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RELATIONSHIP

BETWEEN SOFTWARE INVESTMENT AND ADOPTION OF DIGITAL ACCOUNTING SYSTEMS IN COMPANIES FROM THE PROVINCES OF PICHINCHA AND EL ORO

RELACIÓN ENTRE LA INVERSIÓN EN SOFTWARE Y LA ADOPCIÓN DE SISTEMAS DE CONTABILIDAD DIGITAL EN EMPRESAS DE LAS PROVINCIAS DE PICHINCHA Y EL ORO

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ABSTRACT

This paper investigates how differences in technological adoption levels influence the use of digital accounting systems, comparing Pichincha, a province at the heart of Ecuador's technological hub, with El Oro, a province on the economic periphery of Ecuador. The analysis used microdata from the 2023 National Business Structural Survey (ENESEM) for 1,652 medium- and large-sized companies and performed weighted logistic regression models that account for the survey's complex sampling design. The results indicate a significant relation between the territorial factor and digitization. The driving factors of adoption in Pichincha are mainly internal organizational capabilities, with intensive Internet use and extensive software investment as the strongest predictors. Adoption in El Oro is more correlated with external factors, such as Internet connectivity and online sales. For instance, high device use in El Oro has been positively associated with adverse outcomes, suggesting the presence of technostress in low-digital-maturity contexts. In addition, investment in software does not have a significant influence on adoption in this province.

Keywords:

Technological adoption, intangible capital, territorial heterogeneity, digital accounting systems.

RESUMEN

En este artículo se investiga cómo las diferencias en el nivel de adopción tecnológica influyen en el uso de los sistemas de contabilidad digital, comparando Pichincha, una provincia situada en el corazón del centro tecnológico del país, con El Oro, una provincia ubicada en la periferia económica de Ecuador. El análisis examinó los microdatos de la Encuesta Nacional de Estructura Empresarial (ENESEM) de 2023 para las 1652 empresas medianas y grandes, y aplicó modelos de regresión logística ponderados que reflejan el complejo diseño de muestreo de la encuesta. Los resultados indican una relación significativa entre el factor territorial y la digitalización. Los factores que impulsan la adopción en Pichincha son principalmente las capacidades organizativas internas, donde el uso intensivo de Internet, junto con una amplia inversión en software, son los indicadores más fuertes. La adopción en El Oro está más correlacionada con factores externos, como la conectividad a Internet y las ventas en línea. Por ejemplo, el alto uso de dispositivos en El Oro se ha asociado positivamente con resultados adversos, lo que indica la existencia de estrés tecnológico en contextos de baja madurez digital. Además, la inversión en software no tiene una influencia significativa en la adopción en esta provincia.

Palabras clave:

Adopción tecnológica, capital intangible, heterogeneidad territorial, sistemas contables digitales.

INTRODUCTION

The digitalization of accounting processes has become one of the most profound transformations in contemporary business management, as it integrates information and communication technologies into systems of financial recording, analysis, and control. This process not only involves the automation of traditionally manual tasks but also the reconfiguration of information flows, the improvement of traceability in operations, and the generation of real-time data that strengthens strategic decision-making. In this context, accounting evolves from a merely operational function into a central pillar of organizational intelligence, capable of generating value through predictive analysis and financial transparency.

The convergence of automation, connectivity, and data analytics has enabled the transition toward digital and interoperable accounting environments, where systems facilitate the integration of multiple organizational areas. This phenomenon reshapes both organizational structures and workforce competencies, requiring digital skills, analytical capabilities, and adaptability to change. In particular, the level of implementation of digital accounting systems has become a key indicator of a firm's technological maturity and its ability to compete in increasingly dynamic and globalized markets.

In Latin America, the incorporation of digital technologies into business accounting systems has followed a gradual and heterogeneous trajectory, conditioned by structural factors such as digital infrastructure, firm size, and the availability of intangible capital. In Ecuador, despite significant institutional progress in e-government and tax digitalization, important territorial gaps persist, limiting a homogeneous adoption of accounting technologies. Provinces such as Pichincha, characterized by a higher concentration of industrial and technological activity, exhibit business ecosystems with greater capacity for investment in software and digital competencies. In contrast, provinces such as El Oro maintain more traditional productive structures, with lower technological density and a strong dependence on primary sectors, which constrains the adoption of advanced digital tools.

This territorial asymmetry raises fundamental questions about the determinants of digital technology adoption in accounting management. The international literature has emphasized that investment in software constitutes a strategic intangible asset that drives organizational innovation, improves operational efficiency, and contributes to sustainable value creation (Corrado et al., 2022; Teece, 2018). However, recent studies highlight that its impact also depends on complementary factors such as connectivity, digital skills, and organizational structure. In this regard, technology acceptance models such as TAM, UTAUT, and TOE provide robust conceptual frameworks to explain technological adoption, emphasizing perceived usefulness, ease of use, and contextual conditions as key determinants (Venkatesh et al., 2003).

Moreover, recent contributions have incorporated the role of artificial intelligence in accounting digitalization, highlighting its capacity to transform financial processes through intelligent automation, predictive analytics, and enhanced control mechanisms. In particular, García-Vera and Juca-Maldonado (2026) argue that the integration of artificial intelligence into accounting systems enables the optimization of information flows, the standardization of best practices, and the strengthening of internal control systems. Their work emphasizes that digital accounting is no longer limited to software adoption but extends toward intelligent systems capable of learning, detecting anomalies, and supporting strategic decision-making. This perspective reinforces the idea that digital transformation in accounting involves not only technological infrastructure but also advanced analytical capabilities and governance mechanisms that ensure data reliability and organizational efficiency.

