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Open Innovation, Strategic Orientation and Innovative Performance in ICT SMEs: Evidence from Costa Rica

Innovación abierta, orientación estratégica y rendimiento innovador en las pymes del sector de las TIC: datos de Costa Rica

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Abstract
Objective: This study analyzes the influence of open innovation and strategic orientation on innovative performance in small and medium-sized enterprises (SMEs) in the Information and Communication Technologies (ICT) sector in Costa Rica. **Methodology:** Using a quantitative and empirical research design, data were collected from 70 SMEs selected from an initial population of 400 firms. The proposed model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). **Results:** Results indicate that open innovation ($\beta = 0.369$, $p < 0.05$) and strategic orientation ($\beta = 0.398$, $p < 0.05$) have a moderate and statistically significant positive effect on innovative performance, explaining 46.3% of its variance ($R^2 = 0.463$). **Conclusions:** These findings contribute empirical evidence from a Latin American emerging economy and highlight the importance of aligning open innovation practices with strategic orientation to enhance firm competitiveness. The study provides theoretical and managerial implications and suggests avenues for future research.

Keywords: ICT sector; Innovative performance; Open innovation; SMEs; Strategic orientation

Resumen
Objetivo: Este estudio analiza la influencia de la innovación abierta y la orientación estratégica en el rendimiento innovador de las pequeñas y medianas empresas (pymes) del sector de las tecnologías de la información y la comunicación (TIC) en Costa Rica. **Metodología:** Mediante un diseño de investigación cuantitativo y empírico, se recopilaron datos de 70 pymes seleccionadas de una población inicial de 400 empresas. El modelo propuesto se probó utilizando el modelo de ecuaciones estructurales de mínimos cuadrados parciales (PLS-SEM). **Resultados:** Los resultados indican que la innovación abierta ($\beta = 0{,}369$, $p < 0{,}05$) y la orientación estratégica ($\beta = 0{,}398$, $p < 0{,}05$) tienen un efecto positivo moderado y estadísticamente significativo sobre el rendimiento innovador, explicando el 46,3 % de su varianza ($R^2 = 0{,}463$). **Conclusiones:** Estos hallazgos aportan evidencia empírica de una economía emergente latinoamericana y destacan la importancia de alinear las prácticas de innovación abierta con la orientación estratégica para mejorar la competitividad de las empresas. El estudio ofrece implicaciones teóricas y de gestión y sugiere vías para futuras investigaciones.

Palabras clave: Sector de las TIC; Rendimiento innovador; Innovación abierta; Pymes; Orientación estratégica

1. INTRODUCTION

In highly dynamic and technology-driven markets, firms are increasingly required to develop innovation capabilities that allow them to remain competitive and adaptable. The rapid evolution of digital technologies, globalization of knowledge flows, and intensifying competition have transformed traditional innovation models, making open innovation a central strategic approach for firms seeking sustainable performance (Chesbrough & Bogers, 2014; Bigliardi et al., 2021).

Open innovation challenges the traditional closed innovation paradigm by encouraging firms to purposefully manage knowledge inflows and outflows to accelerate internal innovation and expand market opportunities. This model is particularly relevant for small and medium-sized enterprises (SMEs), which often face resource constraints but can benefit significantly from external collaborations, alliances, and knowledge sharing mechanisms (Garcés, 2023). Empirical studies have shown that open innovation practices can enhance firm performance; however, the magnitude and consistency of this relationship vary across contexts and sectors (Akbar et al., 2021).

At the same time, innovation outcomes are not solely dependent on knowledge exchange mechanisms. Strategic orientation plays a crucial role in determining how firms allocate resources, interpret market signals, and develop entrepreneurial initiatives. Strategic orientation—through its entrepreneurial, market, and resource-based dimensions—shapes the firm's ability to transform innovation activities into tangible performance outcomes (Cheng & Huizingh, 2014). Prior research suggests that strategic orientation strengthens innovation processes by aligning internal capabilities with external opportunities, yet empirical evidence remains fragmented, particularly in emerging economies.

Despite growing research on open innovation and strategic orientation, several gaps persist. First, most empirical studies have focused on developed economies, limiting the understanding of how these relationships operate in Latin American contexts. Second, limited research simultaneously examines open innovation and strategic orientation as complementary drivers of innovative performance. Third, there is scarce empirical evidence from the Information and Communication Technologies (ICT) sector in emerging economies, where innovation intensity and knowledge exchange dynamics are particularly relevant.

Costa Rica represents an interesting context for analysis due to the expansion of its ICT sector and the increasing participation of SMEs in digital and knowledge-intensive activities. Understanding how open innovation and strategic orientation influence innovative performance in this sector provides valuable insights for both theory and practice.

