

Employability skills for civil engineers in Peru. Case study: San Antonio Abad del Cusco National University

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ABSTRACT

Recent modifications to the higher education system aim to ensure an education with high levels of employability; nevertheless, given the current economic climate, it is difficult for young professionals to launch their careers. In light of this circumstance, the authors of this research intend to identify and compare the talents that senior students, graduates, and professionals in civil engineering consider essential for entering the workforce. This study's data were gathered using a questionnaire survey completed by 243 individuals, and descriptive statistics were employed to characterize their perceptions. The results indicate that there are clear disparities in perception; also, it was shown that graduates have negative perceptions of their skills, which generates doubts about their ability to integrate into the market. This research is intriguing since it serves as a decision-making tool for the skills taught at the Professional School of Civil Engineering.

Keywords: civil engineering, graduates, labor market, perception, skills, students.

1 INTRODUCTION

One of the primary goals of higher education is to ensure the employability of young professionals by providing suitable training and skills (Støren & Aamodt, 2010). However, the current economic climate makes it difficult for recent graduates to enter the workforce. In the past four years, young employment rates have declined significantly (Mintra, 2022).

The building industry has a substantial impact on the economy in Peru. The construction industry's contribution to the gross domestic product (GDP) will rise year until 2021. Moreover, given that the construction industry alone contributed around 7 percent of GDP (ComexPeru, 2022), the GDP development trajectory will necessitate the hiring of additional construction specialists.

A review of the literature reveals a number of studies published in recent years, many of which analyze the employability of construction graduates. For instance, Farooqui & Ahmed, (2009) surveyed 36 members of the construction industry and 18 members of the education sector and identified skills rated highly by the industry, but to which educators paid little attention, such as contract document interpretation, listening skills, and negotiation. Teixeira et al., (2006) revealed the results of a survey conducted with roughly 300 firms in four European countries to determine professional training needs in construction management; the study centered on lifelong learning and professional development. This poll revealed that planning and scheduling, cost estimation, quality management, and procurement and tendering procedures were the four most important management areas. Spinks et al. (2006) performed research in two phases: a qualitative study based on 18 interviews with business leaders in the engineering sector and a quantitative survey of 8,247 contacts from the Royal Academy of Engineering. This study distinguished between the talents that are currently in demand and those that engineering organizations would need in the future due to changes and challenges. The two abilities most prized by industry were technical skills (practical application and creativity and innovation), while teamwork was a soft skill. In terms of future requirements, respondents stressed the significance of, among other things, problem-solving, globalization, and sustainability.

These studies identify a number of flaws observed in civil engineering curricula in recent years. This position begs the question of whether the gaps between construction programs and the labor market identified in the literature are still genuine. This case study aims to analyze the perceptions of students in their last year, graduates who have been on the job market for one year, and professionals with more than five years of experience about training gaps that affect their employability.

2 CASE STUDY

The Professional School of Civil Engineering of the National University of San Antonio Abad del Cusco was created in 1947, whose mission is to train professionals with a broad knowledge of basic

sciences and Civil Engineering, with comprehensive training developing knowledge, skills, abilities, attitudes and values that allow them to act in the area of construction, structures, geotechnics, hydraulics and transportation, whose field of work is in the public and private sector, assuming positions of manager, resident, supervisor, designer and consultant, as well as in teaching and research. Therefore, there is a need to know if students in graduation, graduates and professionals with more than five years of experience perceive that the university provides the skills and capabilities to perform according to market demand (FIC, 2021).

3 METHODOLOGY

The type of research was Quantitative - Descriptive, of exploratory research level, the research design was using secondary sources of information, examination of specialized literature. The population studied were the students who were graduates (ninth and tenth semesters), graduates and professionals who studied at the Professional School of Civil Engineering with more than five years of experience. The total number of annual graduates with a bachelor's degree and professional degree from 2010 to 2014 was obtained, averaging 203 total annual graduates of the Professional School of Civil Engineering (EPIC) offered by UNSAAC.

Questionnaires were established for: students graduating from the Professional School of Civil Engineering, for graduates of the Faculty of Civil Engineering - UNSAAC and for professionals graduating from the Faculty of Civil Engineering - UNSAAC. These questionnaires contain closed, open and multiple-choice questions, which were consulted virtually, with the management of questionnaires made possible by the e-survey electronic portal. The sample was chosen randomly, denoting that it is probabilistic, after conducting the surveys the sample size was determined according to the number of responses, students in condition of Graduates (ninth and tenth semesters): 52, graduates 36, professionals who studied at the Professional School of Civil Engineering 155, the techniques and instrument was surveys, primary collection of information, secondary collection of information.