Despite these theoretical advances, empirical studies on the adoption of digital accounting systems at territorial and sectoral levels in Latin America remain limited. In Ecuador, available quantitative evidence is primarily focused on financial and administrative domains, restricting comparative analyses across regions with different levels of technological development. This empirical gap limits the understanding of how variables such as software investment and Internet use translate into the effective adoption of digital technologies in accounting, as well as the structural factors that explain regional differences.

In this context, the present study aims to identify the determinants of digital accounting system adoption in Ecuadorian firms, considering the interaction between software investment, Internet use, and organizational and territorial variables. To achieve this, a comparative analysis is conducted between the provinces of Pichincha and El Oro, which represent contrasting business ecosystems in terms of technological maturity and productive structure. Methodologically, weighted logistic regression models are applied using microdata from the National Structural Business Survey, adjusted for complex sampling design and validated through appropriate statistical procedures.

The adoption of digital technologies in accounting represents a key manifestation of business digital transformation, as it reconfigures information flows and strengthens data-driven decision-making. Digitalization promotes efficiency and formalization by reducing errors, automating processes, and enabling access to standardized financial information. Several studies have shown that the use of digital accounting systems increases productivity and facilitates access to credit by providing verifiable and

transparent information (Li & Wu, 2020). However, in emerging economies, its implementation depends not only on technological availability but also on the organizational capacity to absorb and effectively use such technologies (Venkatesh et al., 2003).

From a theoretical perspective, the adoption of digital accounting systems can be understood as the result of the interaction among technological, organizational, and environmental factors. In this framework, software investment plays a central role as a strategic intangible asset that reflects a firm's technological capability and promotes efficiency and transparency in accounting processes. Intangible capital, including software, human capital, and organizational routines, constitutes a key determinant of competitiveness in the knowledge economy, enabling value creation through learning, scalability, and innovation (Corrado et al., 2022; Teece, 2018).

Additionally, technology acceptance models such as TAM and UTAUT explain how perceived usefulness and ease of use influence adoption intentions, while the TOE framework incorporates the influence of organizational and territorial environments on this process (Gangwar et al., 2015; Venkatesh et al., 2003). The integration of these approaches allows digital accounting adoption to be understood as a multidimensional phenomenon in which technological investment, internal organizational capabilities, and contextual conditions converge.

However, recent literature warns that technological adoption does not always produce positive outcomes, especially in contexts of low digital maturity. Intensive or poorly structured use of technological tools may generate adverse effects, such as technostress, which negatively impacts efficiency and continuity in system use (Tarafdar et al., 2019). This issue is particularly relevant for small and medium-sized enterprises, where limitations in digital skills and technical support may hinder the digitalization process.

In summary, accounting digitalization should be understood as a systemic process that depends on the articulation of technological resources, organizational capabilities, and contextual conditions. Evidence suggests that investing in technology alone is insufficient; it is also necessary to ensure its effective integration into business processes and its alignment with the institutional and territorial environment.

The objective of this article was to comprehensively analyze the determinants of digital accounting system adoption in Ecuadorian firms, with particular emphasis on the role of software investment as a strategic intangible asset, Internet use as an indicator of connectivity, and the organizational and territorial conditions shaping the business environment. Furthermore, the study aimed to compare the behavior of these variables across differentiated regional contexts, specifically between the provinces of Pichincha and El Oro, in order to identify technological development gaps and adoption patterns. Additionally, the research sought to empirically evaluate an analytical model that integrates the perspectives of intangible capital, technology acceptance theories, and the technological, organizational, and environmental framework, while incorporating recent contributions on artificial intelligence in accounting to better understand how intelligent systems enhance efficiency, control, and decision-making in digital accounting processes.

MATERIALS AND METHODS

This study adopts a quantitative, explanatory–correlational approach to identify the factors that determine the adoption of digital accounting systems among firms located in the provinces of Pichincha and El Oro. It follows a non-experimental, cross-sectional design in which variables are observed in their natural context without any direct manipulation, allowing for the analysis of relationships between technological, organizational, and territorial factors within real business environments.

The territorial selection is based on theoretical criteria linked to Ecuador's economic agglomeration structure. Pichincha represents one of the main centers of productive and technological concentration in the country, characterized by a diversified economic structure, higher business density, and greater access to technological resources. In contrast, El Oro reflects a peripheral context, with lower levels of technological accumulation and a productive structure more closely tied to primary and commercial activities. This contrast enables a comparative perspective that highlights how structural and geographic conditions influence the adoption of digital technologies in accounting and financial management.

The empirical analysis is based on secondary microdata from the National Structural Business Survey conducted by Ecuador's national statistics office in 2023. This dataset provides detailed information on the dynamics of medium- and large-sized firms across economic sectors, including specific variables related to the use of digital technologies in administrative and accounting processes. For this study, only observations corresponding to firms in Pichincha and El Oro were selected. The data were cleaned, validated, and standardized to ensure consistency and comparability. The final sample included 1,652 valid observations, representing approximately 17,021 firms after applying sampling weights, which ensures statistical representativeness and robustness in the estimation process.