Therefore, the objective of this study is to analyze the influence of open innovation and strategic orientation on innovative performance in SMEs within the ICT sector in Costa Rica. By empirically testing a structural model using Partial Least Squares Structural Equation Modeling (PLS-SEM), this research contributes to the literature by providing evidence from an emerging economy and by examining the joint effect of these two strategic dimensions on firm-level innovation outcomes.

2. THEORETICAL FRAMEWORK / REFERENCE FRAMEWORK

Open Innovation

Open innovation processes are understood as any type of new idea that is generated, either within the company, outbound, or a mixture of both. Furthermore, it is essentially different from closed innovation in that it takes any innovation and applies it. This allows the organization to improve its products, services or processes without necessarily controlling the innovative processes (Restrepo, 2024).

Inbound innovation represented in Figure 1 refers to knowledge acquired externally that is exploited inside the firm. Outbound innovation shown in Figure 2 relates to the internal knowledge that has been used inside the firm and is later implemented or exploited outside the firm to gain more innovation for the firm itself.

Open innovation assumes that companies can and must maintain close relationships with third-party agents, both in the process of accumulating knowledge and in its commercialization (Anchayhua et al., 2025). It also accelerates the innovation process and reduces the associated costs and risks and, on the other hand, opens up new possibilities for the commercial exploitation of knowledge (Guerrero, 2024).

Therefore there are three main types of open innovations, inbound, outbound, or joint activities (Gassmann & Enkel, 2014). The first refers to obtaining knowledge from competitors, consultants, clients, suppliers, universities or any other external agent. Outbound activities include licenses, sale of intellectual property, spin-offs or new partner firms; while joint activities are a combination of both terms.

Starting with the internal nature, its use for the development of innovation activities can significantly influence innovative performance (Garcés, 2023). Faced with this argument, other authors such as Chesbrough & Bogers (2014), through their open innovation model, ("open innovation"), suggest that the advantages derived from the choice of the internal route for the development of R&D activities have been reduced as a consequence of the greater mobility of knowledge workers, which makes it difficult for the company to appropriate and control R&D results by the company (Moreira & Ribau, 2024) and which constitutes a market failure (Restrepo, 2024).

Regarding the external nature, it is understood as adequate to access specialized knowledge not available internally and to exploit economies of scale associated with specialization (Sarango-Lalangui et al., 2023). It helps to reduce the costs and risks of its internal development (Restrepo, 2024), which would result in better performance.

Finally, with regards to joint activities, the literature reveals their potential advantages of efficiency gains derived from the division of labor (Sarango-Lalangui et al., 2023), access to specialized external knowledge that could be difficult or impossible to obtain internally, as was the case with the external channel, the sharing of costs and risks (Restrepo, 2024), access to public financing (Saran-

go-Lalangui et al., 2023) or the best control over exit spillovers (Shamah & Elssawabi, 2015).

Management academics mention open innovation as a new paradigm in business leadership styles (Anchayhua et al., 2025) According to Shamah & Elssawabi (2015), innovation in general can be divided into three phases:

1) Idea generation: refers to the process of gathering information about consumers and their needs, and then generating or identifying potential ideas (new products, services or technologies) that address these ideas.

2) Idea Development: Transform the most promising of these ideas into market-ready business opportunities by refining the five key elements of the business model (customer value propositions, profit formulas, key processes, key resources and key partnership).

3) Commercialization: the process of testing early hypotheses about the opportunity, adjusting the business model based on new knowledge, and expanding launch opportunities.

The open innovation process can be generated in any of the phases mentioned above; however, the development of organizational trust is necessary between organizations, within the organization and towards clients. This development includes workers, clients and other organizations (Silva-Atencio, 2025).

Table 1.

