Interrelating Digital Strategy, Operational Effectiveness, and Innovation Outcomes in colombian Organizations

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Administración de Empresas

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Abstract

This thesis explores the relationships between digital strategies, innovation outcomes, and operational effectiveness in companies operating in Colombia. The study addresses Colombia's decline in global competitiveness and argues that adopting digital strategies, particularly those aligned with Industry 4.0, can improve productivity, flexibility, and competitiveness.

It highlights how digital transformation can enhance operational effectiveness through the integration of innovative technologies, such as big data and artificial intelligence, into business processes. These strategies not only streamline operations but also enable firms to explore new business models and optimize customer experiences. The research employed Structural Equation Modeling (SEM) to investigate the relationships between digital strategy, innovation, and operational effectiveness, gathering data from 141 respondents in management roles within large colombian organizations.

The findings suggest that innovation is a key mediator between digital strategies and operational effectiveness. While a direct link between digital strategies and operational success was not found, the study confirms that innovation outcomes have a significant positive impact on operational effectiveness. The thesis emphasizes that companies should focus on aligning their digital strategies with innovation to enhance competitiveness and achieve long-term operational improvements.

Key words: digital transformation, business competitiveness, technological innovation, business automation, Colombia.

Introduction

Competitiveness stands as a pivotal determinant in the socio-economic and political advancement of nations, with Colombia being no exception. However, the current competitiveness landscape presents a concerning picture. In 2018, Colombia plummeted to the 60th position in the Global Competitiveness Ranking by the World Economic Forum, showcasing stagnant progress. This trend persisted in the subsequent 2019 report, where Colombia maintained its position at 57th with a score of 63 out of a maximum of 100. Moreover, the World Competitiveness Center's report mirrored these findings, indicating a decline in Colombia's competitiveness ranking from 52nd place in 2019 to 58th place in 2023 (World Competitiveness Center, 2023).

Embracing digitalization grounded in the principles of Industry 4.0 holds immense promise for bolstering the competitiveness of colombian enterprises. The benefits that arise from this concept include productivity, flexibility, competitivity and globalization. Therefore, it is imperative to reassess the digital strategies and innovation frameworks employed within the national economic sphere (Cortés et al., 2017). By doing so, Colombia can foster competitiveness through the formulation of integrated and operationally efficacious development plans. Additionally, in an increasingly digitized global economy, nations that fail to embrace digital strategies risk falling behind in the competitive landscape. Digitalization facilitates process optimization, automation, and data-driven decision-making, leading to enhanced efficiency and productivity across various sectors of the economy. Digital technologies serve also as catalysts for innovation and value creation. Through the adoption of digital strategies, colombian enterprises can explore new business models, products, and services, driving innovation and differentiation in the marketplace.

In light of these arguments, prioritizing the implementation of digital strategies emerges as a strategic imperative for Colombia's long-term competitiveness and economic prosperity.

In this way, it must be understood that innovation is a process of adaptation and transformation to the digital sphere, dimensioning the capacity of companies to generate new productive networks, and intertwining these with their respective attractive and competitive marketing strategies. It is worth mentioning that Colombia is a country that not only requires contributions to business innovation, but also to its legislative systems, which must be updated, enabling it to provide quality regulatory power (Tegethoff et al., 2021).

Regarding this digital era, which is emerging nowadays, constantly new technologies are arising, such as big data, artificial intelligence, blockchains, among others. As companies must adapt to this new period, they have to transform using digitalization in order to improve their processes, service, customer experience, competitiveness and results (Fitzgerald et al., 2014). In order to achieve this, solutions must integrate with the new technologies and tools. When companies implement digitization, they experience great results and benefits through it all. Due to evolution, digital initiatives must be provided to the company's stakeholders, otherwise, it will not succeed; every interaction involves technology, making adaptation a crucial step (Blackburn et al., 2020).

This digitalization brings with it innovation, integrating new digital technologies to enhance non-tech businesses. In this way, digital innovation involves the creation of digital products or services that transform previous processes, helping to increase productivity and reduce operating costs. With this, it can be said that digital innovation is crucial for companies to be competitive and be efficient, as they incorporate technology in their operations seeking the transformation in digital solutions, which is possible with the integration of human and

technological capabilities and resources (Khin & Ho, 2018). In this order of ideas, to evolve and adapt, companies need to act boldly, they need to incorporate digital initiatives, innovate, and implement technologies like artificial intelligence (AI) at scale across the business (Blackburn et al., 2020).

Hence, this study centers on elucidating the strategies employed by organizations to achieve innovative outcomes, which are in line with the generation of business value responsive to market demands and the requisite digital transformation imperatives of domestic firms. It prioritizes enhancing operational efficiency to bolster productivity in service-oriented contexts, elucidating the processes, outcomes, and fostering an innovative mindset within organizational frameworks (Tegethoff et al., 2021).

Therefore, there is a compelling need to conduct a systematic inquiry into the research question: "What is the impact of digital strategy and innovation outcomes on organizational operational effectiveness?" It is imperative to comprehend the evolving dynamics of the contemporary labor market that organizations encounter and to scrutinize the operational mechanisms that yield superior outcomes within the digital landscape, encompassing the adoption of novel technologies and the prioritization of competitiveness as a distinguishing factor at the corporate level.

