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Słowo wstępne

Oddajemy w ręce Czytelników numer 59. „Zeszytów Naukowych Politechniki Częstochowskiej. Zarządzanie”, który stanowi rezultat wielowątkowych rozważań nad współczesnymi wyzwaniami, przed którymi stoi nauka o zarządzaniu. Zawarte w tomie opracowania ukazują aktualność i złożoność badanych zjawisk, wpisując się w dynamiczny kontekst przemian społeczno-gospodarczych. Niniejszy numer zawiera zbiór dziesięciu wartościowych opracowań naukowych poświęconych aktualnym zagadnieniom z zakresu: strategii marketingowych mikroprzedsiębiorstw usługowych, postrzegania dyskryminacji ze względu na płeć w branży budowlanej, wpływu praktyk środowiskowych na zrównoważony rozwój małych i średnich przedsiębiorstw, znaczenia audytu wewnętrznego dla wyników finansowych firm transportowych, edukacji finansowej na obszarach wiejskich w ujęciu demograficznym, oddziaływania nowych technologii i kompetencji zawodowych na efektywność pracowników, zarządzania organizacyjnego wśród przedsiębiorców, roli przywództwa transformacyjnego i innowacji technologicznych w budowaniu zrównoważonej efektywności MŚP, skutków inwestycji w rozwój zrównoważony dla sprawozdań finansowych organizacji zgodnie z krajowymi standardami rachunkowości oraz mnożnikowego efektu inwestycji typu venture capital i private equity na przykładzie debiutów giełdowych. Zgromadzone w publikacji teksty reprezentują zróżnicowane podejścia metodologiczne i tematyczne, od analiz teoretycznych po studia empiryczne, oparte na rzetelnym warsztacie badawczym.

Mamy nadzieję, że publikacja ta stanie się nie tylko źródłem wiedzy, ale także punktem wyjścia do dalszych eksploracji badawczych i krytycznej refleksji nad kierunkiem rozwoju współczesnych nauk o zarządzaniu. Jednocześnie serdecznie dziękujemy wszystkim Autorom za ich wkład merytoryczny i zaangażowanie w tworzenie tego numeru.

Redakcja

Preface

We are pleased to present to our Readers issue number 59 of “Research Reviews of the Czestochowa University of Technology. Management”. This volume is the result of multifaceted reflections on the contemporary challenges faced by management science.

The articles included highlight the relevance and complexity of the phenomena under study and reflect the dynamic context of ongoing socio-economic transformations.

This issue offers a collection of ten valuable scientific papers addressing current topics such as: marketing strategies of service microenterprises; perceptions of gender-based discrimination in the construction industry; the impact of environmental practices on the sustainable development of small and medium-sized enterprises; the importance of internal audit for the financial performance of transport companies; financial education in rural areas from a demographic perspective; the influence of new technologies and professional competencies on employee effectiveness; organizational management among entrepreneurs; the role of transformational leadership and technological innovation in building the sustainable efficiency of SMEs; the effects of investments in sustainable development on financial reporting in accordance with national accounting standards; and the multiplier effect of venture capital and private equity investments, illustrated through stock market debuts.

The contributions collected in this publication represent diverse methodological and thematic approaches, ranging from theoretical analyses to empirical studies, all underpinned by a solid research framework.

We hope that this issue will serve not only as a valuable source of knowledge but also as an inspiration for further research initiatives and critical reflection on the future directions of contemporary management science. At the same time, we would like to express our sincere gratitude to all the Authors for their significant contributions and dedication to the preparation of this volume.

Editorial Board

MANAGING MARKETING STRATEGIES FOR SERVICE MICROBUSINESSES

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Abstract: Strategy management is crucial to the success of any organization, including microenterprises, as it guides changes and facilitates decision-making, addressing challenges to survive or remain in the market. The objective of the research is to identify the marketing strategies of a microenterprise providing services in Escuinapa, Sinaloa, Mexico. The study was conducted as a qualitative case study of a microenterprise and was descriptive in scope, collecting data through semi-structured interviews, observation, and document analysis. The results indicate that the management of marketing strategies for the growth of this microenterprise, providing domestic refrigeration services with thirteen years of experience, initially included advertising its services through traditional media, maintaining contact with its customers. It also expanded the offer of new services and rewarded loyal customers with a discount program, 24/7 customer service, and off-season promotions. In another phase, they used Facebook and WhatsApp to organize contests with regular customers and new users through referrals. The conclusion is that microbusinesses manage both traditional and digital strategies, increasing services and ensuring customer service. To survive or remain in the market, microbusinesses must implement effective strategies focusing on differentiation, innovation, adaptation to customer needs, and efficient resource management.