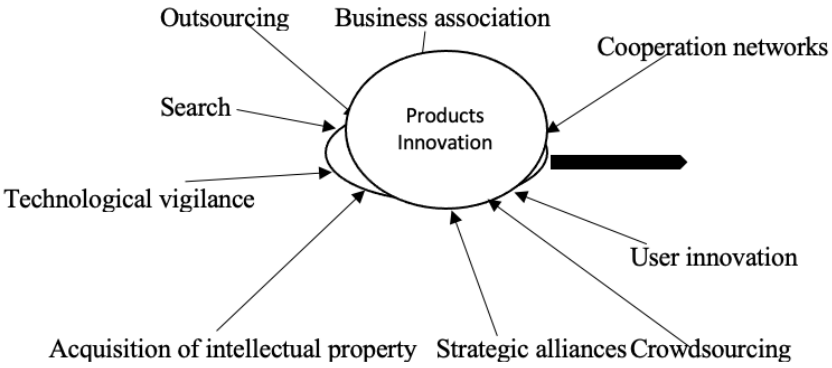
Inbound Open Innovation

INBOUND OPEN INNOVATION (external knowledge exploited inside the firm)		**Adaptation of Costa Rican Context**
Type of application	Description	Description
Search	is the exploration and analysis of information about technology, science, and innovation trends in outside sources.	Applicable in 100% of cases
Technological vigilance	is the organized searching, selective and permanent.	Applicable in 100% of cases
Acquisition of intellectual property	is the purchase of inventions or patents.	Applicable in 50% of cases, because 50% multinationals
Outsourcing	is contracting of external Research & Development services.	Applicable in 100% of cases
Business association	is the pooling of resources through a contract to obtain revenue.	Applicable in 100% of cases
Strategic alliances	is the agreement between two or more institutions with a common goal.	Applicable in 100% of cases
Cooperation networks	is a collaborative work between heterogeneous companies.	Applicable in 100% of cases
User innovation	relates to customer participating in the generation of innovation.	Applicable in 50% of cases, because 50% multinationals and foreign influence
Crowdsourcing	is involvement of the public in the generation of innovation.	Applicable in 100% of cases

Adapted from Chesbrough & Bogers (2014)

The inbound open innovation process can be generated in Costa Rican context in most of cases applicable like literature because they have a lot innovation, research and development in the SMEs, but is 50% applicable in cases like acquisition of intellectual property, because they work with companies from USA and Europe and they have the patent of 50% of exploitation of patents, the same case is with user innovation because they are replicating the pattern of user innovation of products in USA or Europe, because the products are created in many cases to export and the local citizens only adapt the technology. This Table 1 is important for the study because explain, the advance of inbound open innovation and SMEs in Costa Rican context and this is part of our study, and hypothesis.

Figure 1.
Scheme of applications of Inbound Open Innovation



Note: Adapted from Chesbrough & Bogers (2014)

Figure 1, shows the conceptual model of applications of inbound open innovation, understanding such as knowledges, capabilities, or technologies that from outside to inside the company enable innovation results, these actions can be used individually or in combination, if a company applies any of them, it is already developing the inbound strategy.

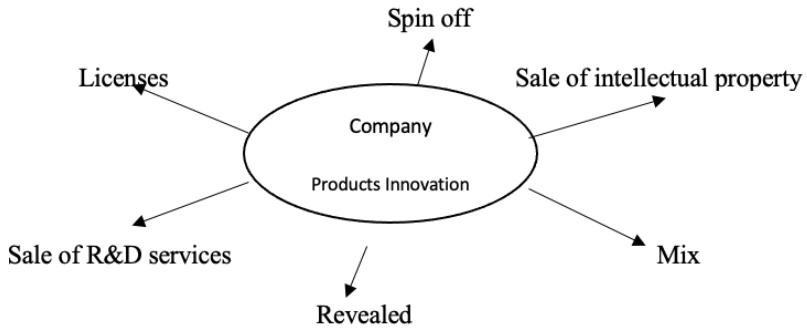
Table 2
Outbound Open Innovation

OUTBOUND OPEN INNOVATION (internal knowledge exploitation outside the firm)		**Adaptation of Costa Rican Context**
Type of application	Description	Description
Licenses	sale of rights of use or commercialization of an asset, usually intangible.	Applicable in 100% of cases
Revealed	is the disclosure of knowledge, science, or technology outside the institution.	Applicable in 100% of cases
Sale of intellectual property	is the sale of inventions, patents, trademarks, or authorships created within.	Applicable in 50% of cases, because 50% multinationals and foreign influence
Sale of R&D services	is the sale of research and development services.	Applicable in 100% of cases
Spin off	is creation of an independent company derived from a parent company.	Applicable in 50% of cases, because 50% multinationals and foreign influence
COUPLED (use of inbound and outbound open innovation)		
Mix	is when the firm apply both strategies of Open Innovation	Applicable in 100% of cases

Note: Adapted from Chesbrough & Bogers (2014)

The outbound open innovation process can be generated in Costa Rican context in most of cases applicable like literature because they have the infrastructure to sale: Licenses, Revealed and Sales of R&D services, however, this is applicable in the SMEs, but only in 50% of cases like: Spin off, and Sales of intellectual property, because most of the companies work with companies from USA and Europe and they have the patent of 50% of exploitation, the same case happens when the products are created to export and the local citizens only adapt the technology. This Table 2 is important for the study because explain, the advance of outbound open innovation and SMEs in Costa Rican context and this is part of our study, and hypothesis.

Figure 2.
Scheme of outbound and mix Open Innovation



Note: Adapted from Chesbrough & Bogers (2014)

Figure 2, shows the conceptual vision of the actions of the outbound and mix open innovation strategies, in a few words it can be described as knowledge, capabilities or technologies that from the inside out of the company allow generating profits and competitiveness, these applications can be used individually or in combination, if a company applies any of them, it is already developing the outbound strategy, if a company uses an inbound application with another outbound, it is developing a mixed open innovation strategy.