This research used Structural Equation Modelling (SEM) to answer the research question. The study starts with an introduction and theoretical background, followed by the methodology, results of the data analysis and finishes with the discussion and limitations.

Objectives

Primary objective:

Ascertain the interrelation among digital strategy, operational effectiveness, and innovation results in organizations.

Secondary objectives:

1. Establish the correlation between digital strategy and innovation results.
2. Establish the correlation between digital strategy and operational effectiveness.
3. Establish the correlation between operational effectiveness and innovation results.

Theoretical background

Operational effectiveness

Operational effectiveness refers to how efficient today's work is, particularly in terms of how well New Product Development (NPD) processes support the organization in reaching its innovation objectives (Weerd-Nederhof et al., 2008). This construct, coupled with organizational strategy, collectively shapes its performance.

It is noteworthy that operational effectiveness encompasses five key factors or competencies pivotal for revenue generation, competitiveness increases and the attainment of associated objectives. Firstly, cost management emerges as a crucial aspect, wherein profitability is achieved through the elimination of excesses and the enhancement of productive efficiency. Subsequently, quality assurance becomes paramount, measured by the satisfaction of clients with the product or service in terms of manufacturing specifications, design, and functionality. Thirdly, reliability is attained when the delivered product or service aligns with the predetermined requirements established between the company and its customers. Lastly, flexibility and speed constitute interrelated variables; flexibility denotes the adaptive capacity to meet client specifications and needs, while speed refers to the rapidity in production to minimize the time between order placement and delivery to the client (Santa et al., 2009).

Expanding upon these competencies, modern-day companies recognize the imperative to revitalize their core operations, emphasizing direct involvement in enhancing key areas. Concurrently, efforts to optimize secondary operations are pursued, synergistically bolstering competitive advantage and achieving operational effectiveness. This multifaceted approach also necessitates technological integration, with automated processes playing a pivotal role. By streamlining supply chains and enhancing operational efficiency at every stage, organizations can

elevate productivity levels, ultimately culminating in operational effectiveness (Blackburn et al., 2020).

In addition, operational effectiveness is essential in creating a stable foundation for leveraging innovations that enhance organizational performance. By focusing on core competencies such as cost management, quality, reliability, flexibility, and speed, operational effectiveness equips an organization to absorb and implement new technologies seamlessly (Santa et al., 2009). These competencies not only streamline resource use and production but also create a structure that supports rapid adaptation to innovative digital solutions. In this context, operational effectiveness serves as both a prerequisite and a beneficiary of innovation, enabling companies to leverage technological advancements in a way that enhances efficiency, aligns processes with customer expectations, and ultimately drives a sustainable competitive advantage (Santa et al., 2014).

Finally, this concept is a fundamental component of organizational performance, reflecting the optimization of business processes, the efficient use of resources, and the alignment with strategic goals. It significantly contributes to key outcomes such as profitability, employee engagement, customer satisfaction, and adherence to regulatory requirements. This suggest that well-structured business processes are strong determinants of overall organizational performance, highlighting a clear link between operational efficiency and business success (Manongsong, 2023).

Innovation results

This variable entails the ramifications of digital innovation, characterized by the implementation or creation of digital technologies aimed at augmenting customer value (Hund et al., 2021). Such endeavors enable firms to bolster their competitive edge, elevate their status, and distinguish themselves from competitors, thereby effectuating a paradigm shift in production,

operational efficiency, and economic performance. Devoid of digital innovation, the fruition of these transformative outcomes remains elusive. The assimilation of these principles needs an appropriate and strategic approach to ensure optimal execution (Kurilova & Antipov, 2020).

Innovation is multifaceted and can be delineated through various lenses, including Tidd & Bessant's 4Ps model, which delineates four categories of innovation outcomes: Process innovation directly affects operational effectiveness by optimizing production workflows and reducing cycle times, thus aligning closely with operational metrics. Product innovation enhances customer value through improvements in goods or services, potentially impacting operational effectiveness indirectly by increasing demand and necessitating more efficient production processes. Position innovation shifts the context or market perception of a product, which can influence the organization’s strategic positioning but may have a less direct impact on internal operations. Lastly, paradigm innovation, which involves a broader transformation of organizational mindset or business model, can foster long-term adaptability and responsiveness but may require a significant cultural shift and gradual implementation to affect operational metrics tangibly (Zastempowski& Przybylska, 2016).

Against this backdrop, companies must discern if they intend to integrate Product, Process, Position or Paradigm innovation into their strategic framework, thereby orchestrating development endeavors in a manner conducive to enhancing user experience and satisfaction. This requires a synergistic alignment with digital innovation and emergent technologies to generate superior outcomes and operational efficacy.

