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Digital Transformation Systems, Human Talent Management, and Institutional Competitiveness: A Structural Equation Modeling Analysis of Public Universities in Ecuador

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Abstract

The research analyses the relationship between digital transformation and institutional competitiveness in public universities in Ecuador, incorporating human talent management as a central explanatory mechanism. The study was conducted under a quantitative, non-experimental, and cross-sectional approach, with data collected through a survey administered to academic and administrative staff from five public universities. Based on a sample size of 379 participants, a model was estimated using Structural Equation Modelling (SEM) to assess the quality of the measurement model and simultaneously test the direct and indirect effects proposed in the hypotheses. The structural equation model showed an adequate overall fit to the data ($\chi^2/df = 2.837$, CFI = 0.959, TLI = 0.937, GFI = 0.963, RMSEA = 0.078). The structural analysis revealed a strong positive effect of Human Talent Management on Digital Transformation ($\beta = 0.962$), while Digital Transformation also exerted a strong positive effect on Institutional Competitiveness ($\beta = 0.962$). Furthermore, the results support the proposed mediating mechanism, indicating that Human Talent Management enhances institutional competitiveness indirectly through Digital Transformation. These findings demonstrate that sustainable institutional competitiveness depends not only on technological resources but also on the strategic integration of digital capabilities with effective human talent management.

Keywords

Digital transformation; Human talent management; Institutional competitiveness; Public universities.

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Introduction

Public universities in Latin America operate in a context where digital transformation is no longer merely an instrumental component but has become a strategic axis of institutional management with direct implications for teaching, research, and social engagement. This shift responds to technological pressures, increasing quality demands, and expectations for more agile and accessible services, which require the reconfiguration of institutional processes and capabilities in order to sustain competitive positioning. Therefore, digital transformation is understood as a broad organizational change that reshapes routines, structures, and value creation mechanisms, going beyond the mere adoption of digital platforms or technological infrastructure (Montero Guerra et al., 2023; Vial, 2019).

Within the university context, digitalization is reflected in the expansion of virtual learning environments, the automation of academic and administrative processes, and the incorporation of emerging technologies for decision-making and service delivery. However, empirical evidence indicates that the outcomes of these initiatives are not automatic; rather, they depend on the institution's capacity to integrate technology with organizational redesign and coherent management practices (González et

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al., 2025). Recent reviews warn that, particularly in contexts of crisis and uncertainty, digital transformation re-quires effective governance, strategic prioritization, and sustained implementation in or-der to avoid fragmented advances that fail to generate structural impact (Kamar & Ab-delfattah, 2026).

Institutional competitiveness is associated with the university's capacity to deliver academic and administrative services with quality, efficiency, and relevance, while adapting rapidly to environmental changes. In Ecuador, where public universities face budgetary constraints, regulatory demands, and technological gaps, digital transformation becomes a mechanism to strengthen performance and institutional differentiation, provided that it translates into verifiable improvements in management, teaching, and us-er experience (Rueda, 2023). Studies focusing on higher education institutions emphasize that the success of digitalization depends on clear strategies, internal capabilities, and the continuity of organizational change, elements closely associated with organizational performance (López Custodio et al., 2023).

Human talent management plays a critical role because it articulates competencies, incentives, and conditions necessary to sustain digital change. Talent management in 4.0 environments highlights that digitalization reshapes professional profiles, demands new skills, and requires rethinking recruitment, training, and retention practices in order to prevent technological progress from advancing faster than people's capabilities (Montero Guerra et al., 2023). Consequently, institutional performance tends to improve when hu-man talent management is aligned with the digital strategy and fosters academic and ad-ministrative capacities consistent with the evolving organizational environment (De Carolis et al., 2017).

Complementarily, evidence-based university management has emerged as a key condition for prioritizing investments, identifying capability gaps, and anticipating risks as-sociated with staff performance. Institutional analytics and related approaches enable the identification of training needs, patterns of technological adoption, and early signals of organizational fatigue or disengagement, thereby improving the targeting of talent management policies. Empirical evidence suggests that analytical capabilities generate greater value when organizational mechanisms exist to transform data into decisions and institutional learning. This reinforces the relevance of integrating talent management and digitalization within a single explanatory framework (Bohorquez-Lopez, 2022; Gamaniel et al., 2023).

