Eco-innovation and performance of SMEs in Ecuador

Eco-innovación y los resultados de las PYMEs en Ecuador

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Abstract

Purpose – This article presents a new approach to modeling the relationships of eco-innovation. The impact of eco-innovation on organizational performance is well known, but the opposite direction has not been explored.
Design/methodology/approach – The research used an online questionnaire survey emailed to 100 Ecuadorian managers. Data obtained from the 62 respondents were analyzed through structural equation modeling.
Findings – The results confirm that while eco-innovation increases company performance, higher performance is negatively related to eco-innovation, with managers preferring to dedicate company resources to projects with more significant benefits and lower outlay.
Research limitations/implications – This study was conducted in one country, so generalizability may be limited. Moreover, the cross-sectional data prevent inferences of causality.
Practical implications – Eco-innovation activities are important to managers and can help them with a new definition of company strategy. The findings confirm that eco-innovation drives performance but not vice versa. It could be necessary to modify the strategy to create a sustainable business.
Originality/value – The results elucidate both directions of the relationship between eco-innovation and performance, representing a new contribution to the literature. The results also confirm that eco-innovation activities are valuable tools in building and developing emerging economies.

Keywords Eco-innovation, Sustainable development, Environment, Organizational performance
Paper type Research paper

Resumen

Propósito – Este documento presenta un nuevo enfoque del modelo de la eco-innovación. La relación entre la eco-innovación y el resultado empresarial es bien conocida. Sin embargo, la relación inversa no ha sido investigada con la misma dedicación.
Diseño/metodología/enfoque – En nuestra investigación utilizamos el método de encuesta electrónica. Se enviaron cuestionarios a 100 gerentes ecuatorianos, recibiendo las 62 respuestas válidas. Los datos obtenidos se analizaron mediante modelos de ecuaciones estructurales.
Hallazgos – Los resultados confirman que las eco-innovaciones aumentan el resultado de la empresa. Sin embargo, la relación inversa tiene signo negativo; en este contexto, los directivos prefieren dedicar los recursos

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de la empresa a diferentes proyectos con mayores beneficios y menor gasto que aquellos centrados en la eco-innovación.

Originalidad – Nuestros resultados completan el análisis de las relaciones entre la eco-innovación y el rendimiento empresarial y representan una nueva contribución a la Academia. Los resultados también confirman que las actividades de eco-innovaciones son herramientas valiosas para construir y desarrollar economías en mercados emergentes.

Limitaciones/implicaciones de la investigación – Este estudio se realizó en un entorno específico de un país, por lo que las generalizaciones son limitadas. Nuestros datos son intersectoriales, lo que dificulta establecer relaciones de causalidad.

Implicaciones prácticas – Los resultados de las actividades relacionadas con la eco-innovación son importantes para los gerentes y pueden ayudarlos redefinir la estrategia de la empresa. Los resultados confirman que la eco-innovación impulsa el rendimiento y muestra que no existe la misma relación entre el rendimiento y las eco-innovaciones. Se podría sugerir que es necesario modificar su estrategia para crear un negocio sostenible.

Palabras clave Eco-innovación, Desarrollo sostenible, Medio ambiente, Performance organizacional

Tipo de papel Trabajo de investigación

1. Introduction

Innovation is a strategic factor used by companies to improve or maintain their competitive position in dynamic markets (Doran and Ryan, 2012). However, market uncertainties frequently change customer expectations, and social pressure has compelled change in companies' ability to innovate (He *et al.*, 2018; Morais Pereira *et al.*, 2020). Responding to these demands, several companies have focused on green technology (Leoncini *et al.*, 2017). By combining technology, innovation, and social development, companies try to find new ways to grow and develop (Halila and Rundquist, 2011). However, the corporate strategy must maintain an equilibrium between improving profitability, minimizing environmental degradation, and maintaining social development. To this end, companies should embrace the new managerial concept of eco-innovation – "the creation of products or processes that reduce the environmental impact, when compared with alternatives, and still promote better economic performance" (Morais Pereira *et al.*, 2020, p. 479).

Eco-innovation improves firm performance when applied systematically and deliberately (Cainelli *et al.*, 2012; Scarpelini *et al.*, 2019). This strategic concept permits the integration of environmental considerations into operational decisions, bringing positive long-term effects to the company's environment (Baumgartner, 2011; Liao and Liu, 2021). According to this, eco-innovation creates value and profit, improves firm performance, and represents a source of competitive advantage. From this perspective, eco-innovation seems an attractive means to reach a consensus between activities and decisions that often have the contrary character. However, it is necessary to consider whether this management concept could be applied in all settings.