4 RESULTS AND DISCUSSION

According to the perception of the Civil Engineers of the Professional School of Civil Engineering, Table 1 shows that 43.9% of this sample totally agrees that it is necessary for the graduate of the professional career of Civil Engineering to have work experience of some kind; likewise, 28.4% agrees that the practical part is more important than the conceptual-theoretical part within their institution where they work, 54.2% totally agrees that the interaction and development of the graduate in teamwork are indispensable. On the other hand, this surveyed group mentions that 60.0% totally agree that the graduate should have ample knowledge about the use of information technologies and software related to Civil

Engineering; finally, 41.3% agree that the graduate has received the necessary knowledge in his or her house of studies to perform adequately in the institution where he or she works.

Table 1: Perception of skills according to professionals

	Strongly Agree	Agree	Neither agree nor disagree	Slightly agree	Strongly disagree
It is necessary that the graduate of the professional career of Civil Engineering has work experience of some kind.	43.9%	35.5%	4.5%	10.3%	5.8%
The practical part is more important than the conceptual-theoretical part within the institution where he/she works.	13.5%	28.4%	25.2%	12.9%	20.0%
The interaction and development of the graduate in teamwork are indispensable.	54.2%	42.6%	0.6%	0.6%	1.9%
The graduate should have extensive knowledge about the use of information technologies and software related to Civil Engineering.	60.0%	33.5%	5.8%	0.0%	0.6%
The graduate has received the necessary knowledge in his or her house of studies to perform adequately in the institution where he or she works.	12.3%	41.3%	13.5%	22.6%	10.3%

According to the perception of the graduates of the Professional School of Civil Engineering, Table 2 shows that 50.0% of this sample group agrees that all the knowledge acquired is useful to the graduate when applied to the work assigned to him/her; 61.1% totally agrees that the graduate should be able to perform in different activities, responsibilities and assigned functions; likewise, 83.3% of the graduates consider that communication skills and teamwork are indispensable; 69.4% totally agree that the use of computer and communication technologies applied to civil engineering should be at least at an intermediate level; on the other hand, 33.3% totally agree that the infrastructure for the use of information and communication technologies applied to civil engineering should be at least at an intermediate level. On the other hand, 33.3% agree that the infrastructure for teaching-learning, research, administration and welfare offers comfort, security and has the necessary equipment; 33.3% slightly agree that information and communication technologies are widely used by teachers; finally, 41.7% neither agree nor disagree that library services are up to date and efficient.

Table 2: Perception of skills according to graduates

	Strongly Agree	Agree	Neither agree nor disagree	Slightly agree	Strongly disagree
The graduate will benefit from all the acquired knowledge applied to the tasks assigned to him/her.	13.9%	50.0%	16.7%	19.4%	0.0%
The graduate must be able to perform in various activities, responsibilities and assigned functions.	61.1%	36.1%	2.8%	0.0%	0.0%
Communication skills and teamwork are indispensable.	83.3%	16.7%	0.0%	0.0%	0.0%
The use of computer and communication technologies applied to civil engineering must be at least at an intermediate level. at least intermediate level.	69.4%	30.6%	0.0%	0.0%	0.0%
The infrastructure for teaching-learning, research, administration and welfare, offers comfort, security and has the necessary equipment.	8.3%	33.3%	27.8%	22.2%	8.3%
The information and communication technologies are widely mastered by the teachers.	0.0%	11.1%	27.8%	33.3%	27.8%
Library services are up-to-date and efficient.	0.0%	16.7%	41.7%	22.2%	19.4%

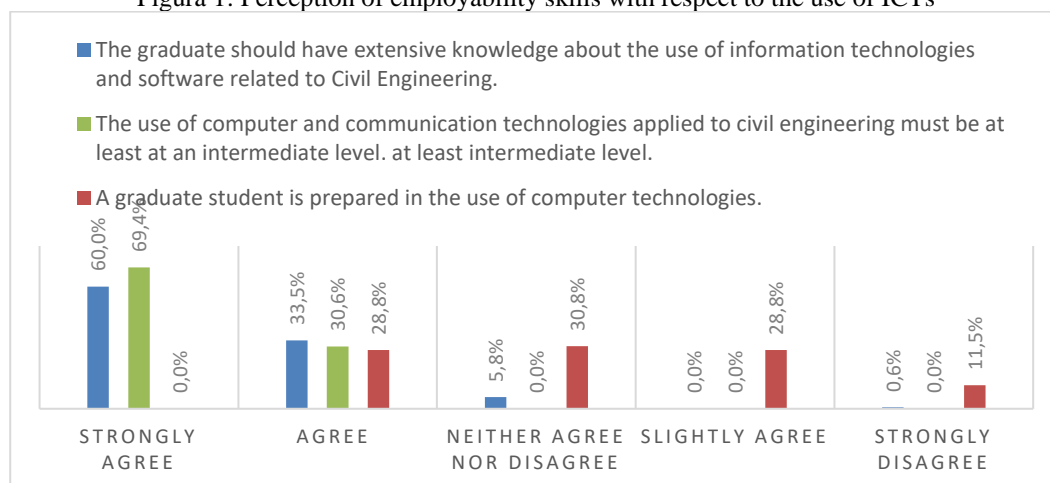
According to the perception of students in their last semesters as graduates of the Professional School of Civil Engineering, Table 3 shows that 40.4% slightly agree that in the practical part a student as a graduate is prepared, 84.6% agree that in the theoretical part a student as a graduate is prepared; likewise, 30.8% neither agree nor disagree that the student as a graduate is prepared in the use of computer technologies, 55.8% agree that the graduating student is in conditions to be able to perform his pre-professional practices, 57.7% agree that the graduating student will have an adequate performance in the tasks assigned to him, finally 38.5% neither agree nor disagree that the graduating student will have complete knowledge in the laboratory tests.