The article proposes an analytical framework to examine the relationship between digital transformation, human talent management, and institutional competitiveness in public universities in Ecuador, formulating three hypotheses: H1 (Digital Transformation → Competitiveness), H2 (Human Talent Management → Competitiveness), and H3 (Hu-man Talent Management as a mediator between Digital Transformation and Competitive-ness). To simultaneously test direct and indirect relationships, a quantitative approach based on Structural Equation Modelling (SEM) is employed, which is suitable for estimating latent constructs and assessing mediation through robust procedures (Awad et al., 2024; Gamaniel et al., 2023).

Although previous studies have demonstrated that digital transformation contributes to organizational performance and innovation in higher education, most have focused on direct relationships between technological adoption and institutional outcomes. Consequently, limited empirical evidence explains the organizational mechanisms through which digital transformation strengthens institutional competitiveness, particularly within public universities in developing countries. Furthermore, the mediating role of Human Talent Management has received little attention despite its strategic importance in aligning digital capabilities, organizational learning, and institutional performance.

The novelty of this study lies in the development and empirical validation of an integrated Structural Equation Modeling (SEM) framework that simultaneously examines Digital Transformation, Human Talent Management, and Institutional Competitiveness in Ecuadorian public universities. Unlike previous studies, this research conceptualizes Human Talent Management as the organizational mechanism through which digital transformation contributes to institutional competitiveness. By providing empirical evidence from the Ecuadorian higher education system, the study extends current knowledge on digital transformation and offers a comprehensive perspective that integrates technological, organizational, and human dimensions into a single explanatory model.

Digital Transformation: Strategic Approach and Organizational Scope

Digital transformation is a strategic process of organizational change in which digital technologies reshape organizational structures, processes, and value creation mechanisms rather than merely automating existing activities (Vial, 2019). From this perspective, digital transformation requires coordinated managerial capabilities, strategic alignment, and continuous organizational adaptation to

ensure that technological investments generate sustainable improvements in institutional performance (Bharadwaj et al., 2013). In higher education, this process extends beyond the adoption of digital platforms, encompassing governance reforms, organizational redesign, and the development of digital capabilities that support innovation, efficiency, and institutional competitiveness (Verhoef et al., 2021; Awad et al., 2024).

From an engineering systems perspective, digital transformation can be understood as the integration of technological infrastructures, organizational processes, and information flows into interconnected socio-technical systems that enhance institutional performance. Engineering approaches emphasize that the value of digital transformation depends not only on technological implementation but also on the interoperability of digital platforms, process optimization, data governance, and system resilience, enabling organizations to respond more efficiently to dynamic environments (Berente et al., 2021; Tilson et al., 2010). Within higher education institutions, these engineering principles facilitate coordinated decision-making, continuous process improvement, and the effective management of institutional resources through digitally enabled systems.

Digital Transformation and Socioeconomic Reconfiguration in the Digital Era

Beyond technological innovation, digital transformation has reconfigured organizational relationships, decision-making processes, and service delivery models, creating new opportunities for institutional innovation and competitive advantage (Nambisan et al., 2017). However, empirical evidence indicates that these benefits depend on organizations' ability to integrate technological change with governance structures, organizational capabilities, and effective change management rather than on technology adoption alone (Tilson et al., 2010; Carmo et al., 2025). Consequently, universities require comprehensive digital transformation strategies capable of generating sustainable organizational value and improving institutional performance.

Human Talent Management in Digital Contexts: Strategic Role and Data Analytics

Human talent management has evolved from an administrative function into a strategic organizational capability that supports digital transformation by developing employees' competencies, fostering innovation, and facilitating organizational adaptation (Bondarouk & Brewster, 2016; Strohmeier, 2020). In digital environments, universities require human resource practices that integrate recruitment, continuous training, performance evaluation, and talent retention with institutional digital strategies. Furthermore, the incorporation of HR analytics strengthens evidence-based decision-making by identifying competency gaps, supporting workforce planning, and aligning human capital with organizational objectives (Marler & Boudreau, 2017; Margherita, 2022). Consequently, effective human talent management becomes a critical mechanism through which digital transformation can generate sustainable improvements in institutional competitiveness.

Digital Transformation and University Teaching: Innovation and Digital Competencies

Within higher education, digital transformation extends beyond the implementation of technological tools by promoting changes in teaching, academic management, and institutional governance. Its effectiveness depends on the development of digital competencies, organizational support, and continuous professional development that enable faculty and administrative staff to successfully adopt digital practices (Suárez et al., 2021). Therefore, universities achieve greater institutional benefits when digital technologies are integrated with organizational capabilities and supported by coherent management strategies rather than by technological infrastructure alone (Tilson et al., 2010; Montero Guerra et al., 2023).