According to Iqbal and Keay (2019), the concepts of sustainability and eco-innovation mainly appeal to large companies, whereas small and medium-sized enterprises (SMEs) typically prioritize rapid, short-term growth (Das *et al.*, 2020), even though flexibility to adapt to the environment can confer a competitive advantage, especially in today's dynamic markets (Haskas *et al.*, 2021).

Eco-innovation has been perceived as a strategic concept allowing creative synergies in environmental protection activities in different regions and areas. In most regions, the majority of companies are SMEs, which can become more efficient through this synergy (Horbach *et al.*, 2012). Levels of innovation vary significantly between regions and countries. Popp (2006) argues that company innovation is driven by domestic rather than foreign laws. In recent years, many governmental institutions have recognized the value of eco-innovation, especially in terms of market potential (Díaz-García *et al.*, 2015; Yan *et al.*, 2022).

The last decade has brought a growing interest in innovation activities in Latin America (Barriga Medina *et al.*, 2022; Morais Pereira *et al.*, 2020; Pineda Escobar, 2022; Sanchez-Henriquez and Pavez, 2021). The ongoing disconnect between firms' innovation models and performance in this region could be explained by specific firms' behaviors, policy effects, and innovation models (Santos *et al.*, 2014).

Given its economic and political stability, Ecuador is a compelling case to study. Dollarization has made the operating environment less volatile and more predictable, and thus a favorable setting for examining reasons for the abovementioned disconnect. The stability of the business environment significantly influences managers' decisions, including investments in innovation, such as eco-innovation.

A firm's success depends on its performance level. Performance reflects the extent to which strategic objectives are achieved (Almatrooshi *et al.*, 2016). From a strategic perspective, there is a universal consensus that eco-innovation is good for business (Berrone *et al.*, 2013; Doran and Ryan, 2012). A company's eco-innovation positively impacts on economic performance and improves the capacity to capture new growth opportunities and increase competitiveness (Kiefer *et al.*, 2017).

Following the institutional theory approach (Scott, 2005), organizations must fit well with their social environment to achieve innovativeness. In this respect, firms tend to adopt practices that will enhance perceived social perception within an institutional field. According to Axtell *et al.* (2000), innovation is a social process in which activities' realization depends on environmental aspects. Innovative success is a function of the social characteristics of activities that encourage performance improvement and the undertaking of cooperative strategies. The organization is environmentally and socially focused on pursuing cost reductions, improved relationships with business partners, and the creation of new market opportunities. The actions targeting these objectives will influence company performance (Kochalski, 2016). Through a reciprocal relationship, corporate social responsibility (CSR) activities stimulate innovations and these innovations promote CSR (Gadaf *et al.*, 2013; Szutowski *et al.*, 2016). For companies to be innovative, they must respect the social impact of their operational processes. CSR is considering a part of the firm's strategy that facilitates decisions targeting higher competitiveness and value. The relationship with innovation, especially eco-innovation, permits the creation of more efficient and effective operations with less environmental impact and guarantees a company's long-term competitiveness (Gadaf *et al.*, 2013).

However, the question arises whether enhanced performance reciprocally boosts eco-innovation. Previous studies have shown that implementing eco-innovation can provide important benefits for companies, yet the relationship between profits and eco-innovation likely depends on the compensation companies receive. In other words, the relationship between eco-innovation and performance may not be positive in both directions.

Previous research focuses mostly on factors influencing the impact of eco-innovation on performance. However, this relationship has not previously been studied in any emerging economies of South America. Also, no research has investigated how performance impacts on eco-innovation. Our research aims to address these gaps. We draw on eco-innovation research to hypothesize that SMEs differ in their evaluation of eco-innovation benefits and in their related decisions. We test our hypotheses using structural equitation modeling with data collected from Ecuadorian SMEs. Our results confirm that managers value the benefits of eco-innovation differently. We show that eco-innovation is important for SMEs, especially if it allows them to reduce their costs and improve performance. By contrast, we find that performance growth does not lead to firms increasing their investment in eco-innovation.

Overall, this article aims to develop a complete conceptual framework for the relationship between eco-innovation and performance. The remainder of the article proceeds as follows. Section 2 presents the theoretical framework and develops the hypotheses. Section 3 then

describes the methodology. Next, Section 4 reports the results, which are then discussed in Section 5. Sections 6 and 7 respectively present the study's theoretical and managerial implications. Finally, Section 8 concludes and outlines the study's limitations.

