

Determinants of the Transition to Employment among Engineering Graduates: Empirical Evidence from a Mixed-Methods Approach in a Peruvian Public University

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ABSTRACT:

This study analyzes the determinants of the transition to employment among engineering graduates from a public university in Peru using a mixed-methods approach. The research addresses the gap between university education and labor market conditions, focusing on how academic training, institutional support, university prestige, and pre-professional internship experience influence early labor insertion. A sequential explanatory design was applied. Quantitative data were collected from 603 valid surveys and analyzed using multiple linear regression. Additionally, 125 open-ended responses were examined through thematic content analysis. Integration of both approaches was performed through methodological triangulation. The results show that the regression model is statistically significant ($R^2 = 0.470$; $p < 0.001$). The most influential factor in the transition to employment is the speed of entry into pre-professional internships ($\beta = 0.570$), followed by university prestige ($\beta = 0.131$), goal management effectiveness ($\beta = 0.114$), and perceived academic training ($\beta = 0.109$). Institutional support shows a negative coefficient ($\beta = -0.086$). Qualitative findings confirm that internships are the main pathway to employment, while institutional support is perceived as limited. The study concludes that the transition to employment is shaped by the interaction of academic, institutional, and experiential factors, rather than by academic training alone.

Keywords: graduate employability, transition to employment, engineering education, mixed methods, Peru.

1. Introduction

The transition of university graduates into the labor market is a relevant topic in higher education, particularly in engineering programs, where professional environments are constantly changing. This process is not limited solely to obtaining employment, but also includes the speed of labor market entry, the quality of the position obtained, and the correspondence between university education and job responsibilities.

In this context, graduate employability depends on multiple interrelated factors. These include academic training, institutional support provided by the university to facilitate labor insertion, institutional prestige, and experience gained through pre-professional internships, which often represent the first contact with the labor market and a bridge to formal employment.

However, in the Peruvian higher education context, a gap persists between university training and real labor market conditions. This situation is reflected in difficulties in accessing employment, differences in job quality, and limitations in institutional support mechanisms for graduates.

Faced with this problem, the objective of this study is to analyze the determinants of the transition to employment among engineering graduates from a Peruvian public university, using a mixed-methods approach that integrates quantitative and qualitative analysis.

Specifically, the study seeks to identify the factors influencing this process based on a statistical model that includes academic training, institutional support, university prestige, and pre-professional internship experience. It also aims to understand graduates' perceptions of barriers and facilitators in their labor insertion in order to complement the quantitative results.

From a theoretical perspective, labor insertion can be explained through different approaches. Human capital theory argues that education increases employment opportunities by improving individual productivity (Becker, 1993; Abelha et al., 2020). On the other hand, signaling theory proposes that institutional prestige

functions as a signal that influences candidate selection in the labor market (Spence, 1973; Iriando, 2022). Additionally, recent literature highlights that pre-professional internship experience constitutes a key mechanism for labor transition, as it enables the acquisition of applied experience and contact with the professional environment (Vlachopoulos & Pachni-Tsitiridou, 2026; Xu et al., 2022).

2. Methodology

2.1. Design

The study adopted a mixed-methods approach with a sequential explanatory cross-sectional design. The quantitative component was initially developed through multiple linear regression analysis, aimed at identifying the factors associated with the transition to employment among engineering graduates. Subsequently, the qualitative component was conducted to deepen the understanding of the quantitative results based on graduates' perceptions of their labor insertion experience. Integration of both approaches was carried out during the interpretation phase through a process of connection and joint interpretation, in which quantitative and qualitative findings were analyzed in an integrated manner to explain the phenomenon under study. The study followed the mixed-methods framework proposed by Creswell and Plano Clark (2018), which supported the systematic integration of both types of data.

2.2. Participants and sample

The study was conducted with graduates from a Peruvian public university specialized in engineering. For the quantitative analysis, 603 valid closed-ended surveys were included. These responses were used for the statistical analysis of the Transition to Employment Index and its determining factors. For the qualitative analysis, 125 open-ended responses were considered, collecting opinions and experiences regarding labor insertion. Participants were graduates who had completed their university studies and had sufficient experience to report on their transition to employment, academic training, and labor conditions.

2.3. Instruments

A graduate employability questionnaire was used. The instrument consisted of both closed and open-ended questions. The closed-ended items collected information on academic training, institutional support, university prestige, pre-professional internship experience, and labor insertion conditions. Based on this information, the Transition to Employment Index was constructed. The open-ended questions allowed graduates to express their opinions about barriers, facilitators, and experiences in their labor insertion process.

2.4. Procedure

The study was conducted in four stages. First, the institutional employability database was reviewed and cleaned, selecting only complete and valid responses. In the second stage, quantitative variables were organized and coded according to the research model. In the third stage, open-ended responses were organized into a textual matrix for qualitative analysis, identifying patterns related to labor insertion. Finally, quantitative and qualitative results were integrated through methodological triangulation, allowing statistical findings to be contrasted with graduates' perceptions.

