. In addition, the support received for the holding of the forum *The relevance of civil engineering in the labor market in the face of global challenges* , from which the information was taken for the qualitative analysis of this research work. Likewise, we appreciate the support in answering the survey from the members of the Advisory Council of the Faculty of Civil Engineering and the two experts from the International Association of Experts in Monitoring and Linking with Graduates (AIESVE) who supported the phase. validation of the instrument that was used in the survey.

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