The estimation accounts for the survey's complex sampling design by incorporating stratification, weighting, and selection probabilities. This approach allows for unbiased

parameter estimation and robust standard errors, ensuring the reliability of statistical inference. The descriptive structure of firms reveals significant territorial differences. In El Oro, economic activity is predominantly concentrated in commerce, while services and manufacturing have a more limited presence. In contrast, Pichincha exhibits a more diversified productive structure, with a strong participation of services and manufacturing alongside commerce. This distinction reflects the contrast between a peripheral, less technologically intensive economy and a more complex and digitally advanced one.

Firm size was classified into large and medium-sized categories according to the number of employees, ensuring comparability across firms and controlling for differences in organizational capacity and access to technological resources. This classification is relevant because firm size is closely associated with the ability to invest in digital infrastructure and adopt technological innovations.

Within the conceptual framework of this study, information and communication technologies are understood as the set of infrastructures, software, and digital networks that enable the processing and management of information within organizations. Digital accounting systems are considered a specialized application of these technologies, designed to manage financial records, automate accounting procedures, and generate standardized reports. Their adoption reflects not only access to technology but also the capacity of firms to integrate digital tools into their operational routines.

The dependent variable measures the adoption of digital technologies for financial and accounting management and is defined as a binary outcome, where firms either adopt or do not adopt such systems. This variable captures the effective use of digital tools in accounting processes, aligning with established approaches in the literature on technology adoption.

The explanatory variables focus on key dimensions of digital transformation. Investment in software is treated as a central factor, representing a form of intangible capital that enhances technological capabilities and supports the automation and integration of accounting processes. Investment in equipment reflects the availability of basic technological infrastructure necessary for digitalization. The intensity of Internet use captures the extent to which firms rely on digital connectivity for their operations, while the availability of technological devices per employee serves as an indicator of technological capacity and digital maturity. Additionally, the degree of participation in digital markets is considered through variables related to online sales and online purchases, which reflect the integration of firms into digital economic environments.

To capture the intensity of digitalization, composite indicators were constructed based on the use of Internet services and the availability of technological devices. These indicators summarize multiple dimensions of digital activity within firms and allow for a more comprehensive measurement of technological adoption. Their construction followed standard procedures of aggregation and normalization, ensuring internal consistency and comparability across firms.

Control variables were incorporated to account for structural and contextual differences, including economic sector, firm size, and geographic location. These factors are essential to isolate the specific effects of technological variables and to capture the influence of organizational and territorial conditions on digital adoption.

The probability of adopting digital accounting systems was estimated using a binary logistic regression model, which is appropriate for analyzing dichotomous outcomes. This approach allows for the estimation of how different technological, organizational, and contextual factors influence the likelihood of adoption, providing a robust empirical framework to identify the key drivers of digital accounting implementation.This can be expressed as follows (F1):

$$\text{Logit}\,(pi) = \ln\left(\frac{pi}{1-pi}\right) = \beta_0 + \sum_{k=1}^{K} \beta_k X_{ki} + \varepsilon_i \quad \text{(F1)}$$

Where pi is the probability of adoption for firm *i,* X_{ki} is the set of explanatory variables, β_k represents the parameters, and each coefficient reflects how a one-unit change in the respective independent variable affects the log-odds of adoption while keeping all other factors constant.

The parameters were based on pseudo maximum likelihood estimation adapted for a complex survey design by means of the svyglm function from the survey package in R. This method takes into account the weights, strata, and clusters associated with ENESEM (Ecuador. Instituto Nacional de Estadística y Censos, 2023) to produce unbiased estimators with robust standard errors that are able to capture design heterogeneity. The Wald statistic was used to judge the individual significance of the coefficients, and then the overall significance was determined using the Wald-F test. The model's explanatory power was probed using Cox–Snell and Nagelkerke pseudo-R^2, and overall goodness-of-fit was tested using McFadden's (1973) pseudo-R^2, which is suitable for logistic models weighted by a survey.

The features included correspond to three analytical dimensions under the TAM–UTAUT–TOE framework: a) Technological dimension: use of the internet, technological instruments, and online transactions; b) Organizational dimension: investment in hardware and software; and c) Contextual dimension: company's size, economic sector, and province. Collinearity was also assessed for each variable using the Variance Inflation Factor (VIF). All data

had values below the critical threshold of 10 in all models; however, in El Oro, several variables were collinear (VIF > 10) for the Economic sector (VIF = 42.572) and the Device usage index (VIF = 10.214). The Device usage index was therefore excluded to preserve the stability of the provincial model. The combined statistical significance of the estimated models was confirmed by the results of the Wald-F test: a) National model: $F = 4.380$, $p = 5.50\times10^{-7}$; b) Pichincha: $F = 3.560$, $p = 3.02\times10^{-5}$; and c) El Oro: $F = 4.336$, $p = 1.13\times10^{-5}$.

Ultimately, diagnostic validation was performed via standardized residuals, detection of influential observations (Pearson and deviance residuals), and comparison of observed probabilities and predicted probabilities. Based on these diagnostics, it was verified that the weighted logistic model was appropriate and that the estimated coefficients were stable, providing evidence supporting the validity of the empirical inferences made above.

RESULTS AND DISCUSSION

The estimation was performed using weighted logistic regression models that accounted for the ENESEM's complex design. To achieve representative estimates and reliable standard errors, weights, strata, and selection probabilities were integrated in line with the survey's sampling methodology. Three separate models were created: one at the national scale and two at the provincial levels (Pichincha and El Oro). All models included indicators for technological, organizational, and structural variables, the index of internet use, device use, investment in ICT (both hardware and software), internet sales figures, online purchases, economic sectors, and enterprise sizes. In El Oro, for example, the variable used to express the device usage index was dropped from the provincial model due to severe collinearity issues identified in diagnostics (VIF > 10).