Innovation results, particularly through digital and technological advancements, directly impact operational effectiveness by introducing new capabilities that reshape core operational processes. For instance, innovations in product, process, and paradigms enable companies to refine

their production cycles, reduce operational delays, and increase adaptability to market changes (Sapaloglu & Bolatan, 2022). By embedding innovation within the operational strategy, organizations can enhance the speed, flexibility, and quality of their operations, thereby creating a feedback loop where innovation continuously supports and elevates operational effectiveness. Consequently, a strategic focus on digital innovation not only adds value to the customer experience but also strengthens the organization's core competencies, reinforcing a sustainable competitive advantage through operational improvements (Santa et al., 2014).

Lastly, innovation outcomes are essential for organizations, as they significantly impact multiple dimensions of business performance, such as financial results, competitive positioning, and customer satisfaction. The ability to sustain innovation is increasingly acknowledged as a critical determinant of organizational success. Companies excelling in innovation often achieve superior financial performance, leveraging innovation as a key factor for competitive differentiation and maintaining market relevance (Dekoulou & Trivellas, 2017; Hult et al., 2004).

Consequently, the first hypothesis states that:

H1: Innovation results have a positive impact on operational effectiveness.

Digital strategy

Digital strategies are understood as those mechanisms implemented by companies to increase their productivity in a technological and digitized globalized market with a high demand for products and services. In this order of ideas, the use of automated strategies and adaptation to the sphere of commercial operations through digitized platforms is required (Tegethoff et al., 2021).

Companies usually have multiple technological strategies, because if they do not have a defined network of contacts, and a reinforced internal and external communication and relationship links, their productivity and operational efficiency may be excessively affected.

Thus, attaining the utmost competitive edge, with a focus on business sustainability, hinges upon the company's strategies concerning digital innovation and development. Within the dynamic landscape of digitalized markets, it is imperative to adeptly manage and continually adapt tools and strategies to mitigate potential errors during the final phases of production processes. Such errors have the potential to significantly impact a company's market positioning (Tegethoff et al., 2021).

Digital strategies, being integral organizational processes, necessitate long-term objectives, accompanied by appropriate methodologies and requisite resources for their attainment. The correlation between business innovation and digital strategy is foreseeable, as the latter is contingent upon theoretical rationales and arguments derived from an analytical examination of the market. Consequently, these strategies exhibit variability and delineate the accessibility to novel commercial landscapes, each characterized by unique differentiators, thereby fostering moments conducive to innovation (Hendela et al., 2017).

Thus, digital strategies can be understood as facilitation capabilities for companies since they interconnect the innovation of their services with the adaptation of products to the new demands of digitized markets. In this context, capabilities pertain to the development of intelligent tools and/or functionalities that are incorporated within companies' expansionist and innovation agendas. These capabilities leverage digitalization platforms to foster the establishment of a highly competitive infrastructure across diverse ecosystem markets (Parida et al., 2015).

Digitalization helps companies to increase the pace of learning and adoption of technologies, which leads to problem resolution (Blackburn et al., 2020). Therefore, obtaining added value for companies and their respective innovation processes is conditioned by the development of digitalization and technological transformation strategies that provide viability, productivity and, consequently, operational efficiency (Hasselblatt et al., 2018).

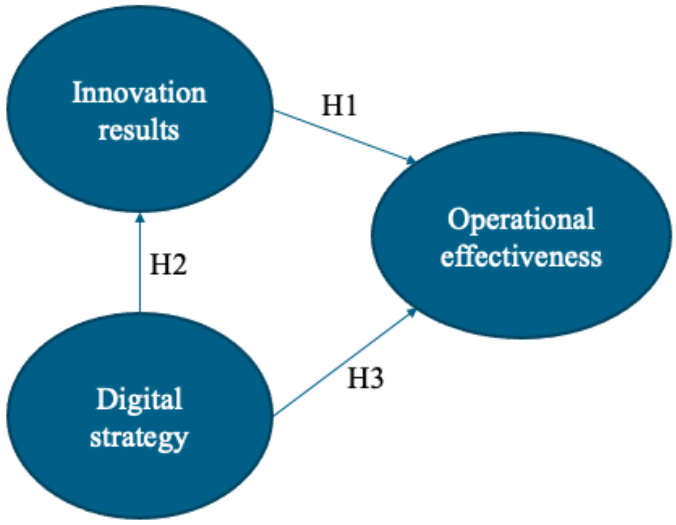
Finally, this variable is fundamental as a clear and well-structured digital strategy allows organizations to integrate technological capabilities with their business goals, ensuring that digital initiatives drive overall performance and strengthen competitive advantage. Organizations with a strong digital strategic focus often achieve superior performance by enhancing their digital competencies (Jian & Moon, 2021).

Therefore, our second and third hypothesis postulate:

H2: Impact of digital strategy on innovation results.

H3: Impact of digital strategy on operational effectiveness.

Figure 1. *Research model with hypothesis*



Note. Author's own creation.

Methodology

The aim of this study is both confirmatory and correlational. Structural equation modeling (SEM) was selected to analyze the proposed relationships between variables. SEM is a valuable tool for examining cause-and-effect relationships in data that isn't from experiments. By studying how the observed variables are connected, factor analysis (exploratory and confirmatory) and SEM can reduce the number of variables to a smaller set of underlying concepts.