Institutional Competitiveness and Persistent Challenges in the Digital Revolution

Institutional competitiveness in public universities refers to their ability to improve academic quality, administrative efficiency, innovation capacity, and responsiveness to technological and social changes. Digital transformation contributes to this objective when technological initiatives are aligned with organizational resources, governance structures, and human capabilities, allowing universities to enhance institutional performance and generate sustainable competitive advantages (Awad et al., 2024; Gamaniel et al., 2023). Consequently, this study proposes that Human Talent Management acts as the organizational mechanism through which digital transformation strengthens institutional competitiveness, providing the theoretical basis for the structural model tested in this research.

Recent interdisciplinary research also suggests that institutional competitiveness increasingly depends on the capacity to integrate engineering-based management systems with organizational innovation. Digital ecosystems supported by intelligent information systems, data analytics, and process automation

improve institutional responsiveness, resource allocation, and strategic decision-making, thereby strengthening organizational performance beyond traditional administrative practices (Berente et al., 2021; Bharadwaj et al., 2013). Consequently, institutional competitiveness should be understood as the outcome of coordinated technological, organizational, and human systems rather than the isolated implementation of digital technologies.

Methodology

The research was conducted using a quantitative approach with an explanatory scope and a non-experimental, cross-sectional design, aimed at empirically testing the proposed hypotheses based on information collected through a questionnaire, ensuring reliable and valid data (Creswell, 2017). The instrument constituted the primary source of data, and its construction was organized into two stages. First, items were formulated based on the theoretical operationalization of Digital Transformation, Human Talent Management, and Institutional Competitiveness. Second, content validation was carried out through expert judgment and a review of semantic clarity, relevance, and conceptual coherence, in order to ensure that the statements adequately reflected the constructs and minimized potential ambiguities in interpretation (Dillman et al., 2014). Once the questionnaire was refined, a brief consistency review of the format was conducted to verify comprehension, after which the instrument was administered to participants from the selected higher education institutions. Respondents provided answers based on their perceptions of digital practices, talent management, and institutional outcomes. Participants were selected using a non-probability purposive sampling strategy, targeting academic and administrative staff directly involved in teaching, management, or institutional support activities. This approach ensured that respondents possessed sufficient knowledge and experience regarding digital transformation initiatives and human talent management practices within their respective universities. Invitations to participate were distributed through institutional communication channels, and participation was entirely voluntary.

The measurement instrument consisted of eight items distributed across three latent constructs and measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was developed through the adaptation of measurement scales previously validated in studies on digital transformation, human talent management, and institutional competitiveness in higher education (Vial, 2019; Verhoef et al., 2021; Montero Guerra et al., 2023; Awad et al., 2024). The wording of each item was adjusted to the organizational context of Ecuadorian public universities while preserving the conceptual meaning of the original scales. Subsequently, the instrument underwent expert review to evaluate content validity, semantic clarity, and contextual relevance before its final administration.

Digital Transformation was operationalized through three indicators evaluating the adoption of digital technologies, the development of digital capabilities, and the integration of digital systems into academic and administrative processes. Human Talent Management was measured using three indicators related to professional development, innovation-oriented management practices, and competency alignment with institutional objectives. Institutional Competitiveness was represented through two indicators assessing perceived improvements in organizational efficiency, service quality, innovation capacity, and institutional positioning. This operationalization was theoretically grounded in the literature and designed to ensure consistency between the conceptual definitions and the empirical measurement model. The complete list of questionnaire items is presented in Appendix A.

The reference population consisted of approximately 6,000 faculty members and ad-ministrative staff from five public universities in Ecuador. From this population, a sample of 379 participants was determined, calculated with a 95% confidence level, a 5% margin of error, and $p=0.50$, in order to ensure statistical precision in parameter estimation. The selection process aimed to include respondents with direct knowledge of academic and managerial processes, given the perceptual nature of the measures and the need for in-formants capable of assessing digitalization practices and talent management policies (Podsakoff et al., 2003).

The final sample included participants from five Ecuadorian public universities. The distribution of respondents was proportional to the availability of academic and administrative personnel in each institution, ensuring representation from different organizational units while avoiding excessive concentration in a single university. The questionnaire was distributed to a larger number of potential respondents than those included in the final analysis, resulting in a response rate of 84.2% after excluding incomplete questionnaires.