2. Theoretical framework and hypotheses development

In recent years, eco-innovation has received increasing focus among researchers, entrepreneurs, and managers (Díaz-García *et al.*, 2015). Thus, the concept's definition is continuously modified as knowledge increases on the different relationship factors between innovation and the environment (Klewitz *et al.*, 2012). Kiefer *et al.* (2017) suggest that eco-innovation lacks a precise definition because of its multifactorial nature. Various studies have investigated different aspects, factors, and elements of eco-innovation. However, there is no universal definition of this phenomenon (Kiefer *et al.*, 2017; Klewitz *et al.*, 2012). Oltra and Saint-Jean (2009, p. 1) proposed that eco-innovations "consist of new or modified processes, practices, systems, and products which benefit the environment and so contribute to environmental sustainability." According to Charter and Clark (2007, p. 9), eco-innovation is "a process where sustainability considerations (environmental, social, financial) are integrated into company systems from idea generation through to research and development (R&D) and commercialization." Eco-innovation could, thus, be considered a bidirectional process between a company and its environment.

Previous studies have analyzed eco-innovation from various perspectives. Horbach (2014) emphasized cost savings as an important reason for eco-innovation; Frondel *et al.* (2007) found that adequate government strategy is more important than single-project proposals as a motivation for eco-innovation; Del Rio Gonzalez (2009) show that strong legal regulation and firms' image and market position are the primary drivers of eco-innovation activities; and Arimura *et al.* (2007) show comparable results for the effect of regulation on eco-innovation R&D.

Companies are increasingly investing in eco-innovation, albeit sometimes accidently (Baumgartner, 2011). It is, therefore, critical to identify the principal factors promoting the implementation of eco-innovation. Bossle *et al.* (2016) identify two groups of eco-innovation drivers: (1) external regulatory and normative pressures, including government regulations; and (2) market and technology expansion considerations and internal pressures.

Several studies have identified regulation as a principal driver of eco-innovation (Carrillo-Hermosilla *et al.*, 2010; Chen *et al.*, 2012; Peiro-Signes *et al.*, 2022; Zhang *et al.*, 2011). Doran and Ryan (2012) found that regulations improve firms' motivation to engage in eco-innovation. However, there are two contrary perspectives on how environmental regulation influences innovation and performance.

First, environmental regulations interfere with firms' competitive nature and reduce their productivity, thus impacting their ability to trade internationally. Johnstone *et al.* (2010) and Horbach *et al.* (2012) found evidence that regulations establishing a regular price for creating pollution (especially air, water, and waste pollution) motivated firms to offset these costs by increasing their prices. Leitner *et al.* (2010) argue that when strict environmental procedures are imposed, they cause smaller firms' financial problems and consequently reduce innovation. However, financial requirements may not be the primary reason to justify socially compliant managerial practices (Berrone and Gomez Mejia, 2009).

Second, from a social point of view, this strategic position of eco-innovation could be an excellent opportunity for companies in South America, given the prevailing socio-economic characteristics. Problems such as low industrial productivity (Aboal and Tascir, 2018), high informal employment (Zuniga and Crespi, 2013), limited innovation in the commercial area (Frank *et al.*, 2016), and low self-employment (Hall *et al.*, 2012) could all be addressed by investing in processes that contribute to sustainable development.

Despite improvements in conditions for eco-innovation in South America, many opportunities are yet to be exploited, particularly in terms of private and public institutional R&D, and links between academia and businesses. Motivation to implement eco-innovative projects and activities remains low, and few government policies help companies to leverage private financing (Rozenwurce *et al.*, 2008). In most Latin American countries, tangible and intangible public resources devoted to R&D should promote companies' eco-innovation. However, economic and political instability may dissuade private investors from financing environmental projects, while public money may be limited by the risk of ineffective and inefficient use (InnovaLatino, 2011). South American companies have introduced eco-innovation to improve perceptions of their brands. They have used several initiatives to implement green technologies and products to reduce barriers, eliminate bureaucratic problems, and have difficulties in the development of environmentally friendly technologies (Doran and Ryan, 2012; Morais Pereira, 2020).

The global environment demands more significant efforts toward developing innovations, especially eco-innovations, which could improve firms' efficiency and performance (Chen, 2008). However, companies must resolve existing problems between economic, social, and environmental criteria affecting performance (Aragón-Correa, 2008). The multifaceted nature of eco-innovation includes process design and a combination of environmental elements and factors.

Previous research has presented the relationship between eco-innovation and company performance in various ways. This relationship is not as direct as might be expected (Szutowski and Ratajczak, 2016). In most cases, positive results are achieved for individual projects. Could this positive relationship be generalized to a whole country or region?

A critical topic when analyzing eco-innovation is the organization's social context. Studies of social aspects of innovations in management processes offer especially interesting insights. Eco-innovation has often been analyzed using systems theory and institutional theory (Young, 2012). According to these theories, organizational behaviors include all activities and decisions related to designing and manufacturing new products, implementing new technologies, and defining new procedures at each management level. When developing organizational activities, managers' decisions focus on performance behavior and perception of innovation results (Walton and Kemmelmeier, 2012).