There is scarce literature on the interrelation among digital strategy, operational effectiveness, and innovation results in organizations in Colombia, although they exist in other countries (Kitsios & Mitroulis, 2019; Meena et al., 2024; Saunila et al., 2023). This research seeks to explain, measure, and identify the connections between variables and the causes behind various occurrences.

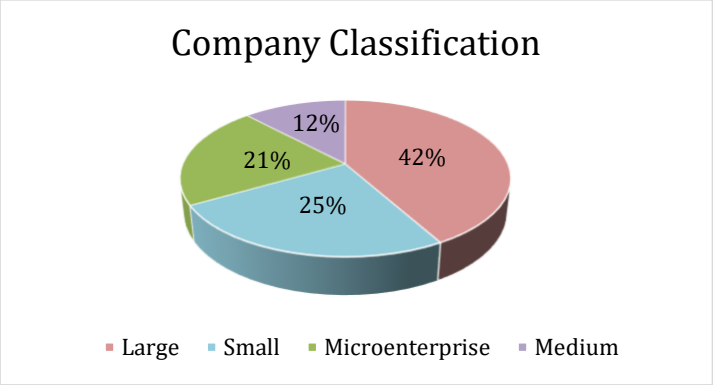
To verify the hypothesis, a survey tool, a measurement construct, and the most suitable model were created following guidelines from Hair et al. (2010). A questionnaire was developed for every user of e-government application that belong to colombian local organizations and government entities to answer in order to collect their data. The survey included a demographic section (industry sector, company size, e-government area, and work area) and a set of conceptual variables used to build a model after data was collected, to be test using descriptive and inferential statistical analysis. It also included a five-point Likert scale (Strongly Agree - Strongly Disagree) used to evaluate statements related to the model's variables. Due to the advantages of online surveys (Evans, 2005), an electronic survey was created, and a link to the survey's website was emailed to potential participants.

With the online survey we obtained 141 answers. This study focused on collecting the opinions of participants at a single point in time. It didn't use multiple data sources, so the results only represent the perspectives of those who participated. Many of the respondents work in large businesses (42%), which are more likely to adopt new technologies than medium, small and microenterprises. Also, 79 respondents that represent 56%, develop their responsibilities in management related areas, as most of them performed their studies in these fields as shown in Figures 2-4.

The selection of participants primarily from management roles in large organizations was a deliberate choice aimed at maximizing the relevance and impact of the study's findings. Managers and individuals in strategic roles are often directly responsible for overseeing key aspects of operational effectiveness, such as resource allocation, process optimization, and decision-making that drive organizational innovation. These professionals have a unique vantage point from which they can assess the effectiveness of e-government applications in enhancing operational processes, given their continuous involvement in evaluating, adopting, and integrating new technologies.

Furthermore, their roles frequently require them to balance short-term operational efficiency with long-term innovation goals, making their insights critical to understanding the broader organizational impact of technological adoption. By capturing the perspectives of those who not only implement but also influence strategic decisions, the study gains a deeper, more nuanced understanding of how digital tools are applied to improve both immediate and future performance outcomes, thereby strengthening the validity of the analysis.

Figure 2. *Company Classification*



Note. Author's own creation.