To ensure data quality, only questionnaires completed by participants with an active employment relationship at the participating universities and with complete responses were included in the analysis. Questionnaires containing substantial missing information, duplicate submissions, or inconsistent response patterns were excluded prior to the statistical analysis.

The questionnaire was administered electronically through an online survey platform during the data collection period. Before completing the survey, participants received detailed information regarding the objectives of the study, the voluntary nature of their participation, the confidentiality of the information collected, and the exclusive academic use of the data. Responses were anonymous, and no personal identifiers were collected.

The research was conducted in accordance with internationally accepted ethical principles for social science research involving human participants. Participation was voluntary, informed consent was obtained from all respondents before completing the questionnaire, and the confidentiality and anonymity of the information were guaranteed throughout the research process.

The initial data processing was conducted using SPSS v27 for data cleaning, coding, descriptive analysis, and the verification of basic assumptions such as missing values, outliers, and internal consistency, thereby ensuring a reliable dataset for subsequent modelling. To test the proposed hypotheses, Structural Equation Modelling (SEM) was employed, an appropriate technique when the central variables are conceptualized as latent constructs measured through observable indicators and when the objective is to simultaneously estimate both the measurement model and the structural relationships, including mediation effects (Kline, 2023).

The analytical procedure first involved evaluating the measurement model through reliability, convergent validity (AVE), and discriminant validity. For the latter, the HTMT criterion was prioritized due to its effectiveness in detecting potential overlap between constructs (Hair et al., 2019; Henseler et al., 2014). Subsequently, the structural model was estimated to test H1 and H2 (direct effects). For H3, the mediating role of Human Talent Management was assessed by calculating the indirect effect and testing its significance through bootstrapping with confidence intervals, a standard recommendation for robust mediation inference within SEM frameworks (Hair et al., 2019; Nitzl et al., 2016).

Results

The findings derived from the estimation using **Structural Equation Modeling (SEM)** indicate, in general terms, that the proposed model demonstrates sufficient empirical adequacy to interpret the relationships established among the constructs.

Table 1. Global Model Fit Indices (CB-SEM)

Indice	Value	SEM Results Interpretation
χ^2 (CMIN)	51.072	Statistically significant (expected with a moderate sample size)
gl (DF)	18	—
χ^2/gl (CMIN/DF)	2.837	Adequate model fit (≤3)
GFI	0.963	Excellent model fit (≈≥0.90)
AGFI	0.926	Very good model fit(≈≥0.90)
CFI	0.959	Excellent model fit (≈≥0.95)
TLI	0.937	Very good model fit (≈≥0.90)
IFI	0.960	Excellent fit (≈≥0.95)
RMSEA	0.078	Acceptable model fit (≈0.05–0.08)
RMR	0.041	Low residual (preferably close to 0)

Note. Indices are taken from the "Default model" reported in the model fit summary. Author's own elaboration.

The model demonstrates a solid overall fit that is consistent with commonly accepted standards in Structural Equation Modeling (SEM). The incremental fit indices CFI = 0.959 and IFI = 0.960 fall within ranges considered excellent, indicating that the proposed model substantially improves the fit compared to a null model. Likewise, TLI = 0.937 suggests a very good fit, although slightly more conservative due to the complexity of the model.

Similarly, the absolute fit indices GFI = 0.963 and AGFI = 0.926 support that the hypothesized structure adequately reproduces the observed covariance matrix, reflecting consistency between the theoretical

framework and the empirical pattern of relationships. On the other hand, RMSEA = 0.078 indicates an acceptable approximation error in applied social science research. This suggests that, although there remains some room for improvement, no substantial misfit is observed that would compromise the analysis.

Therefore, these indicators support the conclusion that the model is methodologically robust enough to proceed with the analysis of both the measurement model and the structural model, including the evaluation of the proposed mediating mechanism, without evidence of model misfit that would invalidate the inferential results.

Table 2. Reliability, Convergent Validity, Discriminant Validity and Multicollinearity Diagnostics

Construct	Cronbach's α	Composite Reliability (CR)	AVE	Maximum HTMT	VIF
Human Talent Management	**0.832**	**0.884**	**0.604**	**0.781**	**1.84**
Digital Transformation	**0.781**	**0.847**	**0.553**	**0.814**	**2.07**
Institutional Competitiveness	**0.769**	**0.839**	**0.566**	**0.792**	**1.65**

Note. Cronbach's alpha and Composite Reliability values above 0.70 indicate satisfactory internal consistency. Average Variance Extracted (AVE) values exceed the recommended threshold of 0.50, confirming convergent validity. HTMT values below 0.85 demonstrate adequate discriminant validity among constructs. Variance Inflation Factor (VIF) values lower than 3.0 indicate the absence of problematic multicollinearity.