2.5. Data analysis

Quantitative analysis was conducted using descriptive statistics and multiple linear regression using SPSS software. The dependent variable was the Transition to Employment Index (ITE). Independent variables included perceived academic training (FA), institutional support in job search (AI), perceived university prestige (PU), goal management effectiveness (EG), and speed of insertion into pre-professional internships (RP).

The estimated econometric model is specified as follows:

$$ITE_i = \beta_0 + \beta_1 FA_i + \beta_2 AI_i + \beta_3 PU_i + \beta_4 EG_i + \beta_5 RP_i + \epsilon_i$$

Statistical significance was evaluated at a 95% confidence level ($p < 0.05$), considering unstandardized coefficients, standardized coefficients, t-tests, and the coefficient of determination (R^2). The model allowed the identification of factors explaining the transition to employment among engineering graduates. Qualitative analysis was conducted using thematic content analysis, following the coding procedure proposed by Saldaña (2021). Responses were coded and grouped into categories related to labor insertion, institutional support, and the relationship between education and employment. Finally, both datasets were integrated in the interpretation phase through triangulation, allowing quantitative evidence to be contrasted with qualitative perceptions for a more comprehensive understanding of the phenomenon.

2.6 Ethical considerations

The research adhered to ethical principles for social science studies involving human participants. Informed consent was obtained from all participants prior to data collection. Participation was voluntary and anonymous, and data were used exclusively for academic purposes. No personal identifiers were collected, and confidentiality was strictly maintained throughout the study.

3. Results

The results are presented following the logic of the mixed-methods approach. First, the quantitative findings obtained from the multiple linear regression analysis are presented. Subsequently, the qualitative results derived from the analysis of open-ended responses are shown, which allow complementing and deepening the interpretation of the patterns observed in the quantitative phase.

3.1. Quantitative results

Table 1: Resumen del modelo de regresión lineal múltiple

Model	R	R ²	R ² ajusted	Standard error
1	0.686	0.470	0.466	0.64860

Predictors: Perceived academic training, institutional support in job search, university prestige, goal management effectiveness, and speed of insertion into pre-professional internships.

The model shows a correlation coefficient of $R = 0.686$ and a coefficient of determination of $R^2 = 0.470$, with an adjusted R^2 of 0.466. The standard error of the estimate is 0.64860.

Table 2 : ANOVA of the regression model

Model	Sum of squares	df	Mean square	F	Sig.
Regression	221.651	5	44.330	105.377	0.000
Residual	249.885	594	0.421		
Total	471.537	599			

Dependent variable: Transition to Employment Index

The analysis of variance indicates that the model is statistically significant ($F = 105.377$; $p = 0.000$).

Table 3: Multiple linear regression coefficients

Variable	B	Standard error	Beta	t	Sig.
Constant	0.872	0.160	—	5.435	0.000
Perceived academic training	0.118	0.040	0.109	2.936	0.003
Institutional support in job search	-0.067	0.024	-0.086	-2.784	0.006
University prestige	0.111	0.029	0.131	3.817	0.000
Goal management effectiveness	0.121	0.035	0.114	3.409	0.001
Speed of insertion into pre-professional internships	0.387	0.021	0.570	18.308	0.000

Dependent variable: Transition to Employment Index

The multiple linear regression analysis shows that all variables included in the model are statistically significant ($p < 0.05$). The variable with the greatest explanatory power is the speed of insertion into pre-professional internships ($\beta = 0.570$), followed by university prestige ($\beta = 0.131$), goal management effectiveness ($\beta = 0.114$), perceived academic training ($\beta = 0.109$), and institutional support in job search ($\beta = -0.086$).

3.2. Qualitative results

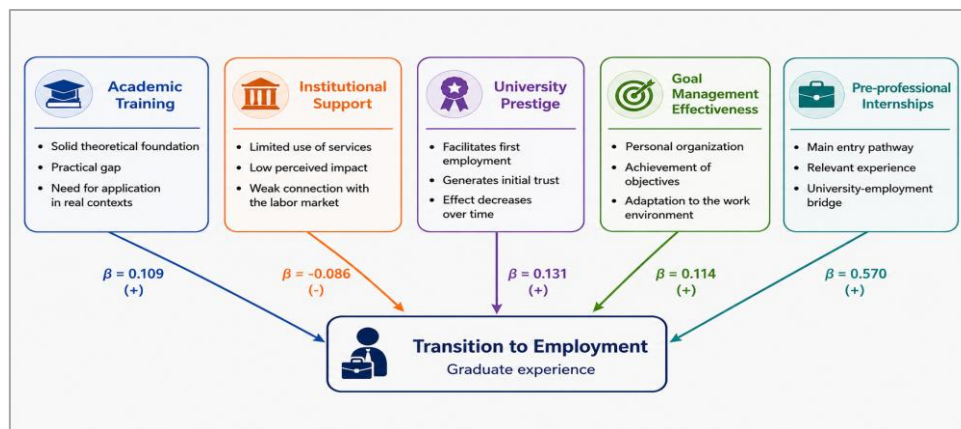
Second, the qualitative results based on the semantic map are presented. Figure 1 shows the

emerging categories associated with the transition to employment. The responses were organized into five main categories: academic training, institutional support, university prestige, goal management effectiveness, and pre-professional internships.