Figure 3. *Area of Responsibility*

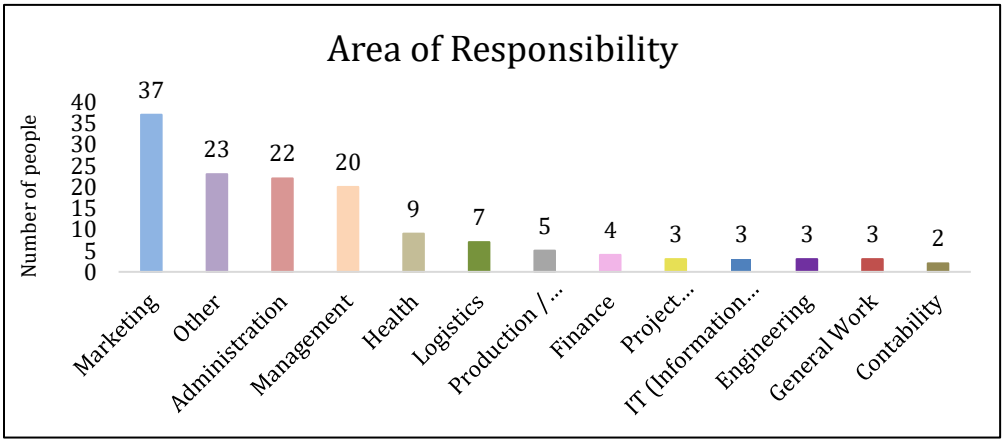


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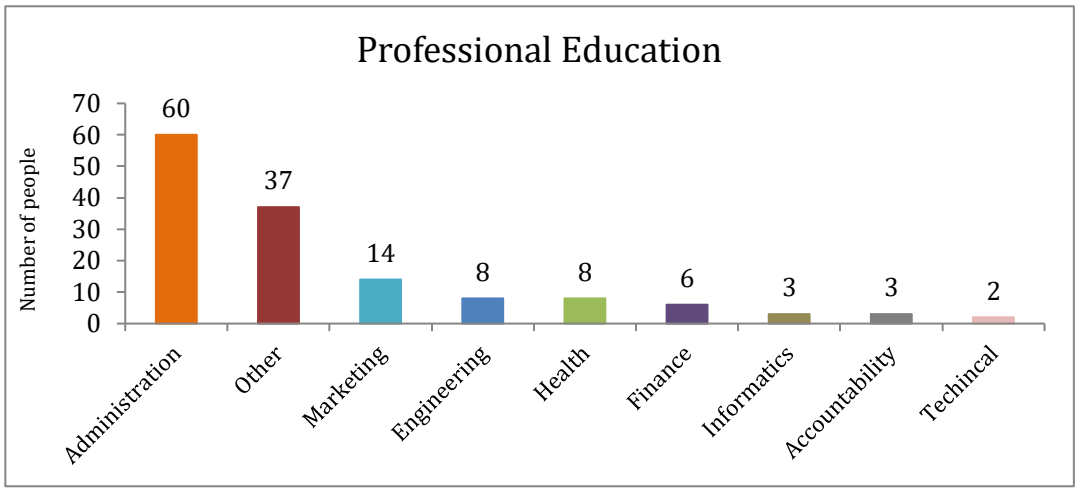
Figure 4. *Professional Education*



Note. Author's own creation.

To examine the data and corroborate the proposed model (Figure 1), the statistical programs SPSS and AMOS from IBM were used. Using a robust statistical technique, confirmatory factor analysis (CFA), the predictive relationships between variables and the model fit were evaluated (Cooksey, 2007; Hair et al., 2010). The internal steadiness of the questionnaire information was evaluated through different indicators that reveal that both digital strategy and innovation outcomes have a significant and positive impact on the operational effectiveness of organizations.

The Cronbach's alpha coefficient is a measure of the internal consistency of a set of items or questions in a questionnaire or scale (Amirrudin et al., 2021). Cronbach's alpha values above 0.7 are generally considered acceptable, while values above 0.8 are considered good. As shown in Table 1, Digital Strategy has an alpha of 0.840, Operational Effectiveness has 0.893, and Innovation Results has 0.908, indicating that these variables are exceedingly connected to one another (Bujang et al., 2018; Taber, 2017).

Table 1. *Cronbach's alpha*

Variable	Number of Items	Cronbach Alpha
Digital Strategy-Strat	4	0.840
Operational Effectiveness	11	0.893
Innovation Results – RI	6	0.908

Note. Author's own creation.

Additionally, the baseline comparison in Table 2 presents various fit indices that assess the model's performance against a baseline model. The NFI (Normed Fit Index), RFI (Relative Fit Index), IFI (Incremental Fit Index), TLI (Tucker-Lewis Index), and CFI (Comparative Fit Index) are all indicators that evaluate the model's fit, with values approaching 1 indicating a better fit. In the default model, all fit indices exceed 0.9, demonstrating that it performs well relative to the baseline and confirming the model's adequacy in representing the observed data.

Table 2. *Baseline comparison*

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0,932	0,914	0,979	0,973	0,978
Saturated model	1,000		1,000		1,000
Independence model	0,000	0,000	0,000	0,000	0,000

Note. Author's own creation.

Table 3 presents indicators for evaluating model fit, which assesses how well the proposed model explains the observed data. Key indicators include the Number of Parameters (NPAR), indicating model complexity (29 for the default model), and the CMIN (Chi-square Minimum), which measures the discrepancy between observed and expected data (88.231 for the default

model, suggesting a reasonable fit). The Degrees of Freedom (DF), at 62 for the default model, provides context for interpreting the chi-square statistic. The p-value of 0.016 indicates that the fit is statistically significant, while the CMIN/DF ratio, which is the CMIN divided by the degrees of freedom (1.423 for the default model), should ideally fall between 1 and 5 to suggest an acceptable fit (Bentler, 1992; Bollen,1986; Byrne, 2016; Wheaton et al., 1977). Together, these indicators confirm that the default model effectively captures the relationships among the variables.

Table 3. *CMIN indices*

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	29	88,231	62	,016	1,423
Saturated model	91	,000	0		
Independence model	13	1293,535	78	,000	16,584

Note. Author's own creation.

In Table 4, the Goodness-of-Fit Index (GFI) is utilized to measure how well the proposed model approximates the observed data, with values above 0.9 indicating a good fit (Bentler, 1992; Bollen,1986; Byrne, 2016; Wheaton et al., 1977). The default model displays a GFI of 0.917, suggesting a satisfactory fit. Additionally, the Root Mean Square Residual (RMR) reflects the average discrepancy between the observed and predicted values, and the PGFI (Parsimony Goodness of Fit Index) takes model simplicity into account. The results indicate that the model maintains an adequate fit while balancing complexity.

Table 4. *RMR, GFI indices*

Model	RMR	GFI	AGFI	PGFI
Default model	,036	,917	,878	,625
Saturated model	,000	1,000		

Model	RMR	GFI	AGFI	PGFI
Independence model	,405	,253	,128	,217

Note. Author's own creation.