The three models all presented satisfactory fit and statistical reliability, with McFadden's pseudo-R^2 of 0.148 for the national model, 0.234 for Pichincha, and 0.212 for El Oro. The models exhibited good discriminative ability, with Area Under the ROC Curve (AUC) values of 0.761, 0.831, and 0.773, all higher than the specified threshold of 0.70 according to McFadden et al. (2013) for efficient function in cross-sectional logistic models.

The global Wald-F statistic confirmed the overall validity of the specifications: $F = 4.380$ ($p < .001$) for the national model, $F = 3.560$ ($p < .001$) for Pichincha, and $F = 25.962$ ($p < .001$) for El Oro. The values of the measurements increase the confidence in the estimates' reliability and emphasize the importance of the predictors implemented in the models. The dispersion parameter (φ) values were noted as 1.031, 1.134, and 11.654, respectively, indicating a minor overdispersion at the provincial level that was effectively addressed through a quasibinomial approach. The estimation algorithms exhibited stable convergence using the Fisher Scoring approach, and both the national and Pichincha models required 6 iterations, while El Oro required 7. The weighted sample sizes were approximately 17,021 nationally, 6,632 from Pichincha, and 1,352 from El Oro—sufficient to ensure the statistical robustness of inference.

In addition, analyses for individual significance reveal different patterns of determinants across regions. In the national model, the significant variables were the Internet usage index and online sales; in Pichincha, the Internet usage index and ICT investment in software; and in El Oro, the Internet usage index, online sales, online purchases (negative effect), and Medium B enterprise size. These results indicate the existence of territorial differences in the factors that explain the adoption of digital accounting systems, associated with both technological infrastructure and the regional productive structure. The global goodness-of-fit and diagnostic values for the models are presented in Table 1.

Table 1. General description and global goodness-of-fit measures of the binary logistic model.

Indicator	National Model	Pichincha Model	El Oro Model (Adjusted)
Type of regression	Weighted logistic regression (svyglm, quasibinomial)	Weighted logistic regression (svyglm, quasibinomial)	Weighted logistic regression (svyglm, quasibinomial)
Variables included	Internet usage index; Device usage index; ICT investment in equipment; ICT investment in software; Online sales; Online purchases; Economic sector; Enterprise size	Same	Same
Pseudo R^2 (McFadden)	0.148	0.234	0.212
AUC (ROC curve)	0.761	0.831	0.773
Wald statistic (F)	4.380	3.560	25.962
Degrees of freedom (model/residual)	12 / 4213	12 / 1441	11 / 160
Global p-value	5.50×10^{-7}	3.02×10^{-5}	$<2.22\times10^{-16}$
Dispersion (φ)	1.031	1.134	11.654a

Iterations (Fisher Scoring)	6	6	7
Weights number of observations	≈17,021	≈6,632	≈1,352
Significant variables	p<0.05	Same	Same
Non-significant variables	p>0.05	Same	Same

Note. a. *The use of the quasibinomial family within svyglm corrects for overdispersion (φ) arising from the complex sampling structure of ENESEM, thereby providing consistent standard errors and reliable Wald inferences.*

National model

The national model identifies two main determinants of the adoption of digital accounting systems among Ecuadorian firms: the Internet usage index and online sales. The overall fit of the weighted model is adequate for this type of analysis, with a McFadden pseudo-R^2 of 0.148 and an area under the ROC curve (AUC) of 0.761, both indicating satisfactory discriminative capacity. The global Wald test ($F = 4.380$; $p < 0.001$) confirms the joint significance of the coefficients and the model's statistical consistency.

As indicated in Table 2, the Internet usage index has a positive, statistically significant effect ($\beta = 0.749$; $p = 0.001$; OR = 2.11; 95% CI [1.34, 3.33]). This means that, after controlling for other factors, a one-standard-deviation increase in Internet usage corresponds to a twofold increase in the likelihood of adopting digital accounting systems. Such an outcome is consistent with previous studies that have established digital connectivity as a determinant of financial inclusion and the digital transformation of organizations (Chatterjee, 2020). According to Mushtaq et al. (2024), Internet adoption positively influences budgeting, saving, and financial management efficiency, reinforcing the interpretation that the intensity of Internet use acts as a catalyst for accounting and budgetary transformation.

Similarly, online sales display a positive and significant effect ($\beta = 0.602$; $p = 0.014$; OR = 1.83; 95% CI [1.13, 2.95]), indicating that firms with a higher share of digital transactions are 83% more likely to implement digital accounting technologies. This finding is consistent with other studies connecting the growth and expansion of e-commerce to better profits and organizational efficiency. Ibujés & Chasi (2017) highlighted that for small and medium-sized enterprises in Ecuador, implementing digital processes into the annual budgets yields higher productivity and competitiveness, which explains the observed relationship between online sales and technological adoption in accounting management.