From this part we conclude, open innovation has influence in firm performance, and we propose the first hyphotesis:

H1: Open innovation has a positive influence on Innovative Performance.

Innovative Performance

Innovative performance is the degree of success achieved by companies in achieving objectives related to new products or services (Anchayhua, et al., 2025). Previous studies use a wide range of measures for innovative performance, such as innovative new products / services, levels at which a new product / service is successful, customer service, and financial success (Restrepo, 2024).

Much of the innovative performance comes from the organization's collaborators (Lee & Pati, 2017). Organizational learning ability is of utmost importance to obtain a positive impact on the mar-

ket. This is because the present characteristics allow to affirm the entrepreneurial orientation of the company and direct it to improve innovative performance (Anchayhua et al., 2025).

Van de Ven (2017) establishes that people will eventually carry out innovative transactions within an institutional order. Tseng, C. and Tseng, C. C. (2019) considers that it is necessary to have a longer-term vision of innovation and greater alignment with strategic objectives. It is also established that the strategic objectives have a positive and important relationship with innovation.

Evidence of a positive correlation between the use of open innovation and the company's innovative performance has been found. This in different industries and also for companies different in size and age (Restrepo, 2024).

The previous discussion resulted in the first hypothesis presented in a following section concerning open innovation and its positive influence on innovative performance. And then, for our study the dependent variable is innovative performance.

Strategic Orientation

Strategic orientation is the intentional positioning implemented by the organization to create a unique value proposition in order to achieve superior and continuous business performance. Pavón-Hernandez et al., (2015) postulates that strategic management presupposes a market-oriented view (customers, competitors, and the market environment), to support flexible strategies that are sensitive to rapid changes in customer behavior. This in contrast to the rigidity of long-term planning. Thus, it defines the general scheme of the strategy, which will be completed with the details of the strategy, content and implementation (Paucar et al., 2025).

On the other hand, the authors Cheng and Huizingh (2014) propose various edges under which the strategic orientation exists. These include entrepreneurial orientation, market orientation and resource orientation. Entrepreneurial Orientation is considered by companies as fundamental today; since, it allows acquiring risks to promote oneself in the market, through aspects such as innovation, proactivity, diversity of knowledge and diversity of direct and indirect contacts (Restrepo, 2024).

For this reason, numerous researchers have dedicated themselves to studying the incidence of this type of orientation in company processes. Among these processes, one of the significant variables of this project is innovative performance. Anchayhua et al. (2025) claim to have found the existence of a "positive and significant relationship between Entrepreneurial Orientation and Innovative Performance" (p. 161).

In addition, Market Orientation relates at establishing mentalities and instruments to satisfy the desires and real and latent needs of customers in general. Likewise, the brand and suppliers are taken into consideration, which are of vital importance within a framework of strategic orientation (Urde et al., 2013).

As a result of the previously observed importance, various authors have developed relevant re-

search in the field. This type of orientation represents a variable of significant influence on some business processes, including innovative performance. In this area, Restrepo (2024) mention that "the literature on Market Orientation has made it possible to establish a positive relationship between the market orientation and innovative behaviors" (p. 167).

Finally, the authors Cheng and Huizingh (2014) consider Resource Orientation as a careful analysis and planning of internal resources that provide greater performance. This is based on the fact that each organization has unique resources, without taking into account the knowledge of the competition. Strategic orientations, since they provoke a better performance of the company and the small ones with a prospective orientation can manage to surpass others, due to their greater proactivity and capacity to adapt, in addition to a greater use of their internal resources (Restrepo, 2024). External resources that can affect the internal environment are also present. Likewise, García et al. (2014) assure this by highlighting the importance of companies clearly defining the key resources that they will require, in order to properly manage innovation that increases their performance. It is also important to emphasize that studies show that innovation, through product differentiation, not only allows companies to survive; rather, it positively impacts its growth and profitability (Paucar et al., 2025). In addition, in the model proposed by Moreira & Ribau (2024), the capacity for innovation is understood as a result of the innovation process, that is, the ability of the organization to adopt and implement new ideas, processes or products successfully (Paucar et al., 2025).

The previous discussion resulted in another hypothesis related to Strategic orientation and Innovative Performance. From this part we conclude, strategic orientation has influence in firm performance, and we propose the second hypothesis:

H1: Strategic orientation has a positive influence on Innovative Performance.

Hypothesis of this research

Based on the theoretical framework and discussions presented before, the following hypothesis emerged in this study:

H1: Open innovation has a positive influence on Innovative Performance.

H2: Strategic orientation has a positive influence on Innovative Performance.