The RMSEA (Root Mean Square Error of Approximation) is another critical fit measure shown in Table 5, providing insight into the model's accuracy. A value below 0.08 is generally acceptable (Bentler, 1992; Bollen,1986; Byrne, 2016; Wheaton et al., 1977). The default model has an RMSEA value of 0.055, which signifies a reasonable fit to the data. In contrast, the independence model exhibits a much higher RMSEA of 0.334, further supporting the conclusion that the default model effectively captures the relationships among the variables.

Table 5. *RMSEA indice*

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	,055	,025	,080	,359
Independence model	,334	,318	,350	,000

Note. Author's own creation.

Results and discussion

The SEM results (Table 6 and Figure 5) confirm H1, showing a strong and positive relationship between innovation results (RestInn) and operational effectiveness (EO) ($b = 0.534$, $p < 0.001$). This finding emphasizes that successful innovation implemented in companies enhances operational effectiveness, aligning with the hypothesis that innovation results have a direct and beneficial impact on operational performance.

The analysis also supports H2, demonstrating that digital strategy (Strat) has a substantial positive influence on innovation results (RestInn) ($b = 0.621$, $p < 0.001$). This result highlights the critical role that a well-implemented digital strategy plays in driving innovation within an organization, showing that strategic digital efforts are essential to achieving meaningful innovation outcomes.

However, the results refute H3, as the digital strategy (Strat) does not have a significant direct impact on operational effectiveness (EO) ($b = 0.068$, $p = 0.540$). This suggests that digital strategy alone does not directly enhance operational efficiency without the presence of innovation as a mediating factor. This finding could be due to the nature of digital strategies, which, while essential for modernization and potential competitive advantages, often require translation through innovative practices to affect operational metrics meaningfully. Digital strategies typically establish a framework or platform for transformation but do not, in isolation, alter day-to-day operations or streamline processes without concurrent adjustments in workflows, employee skills, or management practices. By focusing on how digital strategy enables innovation—which, in turn, enhances operational effectiveness—organizations can better understand that the real value lies in how digital tools are applied innovatively within the organization rather than merely adopting technology.

Organizations should focus on leveraging digital strategies to foster innovation, which in turn, enhances their overall operational performance. The lack of a direct connection between digital strategy and operational effectiveness suggests that innovation is the key to translating digital efforts into operational success.

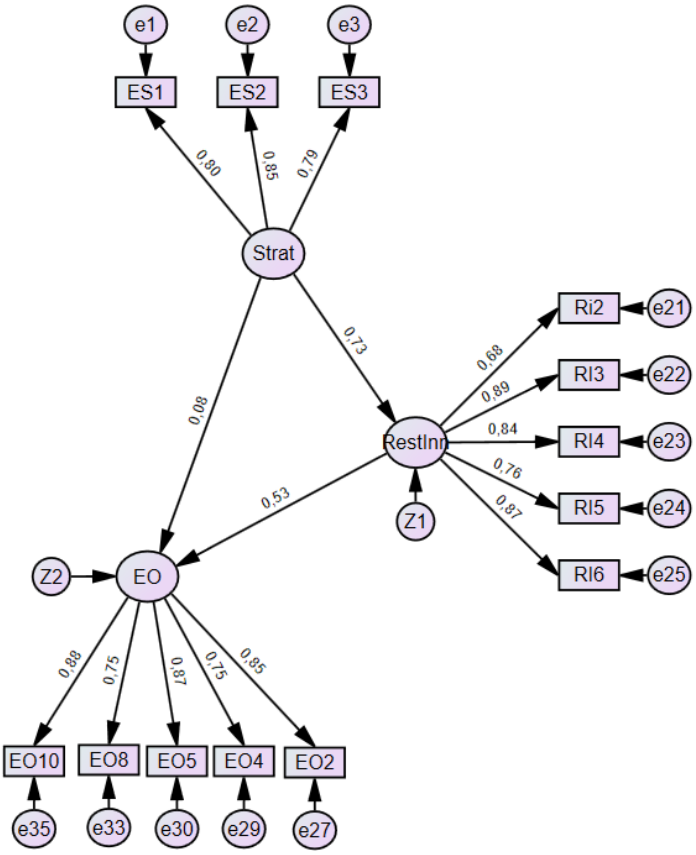
The results provide significant insights into the dynamics of digital strategy, innovation, and operational effectiveness within colombian organizations. The strong positive relationship between innovation results and operational effectiveness underscores the transformative role of successful innovation in enhancing operational performance, suggesting that when companies prioritize and effectively implement innovation, they achieve greater efficiency and competitive advantage. However, the finding that digital strategy does not directly influence operational effectiveness suggests that, within the colombian context, the benefits of digital strategy are primarily realized through its capacity to drive innovation rather than through immediate operational improvements. This insight highlights the need for colombian organizations to focus on fostering innovation as a pathway through which digital strategies can achieve tangible impacts on operational outcomes (Huntzinger et al., 2020).