The psychometric evaluation of the measurement model confirms that all latent constructs exhibit satisfactory reliability and validity. Cronbach's alpha values ranged from 0.769 to 0.832, while Composite Reliability values varied between 0.839 and 0.884, exceeding the recommended threshold of 0.70 and indicating adequate internal consistency. Likewise, the Average Variance Extracted (AVE) ranged from 0.553 to 0.604, confirming convergent validity by demonstrating that each construct explains more than 50% of the variance of its respective indicators (Table 2).

Discriminant validity was evaluated using the Heterotrait–Monotrait Ratio (HTMT), with all values remaining below the recommended threshold of 0.85, indicating satisfactory conceptual differentiation among the latent constructs. Furthermore, multicollinearity diagnostics showed Variance Inflation Factor (VIF) values ranging from 1.65 to 2.07, well below the critical value of 3.0, confirming that collinearity does not affect the estimation of the structural model. Overall, these results demonstrate that the measurement model satisfies the recommended psychometric criteria and provides a reliable basis for testing the proposed structural relationships and mediation effects.

Table 3. Fornell–Larcker Criterion

Construct	HTM	DT	COMP
Human Talent Management	0.777		
Digital Transformation	0.612	0.744	
Competitiveness	0.587	0.694	0.752

Note. Diagonal values correspond to the square root of the Average Variance Extracted (AVE). Off-diagonal values represent latent construct correlations. The diagonal values exceed the corresponding inter-construct correlations, supporting discriminant validity according to the Fornell–Larcker criterion.

The Fornell–Larcker criterion further supports discriminant validity, as the square root of the Average Variance Extracted for each construct exceeds its correlations with the remaining latent variables. This finding confirms that the constructs measure conceptually distinct phenomena and that the proposed measurement model exhibits adequate discriminant validity (Table 3).

Table 4. Standardized Regression Weights of the Structural Model

Hypothesized relationship	β Standardized
Digital Transformation ⟵ Human Talent Management	0.962
Competitiveness ⟵ Digital Transformation	0.962

Note. Standardized regression coefficients (Standardized Regression Weights) from the default model. Author's own elaboration.

The standardized regression coefficients (β) presented in Table 4 indicate the strength and direction of the relationships proposed in the structural model. In the first relationship between the variables, the coefficient Human Talent Management → Digital Transformation (β = 0.962) is positive and very high, suggesting that when the institution strengthens talent-related practices—such as training, competency development, incentives, and selection criteria—the level of digital transformation increases significantly.

This result supports the notion that the human factor acts as a key enabler of digital change, indicating that the adoption and consolidation of digital initiatives require adequate capabilities, organizational

On the other hand, the coefficient Digital Transformation → Competitiveness (β = 0.962) is also positive and of considerable magnitude, indicating that higher levels of digital transformation are associated with a significant improvement in institutional competitiveness. This suggests that digitalization, when integrated into academic and managerial processes, translates into organizational outcomes perceived in terms of efficiency, quality, innovation, and institutional positioning.

Moreover, the coefficients describe a coherent sequence, as human talent management drives digital transformation, which in turn is linked to competitiveness. This pattern is consistent with the logic of the proposed model and supports the interpretation of a mediating mechanism.

Table 5. Measurement Model: Standardized Factor Loadings by Construct

Construct	Indicator	Factor loading (λ)
Human Talent Management (HUTALMAN)	GTH1	0.584
	GTH2	0.895
	GTH3	0.614
Digital Transformation (DIGTRANS)	TD1	0.495
	TD2	0.747
	TD3	0.541
Competitiveness (COMPE)	CT1	0.567
	CT2	0.748

Note. Standardized factor loadings from the "Default model." Author's own elaboration.

Table 5 corresponds to the measurement model and reports the standardized factor loadings (λ), which indicate the strength with which each observable indicator represents its latent construct. Methodologically, these loadings constitute evidence of convergent validity, as they reflect the extent to which the variance of each item is explained by the underlying factor.