During the last decade, eco-innovation has received increasing academic attention (Rexhepi *et al.*, 2013). The importance of eco-innovations and their impact on a firm's performance has been perceived as a management model (Porter and Kramer, 2011). On the one hand, eco-innovation is considered crucial to understanding the link between management decisions and a firm's economic and social performance (Ghisetti and Rennings, 2014). On the other hand, companies' ecologically and socially oriented decisions improve relations with stakeholders, enhance business competencies, and provide new market opportunities (Rexhepi *et al.*, 2013). Consequently, eco-innovation has been recognized as an important driver of a company's results.

Various internal and external elements, specific to each market area, influence the relationship between eco-innovation and performance (Heras-Saizarbitoria *et al.*, 2011; Horbach *et al.*, 2012). Such factors include regulation, customer perceptions of the firm, external connections, and organizational knowledge (Doran and Ryan, 2012). These aspects may have important implications for firm performance (Bossle *et al.*, 2016).

However, there is no consensus on the relationship between eco-innovation and firm performance. Porter and Kramer (2011) suggest that innovative products give the organization a significant competitive advantage, which will increase business performance. This hypothesis is supported by Doran and Ryan (2012), Wang and Sarkis (2013), and Lee (2015). In the South American region, Barriga Medina *et al.* (2022) reported a significant positive relationship between eco-innovation and performance in a sample of 214

manufacturing companies in Colombia, Ecuador, and Peru. However, Filbeck and Gorman (2004) and Brännlund and Lundgren (2010) suggest a contrary relationship and argue that "green" investments reduce profitability for most firms.

The current study analyzes the relationship between eco-innovation and performance in Ecuador. We expect that many companies implementing eco-innovation will gain substantial material savings, consistent with Porter and Kramer's (2011) hypothesis. Accordingly, we propose the following research hypotheses:

H1. Performance has a positive influence on eco-innovation.

H2. Eco-innovation has a positive influence on performance.

In summary, achieving better economic outcomes may motivate firms to integrate eco-innovation into their strategy (Zhu and Sarkis, 2004), while introducing projects, products, or activities related to eco-innovation may bring firms new opportunities to increase their competitiveness.

3. Research methodology

3.1 Research design and data collection

This study sought to examine data for respondents' perceptions of eco-innovation in Ecuador. A questionnaire survey was conducted with randomly selected Ecuadorian firms operating in various sectors and with annual sales ranging from below USD 10 million to over USD 60 million (see Table 1). Seven demographic questions were included to identify each respondent's job level and department, the company's location, and the nature of its business. These questions served to identify which respondents are relevant to our research. We followed guidance from Dillman (2000) and Scandura and Williams (2000) on creating and

Age of company (average in years)	20
Size (number of employees)- average)	*230*
Legal form (% of firms)	
- Public companies (PC)	16%
- Limited liability companies (Cía. Ltda.)	39%
- Public limited company (SA)	45%
Level of annual sales	
Between 10–60 million USD	*20*
Above 60 million USD	*46*
Economic activity (% of firms)	
- Commercial	*20%*
- Industry	*31%*
- Service	*15%*

Note(s): The initial sample included 100 companies. The first stage of research took place in the autumn of 2019. After the first mailing, the response rate was 12%, which was insufficient for this study (Basnet *et al.*, 2003). The second stage and mailing conducted in January and February 2020 increased the number of returned questionnaires to 66, giving a response rate of 66%. This rate is satisfactory based on a comparison with similar studies (Horbach *et al.*, 2012; Kesidou and Demirel, 2012). Concerning the required sample size, we established its minimum by applying two methods: the inverse square root method, which requires a sample size of 9 for a 0.8244 power, and the gamma-exponential method requiring a minimum sample size of 8 for a 0.8086. Therefore the 66-sample size used is enough to reach adequate statistical power

Source:(s): Developed by the authors. Data obtained through quantitative research instruments between autumn 2019 and February 2020

Table 1.
Details on the final sample

conducting a successful online survey. Specifically, we emailed a link to the web-based questionnaire to the manager of each organization in the sample.

Measurement scales for the constructs were adapted from extant literature: Acs and Audretsch (1993), who examined the economic role of technological change and its influence on innovation that reflect their impact on firm perception and environment; Arundel and Kemp (2009), who studied the influence of innovation on company growth, costs, and sales, which have especially significant for eco-innovation; and Xue *et al.* (2012), who assessed the competitiveness, innovation expenditures, and relative patent advantages related to R&D intensity, new product and process patents, and market value in complex environments of the IT sector. Following Ciliberti *et al.* (2009), we also questioned respondents' knowledge and perception of eco-innovation strategy. Perceptions of eco-innovation depend somewhat on the cultural values of different regions and organizations, which may influence managers' behavior (Pache and Fulconis, 2005). We, therefore, expect some variations in respondents' interpretation of the eco-innovation concept.