Table 6. *Regression weights*

			Estimate	**S.E.**	**C.R.**	**P**	**Label**
RestInn	<---	Strat	0,621	0,094	6,625	***	H1 Accepted
EO	<---	RestInn	0,534	0,139	3,855	***	H2 Accepted
EO	<---	Strat	0,068	0,111	0,613	0,540	H3 Rejected

Note. Author’s own creation.

Figure 5. *Structural model results*



Note. Author's own creation.

Conclusions

The analysis of the research findings confirms that digital strategies have a significant impact on innovation outcomes within organizations. The positive relationship between these variables suggests that the proper implementation of digital strategies can drive companies innovation processes, enabling them to differentiate themselves in the market and better respond to contemporary technological demands. However, adopting these strategies does not always lead to immediate improvements in operational effectiveness unless they are approached in an integrated manner.

This finding indicates that organizations facing challenges in achieving operational benefits from digitalization may be encountering issues related to the alignment and internal communication of their strategies. If employees do not understand or adopt these new digital strategies, their implementation will be limited and will not have a meaningful impact on internal processes. This underscores the importance of creating an environment where clear communication and understanding of strategic objectives are prioritized.

Moreover, the results demonstrate that innovation outcomes have a direct and positive impact on a company's operational effectiveness. This implies that organizations that successfully innovate in products, processes, or services experience significant improvements in their operations, translating into greater efficiency and productivity. In this sense, innovation becomes a key driver of competitiveness and organizational performance.

Additionally, the results reveal crucial insights into how digital strategy and innovation interact to influence operational effectiveness in colombian organizations. The strong and positive relationship between innovation results and operational effectiveness highlights that innovation acts as a driving force for enhancing operational performance, suggesting that organizations that

effectively integrate innovative practices are better equipped to optimize processes, improve productivity, and sustain a competitive edge. This relationship implies that successful innovation within colombian organizations can bridge gaps in efficiency and responsiveness, addressing specific operational challenges and enhancing their ability to adapt in a dynamic market.

However, it is essential to highlight that innovation alone does not guarantee uniform impact across all operational areas. Companies that fail to align their innovative efforts with their operational needs may see limited results. This emphasizes the importance of strategically managing innovation, ensuring it aligns with the organization's operational objectives and internal capabilities.

A noteworthy finding of this research is that while digital strategy is crucial for innovation, it does not have a direct impact on operational effectiveness without the mediating influence of innovation. This means that, for a digital strategy to be truly effective, it must be channeled through innovation processes that translate digital efforts into tangible improvements in company operations. Therefore, companies investing in technology and digitalization must ensure that these efforts are directed towards facilitating innovation rather than simply focusing on adopting digital tools. While digitalization is a critical enabler, it is through innovation that real operational improvements are achieved.

Interestingly, the lack of a direct impact of digital strategy on operational effectiveness suggests that, in the colombian context, digital strategies alone may not be sufficient to drive immediate operational improvements. This result implies that digital strategies are most impactful when they actively foster innovation, which in turn translates these strategies into measurable operational gains. This finding could be reflective of unique contextual factors in Colombia, such as the state of digital infrastructure, regulatory frameworks, or varying levels of digital maturity

across industries, which may prevent digital strategies from directly influencing operations. Therefore, for colombian organizations, emphasizing innovation as a mediating factor allows digital strategies to overcome structural and contextual limitations, ultimately enhancing operational effectiveness. This perspective underscores the importance of a tailored approach, where digital strategies are strategically aligned with innovation initiatives to achieve sustained improvements in operational performance.

Additionally, the results suggest that both internal and external barriers limit the impact of digitalization and innovation on operational effectiveness. Internally, one of the main obstacles is the lack of training and resistance to change among employees. This highlights the need for companies to not only adopt new technologies but also focus on creating an organizational culture that supports the adoption and effective use of these innovations. Externally, technological and regulatory limitations also play an important role, particularly in a context like Colombia, where digital infrastructures are still developing. This situation emphasizes the importance of a favorable regulatory environment and adequate technological infrastructure to support innovation and digitalization in the country.

Finally, it is crucial to underline that in today's business environment, innovation is an imperative for companies seeking to remain competitive. Innovation strategies, as discussed in the theoretical framework of this study, should focus not only on products and services but also on processes and business models that drive organizational transformation. Leadership within organizations plays a crucial role in promoting innovation, as it is responsible for clearly communicating strategic objectives and fostering an environment where creativity and innovation are valued and rewarded.

Recommendations

In light of these findings, it is recommended that companies tailor their digital strategies according to their organizational size and resources. Given the unique resource constraints and operational challenges faced by small and medium enterprises (SMEs), it is crucial that these companies adopt a phased approach to digital transformation. SMEs could benefit from leveraging modular and scalable digital tools, such as cloud-based platforms and cost-effective automation solutions, which can grow alongside their business needs. Starting with high-impact, low-cost technologies—such as customer relationship management (CRM) systems or basic data analytics—can provide immediate operational insights and enhance customer engagement without extensive capital investment. Additionally, fostering partnerships with digital solution providers or collaborating with industry associations can allow SMEs to access training resources and expertise at a reduced cost. By adopting flexible digital strategies that align closely with their operational goals, SMEs can build a foundation for incremental innovation, gradually improving their efficiency and competitiveness in a resource-efficient manner.