By contrast, the variables representing investment in hardware and software and the device usage index are not statistically significant ($p > 0.10$). This suggests that the mere availability of technological infrastructure does not guarantee the effective incorporation of digital tools. This result is consistent with the literature on organizational and contextual capabilities as mediating factors in technology adoption. Reggi & Gil (2021) point out that the successful investment in ICT will vary depending on the level of technological maturity and support from public policies, and Zhong et al. (2023) show with this same focus that its impact varies by field: where operational profitability is augmented at a higher level in manufacturing, it is more limited in mining or commerce. As such, accounting digitalization needs to be seen as something dependent on capabilities, rather than simply an incidental byproduct of infrastructure investment.

Structural variables—economic sector and enterprise size, which are also not significant —again add to the sense that digital accounting systems are adopted at the level of connectivity and integrated on digital channels, not by productive or scale-based factors. These results indicate a cross-sectoral trend in technological adoption.

Last but not least, while the model overall demonstrates strong performance (AUC > 0.70), there is a very slight imbalance between adopters and non-adopters, which may affect the model's sensitivity. Previous research warns that in class-imbalanced datasets, predictions tend to skew toward the majority class, and threshold adjustment or cost-sensitive learning can be considered (Chen et al., 2006). Therefore, the results should be interpreted as robust yet conservative evidence, open to refinement through balancing techniques and predictive optimization in future applications.

Table 2. Results of the national weighted logistic model (ENESEM - Ecuador).

Variable	β	SE	Wald b	p	OR	95% CI for OR	Sig.
Constant	2.194	0.215	104.53	<0.001	8.97	[5.89, 13.66]	***
Internet usage index	0.749	0.231	10.50	0.001	2.11	[1.34, 3.33]	**
Device usage index	0.187	0.396	0.22	0.636	1.21	[0.56, 2.62]	
ICT investment in equipment	0.252	0.172	2.14	0.144	1.29	[0.92, 1.80]	
ICT investment in software	0.115	0.087	1.74	0.188	1.12	[0.95, 1.33]	
Online sales	0.602	0.245	6.06	0.014	1.83	[1.13, 2.95]	*
Online purchases	0.089	0.335	0.07	0.790	1.09	[0.57, 2.11]	
Economic sector a (Construction)	-0.443	0.537	0.68	0.410	0.64	[0.22, 1.84]	
Economic sector a (Manufacturing)	0.312	0.463	0.45	0.500	1.37	[0.55, 3.39]	
Economic sector a (Mining)	0.655	0.413	2.52	0.113	1.93	[0.86, 4.33]	
Economic sector a (Services)	-0.132	0.369	0.13	0.721	0.88	[0.43, 1.81]	
Enterprise size a (Medium A)	-0.110	0.391	0.08	0.778	0.90	[0.42, 1.93]	
Enterprise size a (Medium B)	-0.542	0.337	2.59	0.108	0.58	[0.30, 1.13]	

Note. *The quasibinomial family in svyglm accounts for overdispersion (φ) due to the complex sampling design of ENESEM, ensuring robust standard errors and valid Wald inferences. a Reference categories: Commerce (sector) and Large enterprises (size). b The reported Wald statistic corresponds to t^2 values derived from the survey-weighted quasi-binomial model (svyglm, R). p < .05 (*), p < .01 (**), p < .001 (***).*

Provincial models

The provincial models reveal territorial differences in the adoption of digital accounting systems: Pichincha exhibits higher technological density, whereas El Oro maintains a more commerce-oriented and less digitalized productive profile.

Pichincha model results

The weighted model for the province of Pichincha shows strong statistical performance, with a McFadden pseudo R^2 of 0.234 and an AUC of 0.831, both higher than those of the national model, indicating greater predictive capacity. Under the rigorous design of ENESEM's complex survey, the robustness of the model was confirmed by the global Wald test ($F = 3.560$; $p = 3.02 \times 10^{-5}$), which confirmed the joint significance of the predictors.

As shown in Table 3, two variables are statistically significant: the Internet usage index and software investment. The former presents a positive coefficient ($\beta = 0.552$; $p = 0.038$; OR = 1.74; 95% CI [1.03, 2.93]), indicating that a one-unit increase in this index raises the odds of adopting a digital accounting system by 74%. This finding indicates that digital connectivity is an essential aspect of business digitalization. The literature also emphasizes that Internet penetration has a positive impact on financial inclusion and the adoption of digital services (Chatterjee, 2020). Likewise, Mushtaq et al. (2024) noted that Internet use has a positive effect on budgeting and financial planning, further solidifying the notion that intensive connectivity facilitates operations and digitalizes accounts in business settings such as Pichincha.

Specifically, software investments have a significant and positive effect ($\beta = 0.399$; $p = 0.011$; OR = 1.49; 95% CI [1.10, 2.02]), with firms that invest in purchasing or upgrading management software 49% more likely to adopt digital accounting technologies. This observation supports the notion that in technologically mature environments such as Pichincha, spending on intangible assets (software, integrated systems, management solutions) immediately leads to a greater digital absorptive capacity and continuous innovation capacity in the organization.

This aligns with the literature on the enhancement of financial and organizational performance following investments in ICT, which has been proven to positively impact customer understanding and the optimization of organizational processes. International evidence similarly shows that strategic investments in software are conducive to industrial productivity and competitiveness, which is also happening on the ground. Small and medium-sized enterprises in Pichincha are increasingly using ICTs in their budgeting and bookkeeping processes and are leveraging existing digital infrastructure to improve their economic performance (Ibujés & Chasi, 2017).