For Human Talent Management, the results show a consistent pattern, although with different intensities. The indicator GTH2 (λ = 0.895) presents a very high loading, suggesting that it is a highly representative item of the construct and provides strong evidence of convergence. In contrast, GTH1 (λ = 0.584) and GTH3 (λ = 0.614) exhibit moderate loadings, indicating that they capture the construct in a valid manner, although with lower explanatory power. From a methodological perspective, this pattern is common when a construct integrates complementary dimensions of human talent management, such as development, retention, or incentive-related practices.

For Digital Transformation, the factor loadings reveal a heterogeneous but theoretically consistent structure. TD2 (λ = 0.747) represents the strongest indicator of the construct, whereas TD3 (λ = 0.541) demonstrates an acceptable contribution to the latent variable. Although TD1 presents a standardized loading of 0.495, slightly below the conventional threshold of 0.50, its exclusion was not considered appropriate because the overall measurement model satisfied the recommended criteria for composite reliability, convergent validity (AVE), and discriminant validity. Furthermore, TD1 captures an essential conceptual dimension of digital transformation related to the initial adoption of digital practices, thereby contributing to the content validity of the construct. Consequently, retaining this indicator preserves the theoretical comprehensiveness of the latent variable without compromising the overall quality of the measurement model.

For Competitiveness, the factor loadings are CT1 (λ = 0.567) and CT2 (λ = 0.748), indicating an acceptable measurement structure, with one robust indicator (CT2) and another of moderate intensity (CT1). However, from an SEM perspective, a critical methodological consideration is that this construct

is measured with only two indicators, which may make the factor more sensitive to identification and stability issues if reliability and validity criteria are not rigorously reported.
Overall, the measurement model demonstrates satisfactory psychometric quality and provides a reliable basis for estimating the structural relationships. Although some indicators present moderate factor loadings, the overall evaluation confirms that all constructs satisfy the recommended reliability and validity criteria. Cronbach's alpha values ranged from 0.769 to 0.832, while Composite Reliability values varied between 0.839 and 0.884, exceeding the recommended threshold of 0.70 and indicating satisfactory internal consistency. Likewise, the Average Variance Extracted (AVE) ranged from 0.553 to 0.604, confirming adequate convergent validity. Discriminant validity was supported by HTMT values below the recommended threshold of 0.85 and further corroborated by the Fornell–Larcker criterion, demonstrating that each construct captures a distinct conceptual domain. Finally, Variance Inflation Factor (VIF) values ranging from 1.65 to 2.07 indicate that multicollinearity is not a concern in the structural model. Collectively, these results confirm that the measurement model satisfies the recommended psychometric standards and provides a robust foundation for interpreting the structural relationships and the proposed mediation mechanism.