The constructs of eco-innovation and performance were measured by five and three items, respectively. Each item was answered on a five-point Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree"), which is a commonly accepted approach (Kumar *et al.*, 1993). Following Dillman (2000), the research questionnaire was pretested through interviews with Ecuadorian managers, whose feedback was implemented by revising several items to improve overall comprehension. This process served to establish the content validity of the research instrument. When the data collection period finished, we checked for non-response bias by comparing randomly selected responses from the earlier survey phase and the later survey phase. As there were no significant differences between early and late responses, we concluded that nonresponse bias was not an issue (Armstrong and Overton, 1977).

Because all data were collected through a questionnaire, it was also necessary to check for common method bias (Podsakoff *et al.*, 2003). Harman's single-factor test showed that each variable explained less than the suggested 50% threshold of the total variance. Moreover, the results of exploratory factor analysis showed that regression weights for models with and without common latent factors had deltas substantially below the commonly used threshold of 0.20. The findings of both tests suggest that common method bias was not a problem in this research.

3.2 Variables and measurement

The first section of the questionnaire included five items concerning various aspects of eco-innovation in the company's management process:

Q1. In most cases, firms are not aware of eco-innovation actions and have difficulty making decisions based on the eco-innovation criteria strategy.

Q2. In my company, eco-innovation projects have required meaningful funding from the R&D budget, leading to conflict between managers.

Q3. In general, the eco-innovation strategy supports popular issues that may influence perceptions of the company's brand.

Q4. The greatest obstacle to understanding the strategic role of eco-innovation in the process of change was related to its influence on the firm's environment.

Q7. In the global business environment, the capacity to implement eco-innovation is increasingly linked to firms' competitiveness.

The second section of the questionnaire measured performance using the following three items:

Q5. Economic performance (profit) is directly related to innovation but also associated with social and environmental costs.

Q6. Given the particularity of the business, the environmental profits from eco-innovation can result in cost reduction.

Q8. Adoption of an eco-innovation strategy and the implementation of green services, products, and practices produce a cost-saving effect and sales growth.

3.3 Control variables

As control variables, we included firm size and ownership to check extraneous effects related to the firm type and industrial sector. We used the number of employees to measure firm size, consistent with extant research (Horbach *et al.*, 2012). Due to operational differences between distinct types of firms, we measured firm ownership using a dummy variable (1 = publicly owned, 0 = privately owned).

3.4 Validity and reliability

We followed a rigorous process to develop and validate the instruments used in this study. Content validity was ensured by a careful literature review and pilot tests to verify and improve survey items. A series of analyses were performed to check the reliability and validity of each construct. The developed model was specified and estimated using structural equation modeling. To evaluate the model's reliability and validity, a confirmatory factor analysis was conducted using IBM SPSS Amos 23 software (see Table 2).

We also calculated Cronbach's α and composite reliability (CR) values to test the constructs' internal consistency. Cronbach's α measures the degree to which a set of items measures a single unidimensional latent construct, and values of 0.7–0.8 are commonly considered an acceptable standard of reliability (Cronbach, 1951). In this research, Cronbach's α values for eco-innovation and performance were 0.797 and 0.728, respectively. CR reflects the internal consistency of indicators measuring a given factor (Fornell and Larcker, 1981), and a value ≥ 0.70 is considered acceptable (Fornell and Larcker, 1981). In this research, the CR values for eco-innovation and performance were 0.786 and 0.745, respectively. These results confirm that the constructs had acceptable internal consistency (see Table 3).

Component matrix

	Component	
	Eco_innovation	Performance
@1einnov	0.576	−0.223
@2rdbudget	0.120	0.775
@3imppercept	0.794	−0.040
@4impreduce	0.590	−0.045
@5einnovprofit	0.573	−0.553
@6einnovcosts	0.396	0.058
@7einnovcomp	0.674	0.306
@8einnovsales	0.652	0.278

Note(s): Previously to the CFA, the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was evaluated. This yielded a value of 0.752, which is conveniently proximate to 1. Table 2 shows the two obtained principal components

Source:(s): Developed by IBM SPSS AMOS 19.0

Table 2. Extraction Method: Principal Component Analysis. 2 components extracted

Test statistics	Value	Value interpretation
Chi-Squared test	0.720	Chi-Squared =<2
Comparative Fit Index (CFI)	1.000	0.90 =<CFI =<1
Normed Fit Index (NFI)	0.826	0.90 =<NFI =<1
Non-Normed Fit Index (NNFI)	1.000	0.90 =<NNFI =<1
Root Mean Square Error of the Approximation (RMSEA)	0.089	0 < RMSEA< 0.1
Incremental fit index (IFI)	0.952	0.90 <IFI <1
Tucker–Lewis Index (TLI)	1.000	0.90 < TLI <1
Parsimony-Adjusted Measures (PCFI)	0.644	0.50> PCFI<1
CMIN/DF	0.810	CMIN/DF =< 2