On the other hand, the variables other than these, use of technological devices, investment in hardware, online transactions, economic sector, and enterprise size, do not reach statistical significance ($p > 0.05$). This indicates that, in settings heavily influenced by digitalization, structural and material conditions become less important relative to organizational and knowledge management capabilities. According to Reggi & Gil (2021), ICT investment is effective only when institutions are mature, and the policy

framework is strong, and Zhong et al. (2024) show that returns to technological investment are heterogeneous across productive sectors.

Thus, the provincial model for Pichincha indicates that technological adoption has predominantly resulted from internal digital management capabilities rather than structural endowments. The information indicates that accounting digital transformation in more connected business environments is determined by sophisticated infrastructure, intangible resources, and organizational learning. This makes Pichincha a central hub for digital innovation in Ecuador's business ecosystem.

Table 3. Pichincha model results.

Variable	β	SE	Waldb	p	OR	95 % CI for OR	Sig.
Constant	2.388	0.374	40.79	2.28e-10	10.89	[5.23, 22.66]	***
Internet usage index	0.552	0.266	4.30	0.0382	1.74	[1.03, 2.93]	*
Device usage index	0.619	0.804	0.59	0.4417	1.86	[0.38, 8.97]	
ICT investment in equipment	0.308	0.387	0.63	0.4261	1.36	[0.64, 2.91]	
ICT investment in software	0.399	0.157	6.49	0.0109	1.49	[1.10, 2.02]	*
Online sales	0.452	0.410	1.21	0.2707	1.57	[0.70, 3.51]	
Online purchases	0.280	0.604	0.21	0.6434	1.32	[0.40, 4.32]	
Economic sector[a] (Construction)	−1.287	0.836	2.37	0.1239	0.28	[0.05, 1.42]	
Economic sector[a] (Manufacturing)	0.991	0.925	1.15	0.2840	2.69	[0.44, 16.50]	
Economic sector[a] (Mining)	0.795	1.564	0.26	0.6115	2.21	[0.10, 47.47]	
Economic sector[a] (Services)	−0.154	0.687	0.05	0.8229	0.86	[0.22, 3.29]	
Enterprise size[a] (Medium A)	−0.267	0.661	0.16	0.6861	0.77	[0.21, 2.80]	
Enterprise size[a] (Medium B)	−0.453	0.663	0.47	0.4949	0.64	[0.17, 2.33]	

Note. The quasibinomial family in svyglm accounts for overdispersion (φ) due to the complex sampling design of ENESEM, ensuring robust standard errors and valid Wald inferences. a Reference categories: Commerce (sector) and Large enterprises (size). b The reported Wald statistic corresponds to t^2 values derived from the survey-weighted quasibinomial model (svyglm, R). $p < .05$ (*), $p < .01$ (**), $p < .001$ (***).

El Oro model results

Table 4 estimates the weighted model for the El Oro province and indicates a good fit and a moderately high discriminative capacity (McFadden pseudo $R^2 = 0.213$, AUC = 0.779). The combined significance of the predictors, indicated by the global Wald statistic ($F = 4.40$; $p < 0.001$), supports the conclusion that the included variables effectively account for the adoption of digital accounting systems in the provincial business context. The findings indicate a more heterogeneous pattern of effects than in Pichincha, where three statistically significant variables were identified at $p < 0.05$: the Internet usage index, online sales, and online purchases.

The Internet usage index has a highly significant positive coefficient (β = 1.515; $p < 0.001$; OR = 4.55; 95% CI [2.29, 9.05]), which implies that companies using digital platforms more than four times as often tend to adopt digital accounting systems compared to those that use the Internet less. This result aligns with previous research that identified Internet penetration as one of the most important factors influencing financial inclusion and organizational digitalization (Chatterjee, 2020). Similarly, Mushtaq et al. (2024) note that, in terms of business processes, adopting the Internet promotes effective budgeting and economic decision-making, suggesting that Internet connectivity drives accounting transformation and organizational performance, even in peripheral regions, such as El Oro.

Online sales have a positive, statistically significant effect (β = 3.318; $p = 0.026$; OR = 27.59), but the wide confidence interval ([1.50, 506.00]) warrants caution in interpretation. This finding indicates that e-commerce engagement is associated with the rate of digital accounting adoption, consistent with previous studies showing an association among ICT adoption, financial well-being, and organizational performance outcomes. However, the broad interval and the limited subsample size indicate that the magnitude of this effect may be conditioned by local structural characteristics, such as technological maturity or sectoral heterogeneity, as noted by Reggi & Gil (2021) in contexts with low accumulation of digital capital.

In contrast, online purchases have a negative and significant effect (β = −2.173; $p = 0.001$; OR = 0.11; 95% CI [0.03, 0.42]), suggesting that firms that frequently use digital platforms to acquire goods or inputs are less likely to

adopt digital accounting systems. This outcome may be linked to technological overexposure or to business structures with low levels of accounting formalization, in which administrative processes are often outsourced. In this regard, the technostress literature (Karimikia & Singh, 2019) warns that technological overload and operational dependence on platforms can reduce the willingness to integrate new digital management systems, generating organizational resistance and limiting technological appropriation.

The medium type B enterprise category has a positive and marginally significant effect (β = 3.465; p = 0.051; OR = 31.99; 95% CI [0.97, 1054.49]). The effect is highly important (OR ≈ 32), though the p-value is slightly above 0.05, and the confidence interval includes the unit (1.0), indicating that the effect is not statistically significant at the 95% level. However, this finding implies a substantially higher likelihood that medium-sized enterprises will implement digital accounting systems than smaller enterprises, suggesting a much higher technology capacity threshold. The literature suggests that geographic and size-related differences account for digital adoption heterogeneity, such that the ICT investment returns remain contingent on institutional maturity, sectoral structure, and public policy frameworks (Zhong et al., 2023).