Rethinking evolution of business for the future based on Open Innovation

It is important to mention that both, outbound and inbound open innovation could really help to boost the development of new entrepreneurial ventures. The resulting spin-offs which could accelerate or detonate a clear strategy of open innovation. This could even be of more impact if universities or research centers actively participate in the applied innovation process along with companies collaborating to create a competitive innovation ecosystem. It is crucial to incorporate in this process a clear and lean license and patent registration procedures which in developing economies are fundamental for the social progress of our societies (Paucar et al., 2025).

Based on Akbar et al. (2021) undoubtedly, the onset of the digital era has caused a disruptive effect on organizations and, together with the impact of COVID-19, has accelerated the digital transformation processes in many organizations, which is forcing many of them to seek processes that allow them to maintain their competitive advantage through innovative models. Additionally, the proliferation of business through the Internet has eliminated barriers to entry in many sectors and industries, making it necessary to seek strategic alliances or new ways to position business models in the information age. Thus, the short-term implementation of spin off strategies from the combination of outbound / inbound innovation will be a requirement to survive in this new era.

This is why open innovation is becoming a viable strategy for organizations. However, many organizations have not been able to reach a successful level in this area, mainly because they do not have a clear roadmap on how to change their paradigms of their current business processes and start learning and undertaking new strategies based on innovation (Bigliardi et al., 2021).

According to Ahn (2020) to achieve this goal it will be necessary for organizations to initiate a process of learning and knowledge in the efficient use of management models based on open innovation. This process should start with the top-level management but including key operational personnel, to ensure the success of the business strategy.

This learning process will most likely involve a stage where traditional innovation models (with small returns) will have to coexist with open innovation management models (with radical leaps). The maturity of the organization will evolve through the creation of knowledge, expertise and experience, in order to generate new inventions that are difficult to replicate, along with the creation of stakeholder's value. We need to thinking forward the new evolution of business model in the coexistence of traditional innovation models and open innovation models for the exponential growth of creativity in business, new employees and increasing income and value for the society (Ahn, 2020).

3. METHODOLOGY.

Research Design

This study adopts a quantitative, cross-sectional, and explanatory research design to analyze the influence of open innovation and strategic orientation on innovative performance in SMEs operating in the ICT sector in Costa Rica. The research follows a positivist approach, using survey-based data and structural equation modeling to test the proposed hypotheses.

Population and Sample

The target population consisted of 400 SMEs registered in the ICT sector in Costa Rica. Data were collected through an online questionnaire distributed via email to company managers and decision-makers.

A total of 70 valid responses were obtained, representing a response rate of 17.5%. Although the sample size may appear limited, Partial Least Squares Structural Equation Modeling (PLS-SEM) is

particularly suitable for small samples and exploratory research models (Pavón-Hernández et al., 2015). The minimum sample size requirement was assessed using the "10-times rule," which indicates that the sample should be at least ten times the maximum number of structural paths pointing at any latent construct. In this model, the maximum number of arrows pointing at a dependent variable is two, thus satisfying the minimum threshold.

A non-probabilistic purposive sampling technique was used, targeting SMEs with fewer than 100 employees to ensure consistency with national SME classification criteria.

Instrument and Measurement

Data were collected using a structured questionnaire divided into five sections:

1. Respondent profile
2. Firm characteristics (control variables)
3. Strategic orientation
4. Open innovation
5. Innovative performance

All perceptual variables were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The measurement scales were adapted from validated instruments in previous studies, particularly Cheng and Huizingh (2014), ensuring content validity and theoretical alignment.

Data Analysis Procedure

The proposed conceptual model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM), implemented through SmartPLS software (version X.X).

PLS-SEM was selected due to:

- The exploratory nature of the model
- The relatively small sample size
- The non-normal distribution of survey data
- The predictive focus of the study

The evaluation of the model followed the two-step approach recommended by Restrepo-Morales et al. (2024)

1. Assessment of the measurement model
2. Assessment of the structural model

Measurement Model Assessment

The reliability and validity of the constructs were evaluated through:

- Cronbach's Alpha (≥ 0.70)
- Composite Reliability (≥ 0.70)
- Average Variance Extracted (AVE ≥ 0.50)

Discriminant validity was assessed using:

- Fornell–Larcker criterion
- Cross-loadings
- Heterotrait–Monotrait ratio (HTMT < 0.90)

All constructs met the recommended thresholds, confirming internal consistency, convergent validity, and discriminant validity.