Note(s): Model quality indices show a satisfactory goodness-of-fit with a high probability level of 0.893 and a CMIN of 0.623 well below the commonly admitted value of 2 as the threshold. To assess model fit, a covariance matrix was created (Jöreskog and Sörbom, 1981). The fit indices associated with the model showed acceptable values, indicating that the model is acceptable, and the convergent validity is achieved (O'LearyKelly and Vokurka, 1998)

Source:(s): Developed by IBM SPSS AMOS 19.0

Table 3.
The model fit indices

4. Results

Figure 1 depicts the relationships between dimensions in the model, showing the impact of eco-innovation on performance and vice versa. According to the results, all model relationships are statistically significant.

In the first step of the analysis, a model was specified to test the research questions and estimated using structural equation modeling. Two sets of linear equations were formally defined, creating two models: the inner model specifies relationships between unobserved or latent variables, while the outer model specifies relationships between latent variables and their associated observed or manifest variables (Gefen *et al.*, 2000).

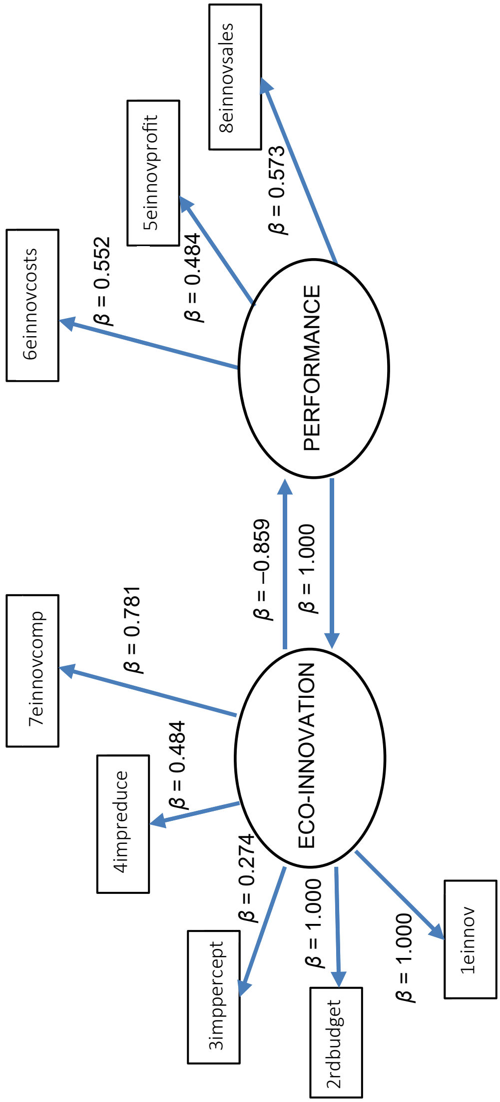
Our hypotheses were based on the expectation that both eco-innovation and performance would be positively related to companies' adoption of a "green" strategy. However, the empirical results suggest that this is not the case. Specifically, the data analysis results show positive relationships between all variables except between performance and eco-innovation where the relationship is found to be negative (see Table 4).

Our results support the prediction of H1, consistent with previous findings that green design is a useful tool for improving organizational performance (Almeida and Wasim, 2022; Barriga Medina *et al.*, 2022; Wang and Sarkis, 2013).

However, the positive relationship between increased eco-innovation activities and firm performance is marked by discrepancies related to managers' negative behavior that reflect the inversion decisions, contrary to H2. It could be suggested that managers prefer to dedicate company resources to projects that offer more significant benefits and lower outlay compared to eco-innovation activities. This would be consistent with Cuerva *et al.*'s (2014) observation that technological and personal knowledge in low-tech sectors fosters conventional innovation but not eco-innovation.

5. Discussion

It is important to note that innovation is a critical factor in business performance management (Szutowski *et al.*, 2017). Although eco-innovation was found to positively influence firm performance, it is evident that several barriers still hinder the development of eco-innovation in Ecuador. Eco-innovations are still perceived as a final stage of environmental protection technologies and activities, rather than as cross-cutting innovations EIO (Eco-innovation Observatory, 2012). In most cases, eco-innovation is still



Note(s): A positive relationship means that an increase in an independent variable's value will increase the value of the related dependent variable. In the case of a negative relationship, the opposite effect occurs; the results show that as a firm's performance improves, eco-innovation activities are reduced ($\beta = -0.859$; $p < 0.05$). In the inverse relationship, increases in a firm's activities related to eco-innovation strongly reinforce increases in the firm's performance ($\beta = 1{,}000$; $p < 0.05$), coinciding with previous studies