Table 3: Perception of skills according to students in graduation status

	Strongly Agree	Agree	Neither agree nor disagree	Slightly agree	Strongly disagree
A graduate student is prepared for the practical part of the course.	3.8%	23.1%	26.9%	40.4%	5.8%
A graduate student is prepared in the theoretical part.	5.8%	84.6%	7.7%	1.9%	0.0%
A graduate student is prepared in the use of computer technologies.	0.0%	28.8%	30.8%	28.8%	11.5%
The graduate student is ready to carry out his pre-professional internships.	25.0%	55.8%	11.5%	5.8%	1.9%
The graduating student will be able to perform his pre-professional internship and will have an adequate performance in the tasks assigned to him.	9.6%	57.7%	23.1%	7.7%	1.9%
The graduating student will have a complete knowledge of laboratory tests.	1.9%	25.0%	38.5%	34.6%	0.0%

A comparative descriptive analysis has been made of the perceptions among the Civil Engineering professionals, graduates and students as graduates, with respect to the employability ability referred to the use of information and communication technologies, Figure 1 shows that professionals and graduates are in total agreement with the need to use ICTs in 60.0% and 69.4% respectively, however, it can be seen that the students as graduates self-perceive that 30.8% and 28.8% neither agree nor disagree and little agree respectively, with respect to their knowledge of these tools.

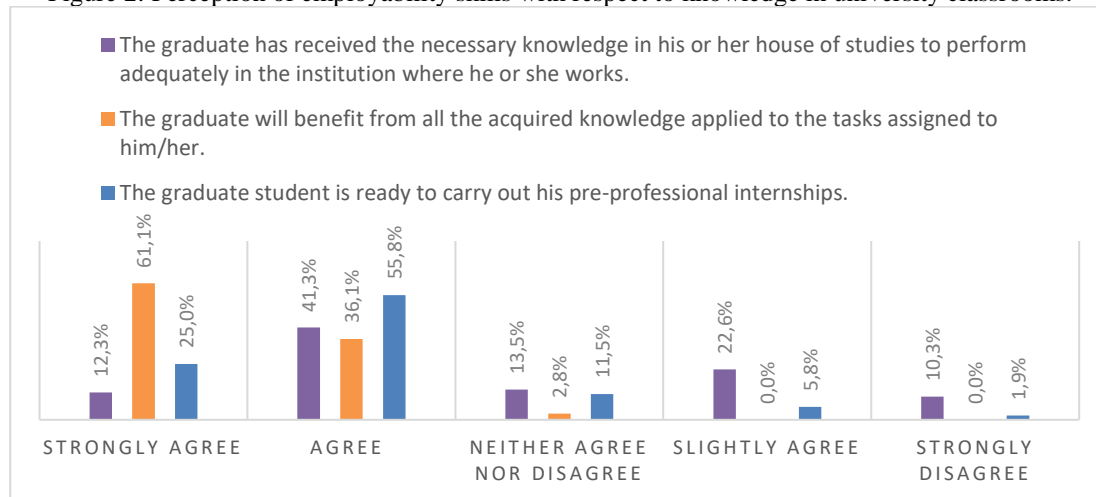
Figura 1: Perception of employability skills with respect to the use of ICTs



Regarding the employability ability with respect to obtaining knowledge in university classrooms, Figure 2 shows that 41.3% of professionals agree that they have received the correct teaching, in contrast