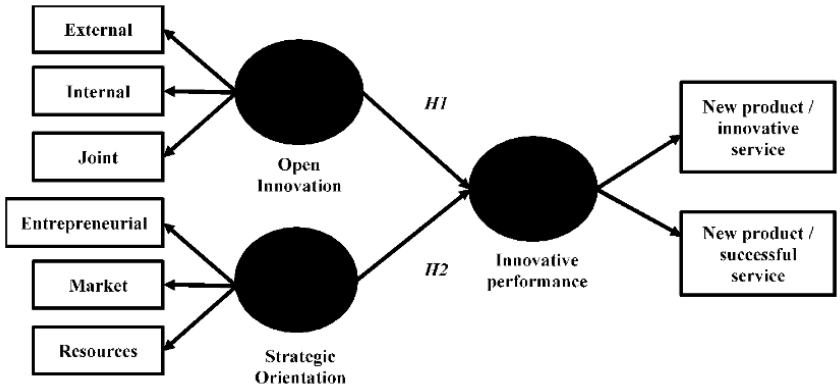
Structural Model Assessment

The structural model was evaluated by examining:

- Path coefficients (β)
- Statistical significance (bootstrapping with 5,000 resamples)
- Coefficient of determination (R^2)
- Variance inflation factor (VIF) to assess multicollinearity

Hypotheses were accepted when path coefficients were statistically significant at $p < 0.05$.

Figure 3.
Conceptual model



4. RESULTS

Figure 4 shows the results of the Partial Least Squares Regression Model (PLS). The relevan-

ce of the relationship between each component and its corresponding dimension is shown on the arrows of the diagram. Technically they are referred as factor loadings which provide the significance or relative weight of the corresponding component, for example the "External" component of the "Open Innovation" Dimension is .812, which weights highly in such relationship (factor loadings greater than .5 are significant).

Once the estimation of the model through the PLS algorithm has been carried out, it is determined that there is a moderate positive influence of open innovation and strategic orientation on innovative performance.

Figure 4.
Estimation of the Path model

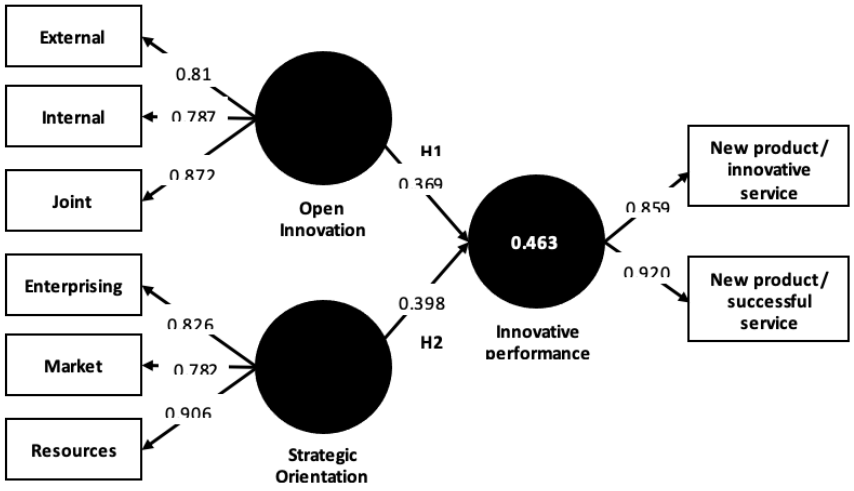


Figure 4 shows the results of all the factor loadings of each component, as well as the path coefficients, which indicate a moderate positive relationship between open innovation (0.369) and strategic orientation (0.398) on innovative performance. In addition, the result of R^2 is also presented, the latter indicates that both variables manage to explain 46.3% of the variability of innovative performance.

The evaluation of the internal consistency of the model is carried out through Cronbach's alpha and the composite reliability in which both values are above the allowed minimum of 0.70. On the other hand, convergent validity is measured by using the mean extracted variance (MEV) in which all the results exceed the established minimum criterion of 0.50. Two important findings of the model are, first of all the R^2 (0.463) is explained for both variables: Strategic Orientation and Innovative Performance. The second important point is variables like: External and Joint moderate the effect of Open Innovation more than 80%, and variables like: Enterprising and Resources moderate the effect of Strategic Orientation.

Table 3
Convergent validity and reliability

Construct	Cronbach's Alpha	Composite reliability	Mean extracted variance (MEV)
Innovative performance	0.741	0.884	0.792
Open innovation	0.768	0.864	0.680
Strategic orientation	0.794	0.877	0.704

Discriminant validity is evaluated using the Fornell-Larcker criterion, the cross-loading of constructs and variables and the Heterotrait-Monotrait (HTMT) matrix. Table 2 shows the results obtained for the first evaluation, in which it can be proven that the variance of the relationship between each construct is greater with its indicators than with the other variables.

Table 4
Discriminant validity (Fornell-Larcker criterion)

Construct	Innovative performance	Open innovation	Strategic orientation
Innovative performance	0.890		
Open innovation	0.598	0.824	
Strategic orientation	0.610	0.575	0.839

Table 3 shows the results of the second criterion used to evaluate the discriminant validity, in which this validity is confirmed as the factor loadings of each construct are higher with the variable they are measuring than with the others in the model.