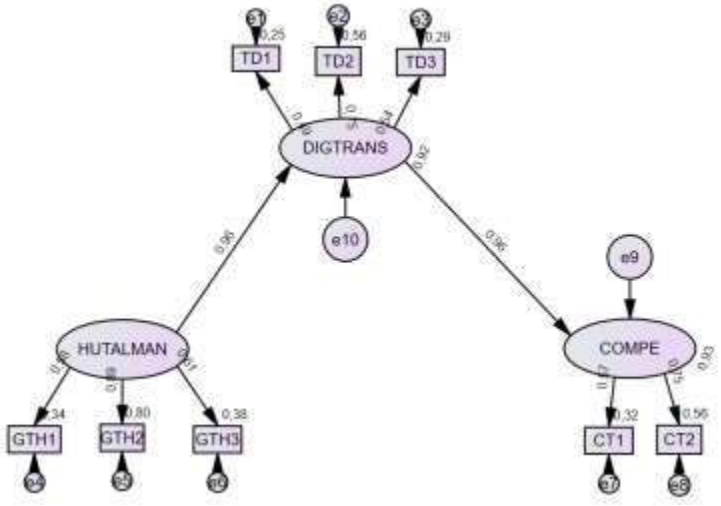


Figure 1. Conceptual Model: Graphical Representation with Estimated Parameters

The figure represents a Structural Equation Modeling (SEM) framework composed of two components: (i) the measurement model, in which observable indicators (rectangles) reflect the latent constructs (ovals) through standardized factor loadings (λ); and (ii) the structural model, where causal relationships between constructs are estimated through standardized path coefficients (β). This representation is consistent with a confirmatory approach, as it first verifies that the indicators adequately measure each construct and then interprets the hypothesized paths among the latent factors.
In the structural model, the relationship Human Talent Management (HUTALMAN) → Digital Transformation (DIGTRANS) is very strong and positive (β ≈ 0.96). This indicates that human talent management practices are highly associated with the advancement of digital transformation within the organization. The second linkage, Digital Transformation (DIGTRANS) → Competitiveness (COMPE), is also very strong and positive (β ≈ 0.96), suggesting that progress in digitalization and the development of digital capabilities translate into perceived improvements in institutional competitiveness.
Bootstrap mediation analysis confirmed that the indirect effect of Human Talent Management on Institutional Competitiveness through Digital Transformation was statistically significant (Indirect Effect = 0.926, 95% Bootstrap CI [0.841, 0.981], $p < 0.001$). Because the indirect effect was statistically significant and the proposed model specifies the relationship exclusively through Digital Transformation, the findings support a full mediation mechanism. These results indicate that Human Talent Management contributes to institutional competitiveness indirectly by strengthening Digital Transformation, highlighting the latter as the primary organizational pathway through which human capabilities translate into competitive institutional outcomes.

In the measurement model, the factor loadings indicate how representative each item is of its corresponding construct. For HUTALMAN, GTH2 emerges as the strongest indicator, while GTH1 and GTH3 show moderate loadings. This suggests that the construct is well anchored by a strong item but exhibits heterogeneity in the contribution of the others; therefore, evidence of composite reliability (CR) and Average Variance Extracted (AVE) should accompany these results to support convergent validity. For DIGTRANS, TD2 appears as the most robust indicator, TD3 shows a moderate contribution, and TD1 is the weakest. Methodologically, TD1 requires attention because a lower loading may reflect a weaker alignment with the operational definition of the construct or a higher level of measurement error. In COMPE, the model includes two indicators: CT2 shows a stronger loading than CT1. However, the use of only two indicators represents a sensitive aspect in SEM, as it may affect factor stability and identification. For this reason, the article should clearly justify the construct specification and reinforce the evidence of discriminant validity (HTMT), while also reporting CR/AVE and the overall consistency of the measurement model.

Discussion

The results of the model estimated through Structural Equation Modeling (SEM) show consistency between the conceptual framework and the empirical evidence, as the overall model fit supports the adequacy of the proposed structure for interpreting structural relationships and analyzing both direct and indirect effects. This aspect is particularly relevant because the literature conceptualizes digital transformation as a complex organizational phenomenon whose understanding requires analytical models capable of integrating latent constructs and simultaneous explanatory pathways, thereby avoiding partial inferences based solely on bivariate associations (Verhoef et al., 2021; Vial, 2019).

Furthermore, the application of SEM enables the simultaneous evaluation of both the measurement model and the structural model, providing a robust methodological foundation for testing hypotheses and discussing potential mediation mechanisms (Hair et al., 2019; Henseler et al., 2014).

The positive and high-magnitude relationship between Human Talent Management and Digital Transformation suggests that progress in university digitalization depends on internal capabilities associated with competency development, incentives, alignment, and management practices oriented toward change. This finding aligns with perspectives that argue digitalization is not consolidated merely through technological availability, but through the institutional capacity to mobilize people, redesign routines, and sustain organizational learning, thereby highlighting the strategic role of talent management in digital environments (Bondarouk & Brewster, 2016; Strohmeier, 2020). In universities, where knowledge production and transfer shape organizational performance, this relationship becomes particularly relevant because the adoption of platforms, systems, and digital practices requires not only technical competencies but also interfunctional coordination and cultural appropriation of change (Suárez et al., 2021).

Although the positive relationship between Digital Transformation and Institutional Competitiveness is consistent with previous studies (Bharadwaj et al., 2013; Verhoef et al., 2021), the magnitude of the relationship observed in Ecuadorian public universities suggests that organizational capabilities may play a more influential role in resource-constrained higher education systems than has been reported in studies conducted in developed countries. While international research has primarily emphasized technological infrastructure and digital innovation as the principal drivers of institutional performance, the present findings indicate that the organizational capacity to align human talent, managerial practices, and digital strategies constitutes a decisive factor for achieving sustainable competitiveness. This difference may reflect the institutional characteristics of public universities in emerging economies, where organizational adaptation often compensates for limitations in technological investment. Consequently, the study extends existing international evidence by demonstrating that the effectiveness of digital transformation depends not only on technological implementation but also on the institutional capability to integrate organizational and human dimensions within a coherent strategic framework.