As a whole, the El Oro model demonstrates a pattern of digital adoption conditioned on Internet access and e-commerce participation, but constrained by the region's structural and organizational constraints. The coexistence of positive and negative effects in digital transactions indicates an unfinished transition to full-fledged digitalization, in which technological capacities are not yet uniformly reflected in accounting transformation. This pattern emphasizes a differentiated policy strategy that seeks to boost digital infrastructure, narrow the technological divide, and facilitate the integration of digital accounting tools appropriate to the local productive context.

Table 4. El Oro model results.

Variable	β	SE	Waldb	p	OR	95 % CI for OR	Sig.
Constant	3.110	0.987	9.935	0.0019	22.430	[3.195, 157.437]	**
Internet usage index	1.515	0.348	18.922	<0.001	4.550	[2.287, 9.051]	***
ICT investment in equipment	0.715	0.629	1.290	0.2575	2.044	[0.590, 7.076]	
ICT investment in software	−0.149	0.369	0.162	0.6878	0.862	[0.416, 1.787]	
Online sales	3.317	1.473	5.072	0.0257	27.592	[1.505, 506.001]	*
Online purchases	−2.173	0.658	10.903	0.0012	0.114	[0.031, 0.417]	**
Economic sector[a] (Industrial)	0.934	1.440	0.421	0.5175	2.544	[0.148, 43.681]	
Economic sector[a] (Mining)	−0.73	1.282	0.325	0.5694	0.482	[0.038, 6.052]	
Economic sector[a] (Services)	-2.362	2.165	1.190	0.2769	0.094	[0.001, 6.775]	
Enterprise size[a] (Medium A)	1.341	1.442	0.865	0.3539	3.821	[0.232, 63.072]	
Enterprise size[a] (Medium B)	3.465	1.523	5.175	0.0233	31.998	[1.598, 640.891]	*

Note. *The quasibinomial family in svyglm accounts for overdispersion (φ) due to the complex sampling design of ENESEM, ensuring robust standard errors and valid Wald inferences. a Reference categories: Commerce (sector) and Large enterprises (size). b The reported Wald statistic corresponds to t^2 values derived from the survey-weighted quasibinomial model (svyglm, R). p < .05 (*), p < .01 (**), p < .001 (***).*

Interprovincial comparison

The comparative analysis between the provincial models of Pichincha and El Oro reveals substantive differences in the factors explaining the adoption of digital accounting systems, reflecting territorial heterogeneity and varying degrees of technological maturity across regional productive structures.

In Pichincha, adoption is primarily sustained by internal technological management capabilities, as reflected in intensive Internet use (β = 0.552; p = 0.038; OR = 1.74) and software investment (β = 0.399; p = 0.011; OR = 1.49). This phenomenon emerges from a consolidated business ecosystem comprising both digital infrastructure and specialized human capital, which creates structural conditions; adoption differences arise from the organization's capacity to integrate and use technological tools. These findings align with supporting evidence that Internet penetration drives financial inclusion and digital service adoption (Chatterjee, 2020), as well as that strategic ICT investment enhances business productivity and competitiveness (Ibujés & Chasi, 2017). Consequently, accounting digitalization in Pichincha can be interpreted as a functional extension of technological maturity and the consolidation of internal innovation capabilities.

In contrast, the El Oro model reveals a more dispersed structure of effects, largely dependent on commercial exposure to the digital environment. The significant variables—Internet usage index (β = 1.515; p < 0.001; OR = 4.55), online sales (β = 3.318; p = 0.026; OR = 27.59),

online purchases (β = −2.173; p = 0.001; OR = 0.11), and medium-sized enterprises type B (β = 3.465; p = 0.038; OR = 31.98)—suggest that in contexts of lower technological density, digital adoption depends on connectivity, e-commerce orientation, and operational scale. The negative sign associated with online purchases (β = -2.173) may, according to the technostress literature, reflect the adverse effects of intensive platform use (Karimikia & Singh, 2019), in which technological overexposure generates resistance and limits digital appropriation. This pattern is consistent with Reggi & Gil (2021), who argue that in local economies with lower technological maturity, ICT investment may become less effective in the absence of an organizational ecosystem that facilitates technological absorption.

The interprovincial comparison confirms that accounting digitalization is contingent upon the interaction between internal capabilities, productive structure, and territorial context, in addition to technological infrastructural availability. In such technologically advanced territories like Pichincha, key adoption drivers are organizational competencies and software investment. So, unlike peripheral provinces like El Oro, where factors like connectivity and digital commercial orientation act as triggers, but their effects are more heterogeneous and less sustainable over time. These results align with studies showing that the adoption of ICT does not produce homogeneous impacts but depends on the structural, economic, and social characteristics of each territory (Zhong et al., 2023).

In that respect, the findings emphasize the need for more region-specific digital transformation policies that address the region's particularities, along with a clearer articulation of infrastructure, human capital, and institutional maturity. This contrast is well illustrated in Figure 1, which presents a forest plot of odds ratios and 95% confidence intervals, showing that the effects in Pichincha are more stable and coherent than the volatility and amplitude observed in El Oro. The asymmetry of variances and wide intervals in the coastal province highlight an early-stage technological change, with a highly external-dependent business structure and the need for precise digital consolidation strategies to narrow the territorial gaps.