Table 5
Cross factorial loads

Variable	Innovative performance	Open innovation	Strategic orientation
Product / Innovative Service	**0.859**	0.460	0.460
New Product / Successful Service	**0.920**	0.591	0.610
External	0.433	**0.812**	0.331
Internal	0.419	**0.787**	0.344
Joint	0.595	**0.872**	0.676
Enterprising			**0.826**
Market			**0.782**
Resources			**0.906**

To finalize the measurement of discriminant validity, the HTMT ratio is used, which manages to prove that the model has this validity by presenting values of the variables of open innovation and strategic orientation below 1, in relation to innovative performance.

Table 6
Heterotrait-Monotrait Ratio HTMT

Construct	Innovative performance
Open innovation	0.762
Strategic orientation	0.750

Measurement Model Assessment

Prior to evaluating the structural relationships, the measurement model was assessed to ensure reliability and validity.

All constructs demonstrated adequate internal consistency, with Cronbach's Alpha and Composite Reliability values exceeding the recommended threshold of 0.70. Convergent validity was confirmed, as the Average Variance Extracted (AVE) for all constructs was above 0.50.

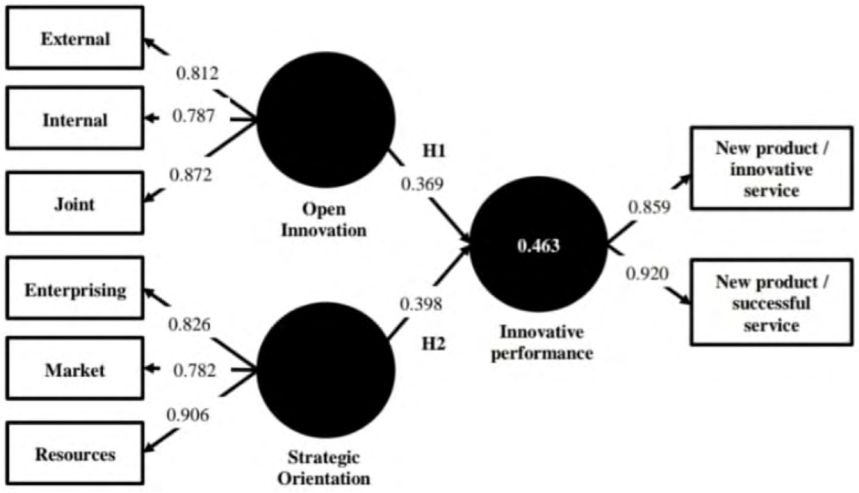
Discriminant validity was verified using the Fornell–Larcker criterion, cross-loadings, and the Heterotrait–Monotrait (HTMT) ratio, with all HTMT values below the conservative threshold of 0.90, indicating satisfactory discriminant validity.

Factor loadings for all indicators were above 0.70, confirming strong indicator reliability and supporting the robustness of the measurement model.

Structural Model Assessment

After confirming the adequacy of the measurement model, the structural model was evaluated using bootstrapping with 5,000 resamples to determine the statistical significance of the path coefficients.

The results indicate that:



Both relationships are positive and statistically significant, supporting H1 and H2.

The model explains 46.3% of the variance in innovative performance ($R^2 = 0.463$), which can be considered moderate explanatory power according to Pavón-Hernandez et al., (2015) and Restrepo-Morales et al. (2024).

Effect Size and Collinearity

The magnitude of the path coefficients suggests a moderate effect of both independent variables on innovative performance. Strategic orientation (β = 0.398) exhibits a slightly stronger influence compared to open innovation (β = 0.369), indicating that innovation outcomes depend not only on knowledge exchange mechanisms but also on the strategic alignment of firm capabilities.

Variance Inflation Factor (VIF) values were below the critical threshold of 3.3, indicating the absence of multicollinearity issues among predictor variables.

Interpretation of Findings

The findings demonstrate that both open innovation and strategic orientation significantly contribute to innovative performance in ICT SMEs.

The moderate effect of open innovation is consistent with previous studies (Akbar et al., 2021; Garcés, 2023), which argue that external knowledge flows enhance innovation outcomes, particularly in resource-constrained firms.

Similarly, the stronger coefficient observed for strategic orientation aligns with Cheng and Huizingh (2014), who suggest that open innovation practices generate superior performance only when embedded within a coherent strategic framework. This supports the perspective of the Resource-Based View, where strategic alignment determines the effective transformation of knowledge resources into competitive advantage.

Importantly, the results indicate that innovation practices alone are insufficient; rather, their effectiveness depends on the firm's entrepreneurial, market, and resource orientations.