Source(s): Developed by the authors

Figure 1.
Research model

			Estimate	S.E.	C.R.	P
@1 einnov	<—	Eco-innovation	1.000			
@2 rbudget	<—	Eco-innovation	1.000			
@3 imppercept	<—	Eco-innovation	274	139	1.654	***
@4 rdbudget	<—	Eco-innovation	484	0.266	2.665	0.005
@7 einnovcomp	<—	Eco-innovation	781	0.410	3.295	0.003
@5 einnov	<—	Performance	0.484	0.216	1,635	***
@6 einnovcosts	<—	Performance	552	0.297	2.385	0.004
@8 einnovsales	<—	Performance	573	0.314	2.953	0.003
Eco-innovation	<—	*Performance*	*−859*	*0.767*	*2,406*	***
Performance	<—	*Eco-innovation*	*1,000*	*0.483*	*2,388*	***

Note(s): Figure 1 depicts the proposed model in schematic form and maximum likelihood parameter estimates. All of them (Table 4) are statistically significant and show a p-value<0.05. The reciprocal postulated relationship between Eco-innovation and Performance was significant (***$p < 0.000$)
Source:(s): Developed by IBM SPSS AMOS 19.0

Table 4.
Estimates for the structural coefficients

perceived as the path to achieving cleaner production, rather than a cross-sector, interdisciplinary innovation strategy capable of offering information and cooperation opportunities and a foundation for synergistic networks.

In many cases, strong environmental procedures are viewed as a cost and not an opportunity. Company managers and consumers have relatively low awareness of the benefits achievable through implementing eco-innovative technologies. Managers prefer to invest in the cheapest techniques for achieving commercial goals while respecting legal requirements. Many managers also fail to recognize the profits that can be realized through interorganizational cooperation.

Current weaknesses in Ecuador include the private sector's low involvement in financing environmental R&D projects. Moreover, limited financial resources result in low collaboration between universities and companies, which reinforces the barrier to transferring strategy and technology (EIO, 2012), even though knowledge exchange would help companies to achieve ecological goals (Wong, 2013). While university researchers are not oriented toward the technological and strategic needs of enterprises, firms generally do not ask for patents or set conditions for establishing collaboration agreements. Furthermore, Ecuador's public sector depends excessively on external funds as its principal source of finance. However, these financing resources are another important source of eco-innovation; according to Klewitz *et al.* (2012), Veugelers (2012), and Varadarajan (2017), government proactivity is critical to motivating the implementation of eco-innovation by SMEs. Moreover, Gee and McMeekin (2011) contend that eco-innovation ideas and projects are conceived and developed to solve ecological problems. The government thus plays a critical role in the definition and promotion of innovation systems through implementing specific laws and legal arrangements.

Eco-innovation collaboration can involve many public entities, private organizations, specific programs, and funds, focusing efforts on developing and implementing environmental technologies. Today's customers care about protecting the environment, especially when they see innovation as enhancing a product. Their willingness to buy eco-friendly products increases when such products meet their needs (Doran and Ryan, 2012; Horbach *et al.*, 2012). However, consumer awareness of the advantages of eco-innovation remains weak, which limits the impetus for businesses to prioritize eco-innovation.

Although interest in eco-innovation is growing rapidly, its concept and know-how are at an early stage (Chistov *et al.*, 2021; Gonzalez-Moreno *et al.*, 2019). The full impact of eco-

innovation on performance and vice versa has yet to be fully verified. Both concepts need deeper and broader systematic analysis, especially in emerging markets.

In Ecuador, there is excellent potential for eco-innovations involving energy consumption in the industrial and construction sectors, the latter being the most energy-consuming sector in the country. Therefore, eco-innovation should focus particularly on introducing renewable energy sources and energy-saving materials. It is essential to move the building sector toward less materially intensive practices.

6. Theoretical implications

According to institutional theory, financial performance is not the principal consideration for socially compliant managerial practices. This applies especially to "green" investments, which often cannot be financially justified (Berrone *et al.*, 2013). We argue that the successful implementation of eco-innovation strategies can be facilitated by firms' collaborative working capabilities. Nowadays, investment in eco-innovation depends on interactions between multiple organizations, with companies functioning as principal driver, mainly via international networks (Fritz and Silva, 2018).

Eco-innovation is particularly important in the context of strategic changes intended to increase a company's market share and lead to partnership and networking opportunities. Such changes can produce better allocation of resources, more efficient flows of know-how, reduced risks, better access to global markets, and other important advantages (Agi and Nishant, 2017). However, to realize these advantages, companies must also overcome several difficulties, including those inherent in synchronizing specific activities and communicating with multiple international partners. It is necessary for all network members to collaborate in developing, synchronizing, and expressing a coherent image and reputation.