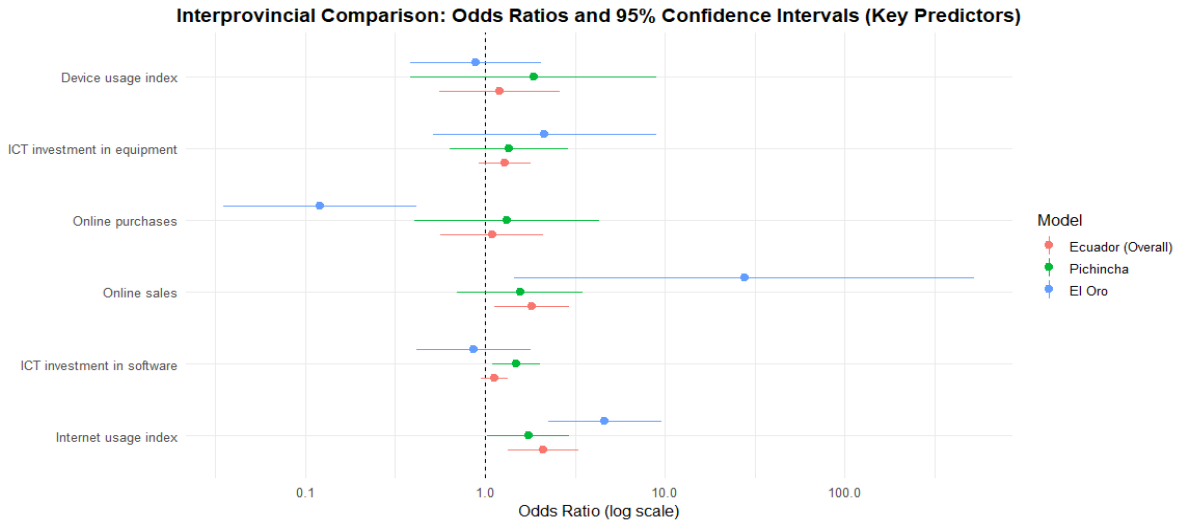

Figure 1. Interprovincial comparison: odds ratios and 95% CI (key predictors).

CONCLUSIONS

The study analyzed the determinants of digital accounting system adoption among medium- and large-sized firms in Ecuador, using a territorial comparative approach between the provinces of Pichincha and El Oro. Empirical evidence confirms that Internet use is the primary positive determinant of the adoption of digital technologies applied to financial and budgetary management (H2). Connectivity, therefore, emerges as a fundamental enabling condition for accounting digitalization, fostering the interoperability of systems and perceived technological usefulness. However, investment in software showed no significant effect at the national level. However, it displayed a positive and robust influence in Pichincha, a province with relatively high technological density and intangible capital (H1 and H3). This finding also supports the idea that technological investment is largely determined by digital infrastructure and the maturity level of the productive environment.

The validation of the method for the El Oro region required omitting the variable Device usage index per employee due to extreme collinearity, thereby ensuring the statistical robustness of the final parameters. However, the initial coefficient showed a negative and insignificant relationship, a finding that, in theory, aligns with H4: in contexts of low organizational maturity, a high provision of devices may be associated with technological stress or digital overload.

Methodologically, the model showed asymmetric performance: high accuracy in classifying firms as sensitive to ICT uptake but low specificity, also due to class imbalance (a common feature of studies of technology adoption). This result suggests adopting adaptive or cost-sensitive learning models to further promote discrimination in unbalanced datasets. Theoretically, the findings support the intangible capital approach and suggest that digital transformation is not the outcome of technology availability alone, but requires complementary organizational capability, human capital, and a connective environment. They also enhance the relevance of both the TAM and UTAUT models in low- and middle-income countries and highlight perceptions of Internet value and context-dependent factors in digital adoption. At the applied level, the findings have some implications for public policy and business operations. Strengthening digital infrastructure and connectivity is the foundation for national technology transformation. Territorially, separate strategies need to be implemented to minimize the structural gaps between the provinces. At the same time, investment in training in digital and accounting skills, as well as in mechanisms to finance technological modernization, must be made a priority.

A notable constraint on the study is the reporting in the ENESEM database, which is limited to medium and large enterprises and, consequently, limits the generalizability of the findings to the whole productive fabric. However, the territorial analysis also identified structural and technological disparities that inform the formulation of inclusive digital development policies. This study should further explore digital culture, financial literacy, and perceived technological risk for micro and small enterprises in the future. It would also be relevant to apply hybrid machine learning approaches to maximize prediction on unbalanced datasets and to evaluate firms' digital maturity as a multidimensional construct.

In summary, the results confirm that the adoption of digital accounting systems in Ecuador depends on the interplay among intangible capital, connectivity, and the territorial context. This reaffirms the need to promote business digitalization strategies aligned with regional development and knowledge-based economic sustainability.

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Conflicts of Interest:

The authors declare no conflicts of interest.

Author Contributions:

María Angélica Vizuete-Martínez, Javier Alejandro Solano-Solano, Gloria Ramírez-Elías: Conceptualization, data curation, formal analysis, investigation, methodology, supervision, validation, visualization, original draft writing, and writing, review, and editing.

Ethical statement:

The study was based on the analysis of documentary sources and publicly available data, and therefore did not involve the direct participation of human subjects. No personally identifiable information was handled.