Another important recommendation is to improve internal communication related to digital strategies and innovation processes. It is vital that all employees, from operational to executive levels, understand the benefits and implications of digitalization in their daily roles. Implementing regular training and development programs focused on digital literacy and upskilling—such as analytics training for managers or process automation for operational staff— can be key to ensuring employees are equipped with the necessary skills to adapt to new technologies and understand how these can contribute to the overall success of the organization. This will not only improve the adoption of new technologies but also foster a more collaborative and efficient work environment.

Additionally, fostering an organizational culture that values innovation should be a priority for companies. This involves not only encouraging creative thinking and the development of new ideas but also establishing cross-functional innovation teams that bring together individuals from various departments, such as IT, operations, and marketing, to enhance collaboration and ideation. These teams should meet regularly to share insights, discuss progress on digital initiatives, and align on goals. Companies must provide the necessary resources to support these efforts and ensure that organizational leaders act as role models, actively supporting innovation projects and recognizing achievements in this area. Furthermore, implementing agile methodologies, such as Scrum or Kanban, in digital projects can promote flexibility, responsiveness, and iterative development, helping teams break down larger initiatives into manageable tasks. Training employees in agile practices can further encourage a culture of continuous improvement and adaptability.

Continuous measurement of the success of innovation initiatives is also crucial. Companies should establish clear metrics and evaluation processes tied to both innovation and operational effectiveness. Suggested metrics include time-to-market for new innovations, productivity gains, error reduction rates, and customer satisfaction improvements.This data-driven approach will allow organizations to make real-time adjustments and continuously improve their innovation and digitalization strategies.

A practical approach for colombian companies seeking to align digital strategy with operational effectiveness is to establish interdepartmental teams dedicated to innovation. By involving representatives from IT, operations, and management, companies can facilitate collaboration across departments, which accelerates the adoption of digital tools and ensures that innovations are rooted in practical operational contexts. Strengthening internal communication is

also essential; employees at all levels should understand the strategic benefits of digital initiatives. Training and development programs aimed at equipping employees with digital skills can ease the adoption of new technologies, fostering a culture of continuous learning that supports innovation and organizational resilience. Moreover, cultivating a culture that rewards innovation and collaboration is vital, as it motivates employees to contribute actively to the company's transformative goals, with leaders modeling and rewarding successful innovation initiatives through recognition programs, incentives, and career development opportunities.

Besides, continuous measurement of innovation initiatives is recommended, with clear metrics in place to evaluate their impact on operational efficiency and customer satisfaction. The colombian context also presents unique challenges, as technological infrastructure and regulatory factors can influence the successful implementation of digital strategies. Companies can proactively address these barriers by engaging with regulatory bodies, industry stakeholders, and adopting global best practices to support digitalization efforts. Finally, investing in continuous digital skill development is crucial; training employees on new technologies not only enhances adaptability but also transforms the workforce into a strategic asset that drives sustainable growth and competitiveness. Emphasizing these elements enables colombian companies to align digital strategy with innovation, ultimately strengthening their position in an increasingly digital and competitive landscape.

In conclusion, by integrating these recommendations, colombian companies can build a robust foundation for sustainable digital transformation that aligns closely with operational and strategic goals. Establishing cross-functional collaboration, prioritizing effective communication, and fostering a culture that values innovation not only enhances the immediate impact of digital tools but also positions companies to adapt effectively to future changes in technology and market

demands. Continuous measurement and engagement with the regulatory landscape further support these efforts, ensuring that digital strategies evolve in tandem with the organization's operational needs and industry standards. This comprehensive approach will enable colombian companies to navigate the complexities of the digital era with resilience, agility, and a strengthened competitive edge.

Limitations

This study has several limitations that should be acknowledged. First, the convenience sampling of primarily large organizations with participants in management roles limits the generalizability of the findings to smaller businesses or diverse operational levels within colombian organizations. Additionally, the study's cross-sectional design restricts the analysis to a single point in time, preventing insights into how the relationship between digital strategy, innovation, and operational effectiveness may evolve. Future research could address these limitations by employing longitudinal designs to observe these dynamics over time or by expanding the sample to include a more diverse range of organizations, including small and medium enterprises. Moreover, exploring sector-specific challenges in digital transformation across different industries in Colombia would offer more tailored insights. Comparative studies across different emerging economies could also provide a broader understanding of contextual factors, such as regulatory environments or digital infrastructure, which influence the effectiveness of digital strategies.

Additionally, the study's reliance on self-reported data through a survey instrument may introduce subjectivity, as responses could be influenced by individual perceptions or organizational norms. This potential bias may affect the accuracy of the reported impacts of digital strategy and innovation on operational effectiveness. Lastly, the study is conducted within the specific context of Colombia, where technological infrastructure and regulatory factors differ significantly from those in other regions. These contextual factors may influence the applicability of the findings beyond Colombia, suggesting that future research should explore similar models in different regulatory and technological environments to validate and broaden the conclusions drawn here.

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