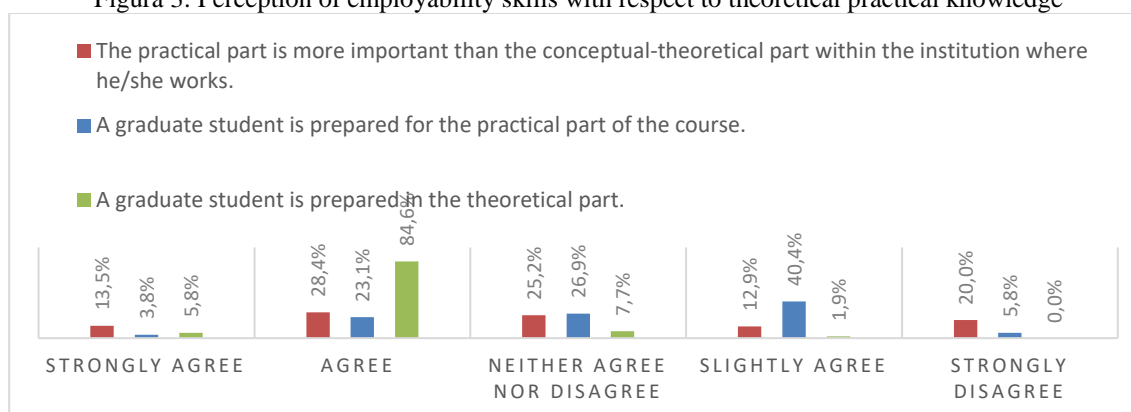
to the 61.1% of graduates who totally agree that the knowledge acquired can be applied; likewise, students in the last semester consider that 55.8% have the knowledge to be applicable in the labor field.

Figure 2: Perception of employability skills with respect to knowledge in university classrooms.



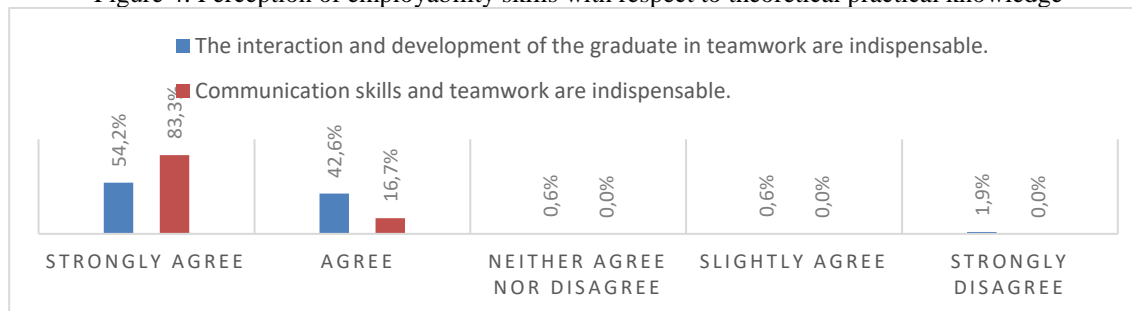
Regarding the employability ability with respect to obtaining practical theoretical knowledge, Figure 3 shows that 84.6% of the professionals agree that the practical part is more important than the theoretical conceptual part in their organizations; however, 40% of the graduating students perceive that they have little agreement with the practical part of their level of preparation, in contrast to 84.6% of the graduating students, who consider that they agree that they have good theoretical knowledge.

Figura 3: Perception of employability skills with respect to theoretical practical knowledge



Regarding the employability skill referred to teamwork, Figure 4 shows that 54.2% of the professionals totally agree that the interaction and development of the graduate in teamwork are indispensable; this perception is even greater among the graduates, since 83.3% of the graduates totally agree that the ability to communicate and work in a team are indispensable.

Figure 4: Perception of employability skills with respect to theoretical practical knowledge



5 CONCLUSIONS

A descriptive analysis has been made of the perceptions regarding the employability skills of the graduates of the Professional School of Civil Engineering of the National University of San Antonio Abad del Cusco, taking into account three important study groups corresponding to professionals, graduates and students in their last cycle of study. Regarding the perception of the professionals, it is observed that among the most important characteristics this study group considers that the interaction and development of the graduate in teamwork are indispensable and that the graduate should have extensive knowledge about the use of information technologies and software related to Civil Engineering. Regarding the perception of the graduates, it is observed that among the most important characteristics, this study group considers that all the knowledge acquired is useful to the graduate, the graduate must be able to perform in different activities, responsibilities and assigned functions; also, that communication skills and teamwork are indispensable and that the use of information and communication technologies applied to civil engineering must be at least at an intermediate level. On the other hand, the graduating students consider that they are prepared in the theoretical part, that they are in conditions to be able to carry out their pre-professional practices and that they will have an adequate performance in the tasks assigned to them.

Regarding the differences in perceptions, it can be seen that the professionals and graduates are in total agreement with the need to use ICTs; however, the graduating students self-perceive that they do not have this knowledge. Regarding the acquisition of knowledge in university classrooms, there is a relative agreement among professionals, graduates and students that they have received the necessary knowledge at university. On the other hand, professionals mention that practical knowledge is more important than theoretical knowledge; however, graduates feel insecure about their practical knowledge. Finally, all study groups consider that communication skills and teamwork are indispensable.

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