5. DISCUSSION

This study provides empirical evidence that both open innovation and strategic orientation exert a positive and statistically significant influence on innovative performance in ICT SMEs in Costa Rica. The structural model explains 46.3% of the variance in innovative performance, indicating moderate explanatory power and confirming the relevance of these strategic drivers in emerging economy contexts.

The positive effect of open innovation (β = 0.369) supports prior empirical findings suggesting that the integration of external knowledge sources enhances innovation outcomes (Akbar et al., 2021; Garcés, 2023). However, the moderate magnitude of the coefficient suggests that open innovation practices alone are insufficient to fully explain innovative performance. This aligns with the argument of Chesbrough and Bogers (2014), who emphasize that open innovation mechanisms require complementary organizational capabilities to generate sustainable value.

The slightly stronger influence of strategic orientation (β = 0.398) reinforces the perspective

proposed by Cheng and Huizingh (2014), who argue that strategic alignment conditions the effectiveness of open innovation activities. In this sense, entrepreneurial, market, and resource orientations appear to function as enabling mechanisms that transform knowledge inflows and outflows into measurable innovation outcomes. These findings are consistent with the Resource-Based View (RBV), which posits that competitive advantage emerges not merely from access to resources, but from their strategic deployment.

Importantly, the results highlight that in SMEs operating in emerging economies, structural constraints such as limited financial resources, institutional instability, and restricted access to global networks may moderate the impact of open innovation practices. This may partially explain the moderate effect size observed. In contrast to firms in developed economies, where open innovation ecosystems are more consolidated, SMEs in Latin America may depend more heavily on strategic orientation to leverage external collaborations effectively.

Furthermore, the results suggest that strategic orientation may act as a complementary capability that enhances the impact of open innovation, rather than operating independently. Although the present study did not test interaction effects, the relative magnitude of the coefficients indicates a potential synergistic relationship worth exploring in future research.

From a managerial perspective, the findings imply that SME managers should avoid adopting open innovation practices in isolation. Instead, firms should integrate these practices within a coherent strategic framework that fosters proactivity, market responsiveness, and efficient resource allocation. Without such alignment, knowledge exchange mechanisms may not translate into improved innovation performance.

The study contributes to the literature in three main ways. First, it provides empirical evidence from an underexplored Latin American ICT context. Second, it simultaneously examines open innovation and strategic orientation as complementary determinants of innovative performance. Third, it offers quantitative validation using PLS-SEM, reinforcing the predictive capacity of the proposed model.

6. CONCLUSIONS

This study examined the influence of open innovation and strategic orientation on innovative performance in ICT SMEs operating in an emerging economy context. The empirical findings confirm that both constructs exert a positive and statistically significant effect on innovation outcomes, explaining 46.3% of the variance in innovative performance.

Beyond statistical confirmation, the results suggest that innovation performance is not solely determined by the adoption of open innovation practices, but rather by the strategic capacity of firms to align external knowledge flows with internal orientations. In this sense, strategic orientation appears to function as an enabling mechanism that enhances the effective transformation of knowledge resources into innovation outputs.

From a theoretical standpoint, this research contributes to the literature by integrating open innovation and strategic orientation within a single predictive model. The findings reinforce the assumptions of the Resource-Based View by demonstrating that access to knowledge is insufficient without strategic deployment capabilities. Furthermore, the study extends open innovation research into a Latin American ICT SME context, a setting that remains underrepresented in empirical studies.

Methodologically, the use of PLS-SEM provides robust predictive validation of the proposed relationships, offering quantitative evidence that supports the complementarity between external collaboration mechanisms and internal strategic orientations.

From a managerial perspective, the results suggest that SME managers should avoid implementing open innovation initiatives as isolated practices. Instead, firms should embed external collaboration strategies within a coherent strategic framework that fosters entrepreneurial behavior, market responsiveness, and efficient resource management. This integrated approach increases the likelihood that open innovation efforts translate into measurable performance improvements.

Limitations

Despite its contributions, this study presents certain limitations. First, the cross-sectional design restricts the ability to infer causal relationships over time. Second, the data were collected from a single country, which may limit the generalizability of the findings to other institutional contexts. Third, the model does not incorporate moderating or mediating variables, such as absorptive capacity or dynamic capabilities, which may further explain the transformation of knowledge into innovation outcomes.

Future Research Directions

Future research should consider longitudinal designs to capture the dynamic evolution of open innovation strategies and their long-term impact on performance. Additionally, incorporating moderating variables such as absorptive capacity, organizational learning, or institutional support could provide deeper insight into the mechanisms underlying innovation success in emerging economies.

Comparative cross-country studies would also be valuable to determine whether the relative importance of strategic orientation varies across institutional environments. Finally, future models could test interaction effects between open innovation dimensions and strategic orientation to explore potential synergistic relationships.

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