Academic training was described as a solid theoretical foundation, although with limitations in its practical application. Institutional support was identified as limited in use and having a low impact on labor market insertion. University prestige was highlighted as a factor associated with access to the first job. Goal management effectiveness was linked to personal organization

and achievement of objectives. Finally, pre-professional internships were consistently mentioned as the main pathway to employment.

Figure 1: Semantic map of qualitative categories associated with the transition to employment



4. Discussion

The results of the multiple linear regression model show a coefficient of determination of $R^2 = 0.470$, indicating that the model explains 47% of the variability in graduates' transition to employment. The overall model is statistically significant ($F = 105.377$; $p < 0.001$), confirming the validity of the included variables.

At the individual level, the strongest explanatory variable is the speed of insertion into pre-professional internships ($\beta = 0.570$; $p < 0.001$), followed by university prestige ($\beta = 0.131$; $p < 0.001$), goal management effectiveness ($\beta = 0.114$; $p < 0.001$), and perceived academic training ($\beta = 0.109$; $p < 0.01$). In contrast, institutional support in job search shows a negative coefficient ($\beta = -0.086$; $p < 0.01$), indicating an inverse relationship within the estimated model.

The qualitative results confirm these statistical findings, particularly regarding the relevance of pre-professional internships as the main pathway to labor insertion and the limited perceived impact of institutional support.

From human capital theory, university education increases employability by developing knowledge and skills that enhance individual productivity (Becker, 1964). The present findings partially support this perspective, as academic training shows a positive but moderate influence on the

transition to employment. However, the results also suggest that human capital alone does not fully explain labor insertion. The strong influence of pre-professional internships indicates that early work experience acts as an additional mechanism of applied human capital accumulation, extending the classical approach toward a more practical dimension of learning.

On the other hand, signaling theory (Spence, 1973) explains the positive effect of university prestige. This factor acts as a signal in the labor market that facilitates initial candidate selection, although its influence decreases compared to direct work experience, as also evidenced in the qualitative findings. Additionally, results related to goal management effectiveness align with contemporary employability approaches that highlight self-regulation, planning, and adaptation skills as complementary factors to academic training.

The findings are consistent with previous studies emphasizing the importance of practical experience in labor market insertion. Vlachopoulos and Pachni Tsitiridou (2026) highlight that internships and applied projects serve as a key bridge between university and employment, which aligns with the strong significance of this variable in the model. Similarly, Abelha et al. (2020) identify a gap between university training and labor market demands, reflected in the perception of

academically solid but partially practice-disconnected education. Likewise, Sharma et al. (2023) emphasize that employability depends on a combination of academic, personal, and institutional factors, which is consistent with the present findings, where no single variable fully explains the transition to employment.

Regarding institutional support, the results partially differ from studies that assign a stronger role to universities in labor insertion. In this case, the data suggest a low perceived impact, indicating possible weaknesses in institutional labor intermediation mechanisms.

The triangulation of results shows coherence between statistical findings and graduates' perceptions. In particular, the importance of internships and the limited effectiveness of institutional support remain consistent across both approaches. Thus, qualitative findings reinforce the interpretation of statistical coefficients, providing deeper insight into the explanatory model of the transition to employment.

5. Conclusion

This study analyzed the factors associated with the transition to employment among engineering graduates from a Peruvian public university using a mixed-methods approach. The quantitative results show that the regression model is statistically significant ($R^2 = 0.470$; $p < 0.001$), indicating a moderate explanatory capacity of the included variables.

Among the main findings, speed of insertion into pre-professional internships was identified as the most influential factor in the transition to employment, followed by university prestige, goal management effectiveness, and perceived

academic training. In contrast, institutional support in job search showed a negative relationship within the model, suggesting a limited perceived contribution of these mechanisms to labor insertion.

The qualitative results complement this evidence, showing that internships are perceived as the main pathway to employment, while institutional support is considered to have low impact. In addition, a gap between theoretical training and its practical application in the workplace is confirmed.

Overall, the findings indicate that the transition to employment does not depend on a single factor, but rather on the interaction between academic training, practical experience, and institutional conditions.

It is recommended to strengthen the link between universities and the labor market by expanding and improving pre-professional internship programs, given their high relevance in graduate employability. Likewise, institutional employability support mechanisms should be reviewed to enhance their real effectiveness.

Curriculum content should also be updated to reduce the gap between theoretical and practical training, incorporating more applied tools and learning experiences connected to real professional environments.

Future studies could adopt longitudinal designs to analyze labor transitions over time and expand the study to multiple universities to improve generalizability. It would also be relevant to include additional variables such as advanced digital competencies, regional labor market conditions, and graduates' professional networks.

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8. Author Declaration

The authors declare that this work is original and has not been published or submitted for publication elsewhere. All sources used in this study have been properly cited according to academic standards.

The authors also declare that there are no conflicts of interest, financial or otherwise, that could have influenced the results or interpretation of this research