Our findings suggest that although eco-innovation can help firms cut costs and improve sales and profits, current barriers and technological constraints will delay the achievement of a meaningful impact on performance. Berrone *et al.* (2013) suggest that normative and regulatory pressures may incentivize companies to undertake eco-innovation activities in the time before this impact emerges. In our view, this mechanism could be effective but is unlikely to be efficient. Further analysis is needed of the relationship between normative and regulatory pressures and the adoption of eco-innovation strategies.

Previous studies of the impact of eco-innovation on performance have shown mixed results, including a positive influence overall (Mathieu *et al.*, 2015), a positive influence on only some performance aspects (Barriga Medina *et al.*, 2022), and no significant influence (Ryszko, 2016). This research aimed to empirically verify the effect of eco-innovation on performance and its influence on the perception and decisions of managers in an emerging market. In this sense, the study makes the following contributions to the literature. First, our research model allows the simultaneous evaluation of both directions of the relationship between eco-innovation and performance. Second, we analyzed the relationship in a South American emerging economy. Third, we identified perception as a key component in the management process developing in countries with little external (institutional) support. In these unfavorable environments, managers must rely on these resources to persevere with the idea of changing their inversion strategy toward eco-innovation and seek legitimacy (institutional theory).

7. Managerial implications

Our findings suggest that managers should first ensure they clearly understand the context of eco-innovation and how to make decisions in the local and regional settings where the firm is developing its activities. Managers should then develop appropriate innovation capabilities based on this understanding, which will permit them to convert unitary,

narrow projects into cross-sector, interdisciplinary innovation strategies. In this regard, managers must consider two forms of action: external and internal.

External approaches could include information and knowledge sharing, collaboration and joint support, and participation in cross-company and cross-functional teams to foster or enhance the implementation of eco-innovation practices (Agi and Nishant, 2017). Therefore, companies intending to embrace eco-innovation should establish information channels that allow them to communicate with other actors in their commercial environment and discover their preferred options in terms of eco-innovation strategy. In this way, firms can access new knowledge to improve the design of their eco-innovation strategies.

Internal approaches may include management commitment, education, and training to facilitate the company's preparations for implementing eco-innovation decisions and the efficient use of company resources (Agi and Nishant, 2017). From this viewpoint, managers must understand their company's eco-innovation strategy and the process of adaptation to knowledge, requirements, and expectations of external and internal environments. Managers' facilitation efforts must include active investment in green training, environmental assessment (Fleury and Fleury, 2011).

Finally, eco-innovation may have a principal role in company changes toward more sustainable production models and new operational strategies. In this sense, eco-innovation may help managers initiate changes in external and internal relationships.

8. Conclusion and limitations

Eco-innovation is significant for all companies today. However, previous research has indicated that eco-innovation outcomes vary significantly across regions, countries, and companies (Horbach, 2014). It appears that several variables determine these outcomes and, in turn, firm performance. In this light, the present study aimed to identify what factors determine the performance model used in Ecuador.

Classic environmental strategies focused on resolving specific problems have been quite successful. However, solving individual problems through specialized environmental technologies can worsen other issues, including those yet to be discovered.

Today, over 95% of natural resources are wasted before finished goods reach the market, while many industrial products consume additional natural resources while in use. Changes are needed to separate production from consumption of natural resources. For this purpose, it is necessary to design new systems, processes, and procedures, while also developing new legal and institutional models. In combination, these changes will shift the understanding and behaviors of individuals and companies.

At present, eco-innovation does not seem a strong motivation for exploring new business opportunities in Ecuador. The development of eco-innovations is significantly inhibited by many barriers and ongoing problems. Most importantly, managers and government decision-makers do not yet appreciate and recognize the potential of eco-innovation as a growth engine. Policy-makers expect government-funded resource allocations to determine expectations for development objectives. Consequently, Ecuadorian development policies focus on reducing infrastructure dependence and accelerating extensive economic growth, based on the traditional price-based model. Future changes related to green quality and competition are thus ignored.

This study is not free of limitations. As the research design was cross-sectional, causality cannot be inferred from the identified relationships between analyzed variables. The research model needs to be tested by longitudinal studies. As the sample included participants from different economic sectors and organizations, representing diverse organizational cultures, the results may be comprised. Moreover, the sample size limits the generalizability of the findings. As we only analyzed the direct influence of eco-innovation on performance and vice versa, our study could not account for possible indirect effects of variables not included in the model.

Future research should explore possible indirect influences. This study's findings also need to be confirmed by research in other countries. Finally, the implications of eco-innovation in defining organizational strategy processes should be considered further. This study has established new and interesting platforms for debate among scholars and managers (Crespi *et al.*, 2016).

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