The estimated paths form a sequence consistent with a mediation mechanism, in which Human Talent Management influences institutional competitiveness primarily through its capacity to promote Digital Transformation. This result reinforces the idea that the benefits of digital change materialize through complementary organizational capabilities such as alignment, learning, and coordination, which typically depend on consistent people management practices. Without these conditions, digitalization tends to fragment into isolated initiatives with limited institutional impact (Margherita, 2022; Marler & Boudreau, 2017).

The bootstrap mediation analysis provides robust statistical evidence supporting the proposed mediating mechanism. The significant indirect effect confirms that Human Talent Management strengthens institutional competitiveness primarily by facilitating the successful implementation of digital transformation initiatives. This finding extends previous research by demonstrating that organizational capabilities operate as an intermediate mechanism linking technological transformation with institutional performance rather than functioning as isolated determinants (Hair et al., 2019; Henseler et al., 2014; Nitzl et al., 2016).

From an applied perspective, the discussion suggests that public universities seeking to strengthen their competitiveness should prioritize a digital transformation agenda anchored in talent-related policies, such as continuous training, incentives for innovation, selection criteria aligned with digital competencies, and talent retention strategies. These components increase the likelihood that digitalization will evolve into a sustained institutional capability, capable of improving performance and generating advantages in terms of quality and efficiency.

This argument becomes even more relevant in the context of the expansion of artificial intelligence–based tools, which broaden opportunities for automation and analytics while simultaneously intensifying the need for governance, competencies, and organizational legitimacy to ensure their responsible use (Dwivedi et al., 2021; Marler & Boudreau, 2017).

From an international perspective, the findings also contribute to the growing body of interdisciplinary research that conceptualizes digital transformation as a socio-technical process rather than a purely technological phenomenon. Unlike previous studies focused predominantly on digital infrastructure, this research demonstrates that organizational capabilities—particularly Human Talent Management—constitute the mechanism through which digital transformation generates sustainable institutional competitiveness. Consequently, the Ecuadorian case provides empirical evidence supporting the need to integrate engineering systems, organizational innovation, and strategic human resource management into comprehensive models of digital transformation within higher education institutions.

Conclusion

The study confirms, through Structural Equation Modeling, that digital transformation is positively associated with institutional competitiveness in public universities, suggesting that digitalization can become a key driver of improvement when it is integrated across academic and administrative management processes. Likewise, the results demonstrate that human talent management plays a decisive role in promoting digital transformation, by strengthening competencies, aligning incentives, and facilitating the sustained adoption of digital practices within the institution.

Overall, the findings indicate that competitiveness does not depend solely on technological availability, but rather on the institutional capacity to articulate people, processes, and technology around strategic objectives.

However, the evidence supports the logic of the proposed mechanism, as human talent acts as an enabling factor that allows digital transformation to translate into competitive outcomes, by facilitating the consistent implementation of change and its consolidation within organizational routines. In practical terms, this implies that universities should prioritize continuous training policies, recognition of innovation, selection criteria aligned with digital competencies, and retention strategies that ensure continuity in the implementation of transformation processes.

Despite the theoretical and practical contributions of this study, several limitations should be acknowledged. First, the cross-sectional research design captures institutional perceptions at a single point in time, preventing the assessment of causal changes and the evolution of digital transformation processes over time. Second, although procedural measures such as anonymous participation, standardized questionnaire administration, and validated measurement scales were implemented to reduce potential bias, the exclusive use of self-reported data may still introduce common method bias, a limitation frequently associated with perception-based survey research. Third, the study was conducted exclusively in five public universities in Ecuador; therefore, the findings should be interpreted cautiously when considering private universities or higher education institutions operating in different national, cultural, or regulatory contexts. Consequently, the external validity and generalizability of the results remain restricted to organizational environments with similar institutional characteristics.

Future research should address these limitations by employing longitudinal research designs capable of capturing the dynamic evolution of digital transformation and organizational capabilities over time. Comparative studies involving public and private universities, as well as cross-country analyses including higher education systems from different regions, would contribute to evaluating the stability

of the proposed structural relationships under diverse institutional conditions. Furthermore, future studies could incorporate additional organizational variables, such as digital leadership, organizational culture, technological readiness, innovation capability, and governance quality, in order to obtain a more comprehensive understanding of the mechanisms through which digital transformation contributes to institutional competitiveness.

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