Keywords: management, marketing strategy, microbusiness

JEL Classification: M10, N8, L10

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Introduction

Micro, small, and medium-sized enterprises (MSMEs) have become the backbone of economies as a driver of innovation and economic growth. As a source of employment, they generate more than 50% of employment worldwide (World Bank, 2025).

MSMEs represent more than 99.8% of businesses in Mexico. Their sociocultural elements reflect the country's diversity and wealth, contribute to economic strengthening, promote regional development, generate 52% of the income and employ 27 million people. Their distribution throughout the territory is diverse, with SMEs dedicated to commerce concentrated in the southern region and industrial activities in the north (Table 1).

Table 1. MSMEs in Mexico

MSMEs	Income	Employment
99.8%	52%	27 million

Source: (INEGI, 2019)

The diversification and differentiation of their products represent one of their strengths, which, when marketed, allow them to support families and communities. The most significant sectors of economic activity in which Mexican MSMEs operate are: retail trade (5 out of 10), services (4 out of 10), and manufacturing (1 out of 10). Commerce is the predominant activity, however, as company size increases, the manufacturing sector also grows, achieving greater participation among medium-sized companies (See Table 2 and Figure 1).

Table 2. MSMEs by size, employees and establishments in Mexico

Size	%	Employment/people	Establishments
Micro	95	1-10	4,500,000
Small	4	11-50	190,000
Medium	0.08	51-250	38,000

Source: (INEGI, 2019)

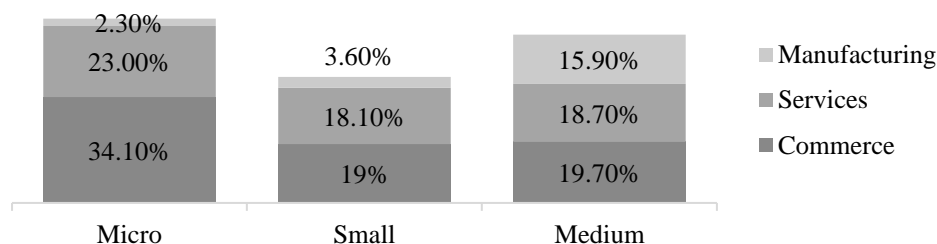


Figure 1. MSMEs by size and sector

Source: (INEGI, 2019)

Building effective marketing strategies for SMEs is essential for growth, competitiveness, and sustainability in today's dynamic business environment. Given challenges such as limited resources and market reach, careful marketing planning can significantly improve customer satisfaction, loyalty, and overall company performance (Oklander et al., 2024).

Effective marketing strategies increase customer satisfaction and long-term loyalty. Research shows that a tailored marketing approach which addresses customer needs, leads to better results. In competitive markets, a market-oriented strategy helps SMEs respond to customer feedback, adapt their offers, and innovate, which is crucial for maintaining a competitive advantage (Ngo, 2021).

Furthermore, marketing strategies must align with overall business goals to support the company's mission. For example, when expanding into new markets, effective marketing communications combining traditional and digital methods help reach diverse customer segments (Sathana et al., 2019).

This study examines the marketing strategies of a family-owned microenterprise providing refrigeration services. Operating for thirteen years, the company combines traditional and digital marketing techniques, including loyalty programs and social media marketing, to achieve growth despite limited resources.

The study addresses a significant knowledge gap as research on service microenterprises in Latin America is predominantly quantitative, neglecting the wealth of qualitative experiences. This qualitative analysis provides deeper insight into the factors that influence the growth of these firms, such as those related to marketing, pricing, and production control, allowing an understanding of the context that has been neglected by purely numerical approaches.

The article consists of four sections: introduction, theoretical framework, methodology, and empirical results, along with conclusions relevant to similar organizations.

Theoretical overview

Challenges to microenterprises in the changing environment

Understanding the characteristics of microenterprises helps define their role within organizations. In Mexico, the Official Journal of the Federation (2009) defines microenterprises as those employing up to 10 employees in the industrial, commercial, and service sectors, with a maximum annual turnover of 4 million pesos (MXN) and a maximum total turnover of 4.6 million MXN.

Microenterprises operate in complex, rapidly changing environments, facing numerous challenges that limit growth and sustainability. Key obstacles include limited access to capital, technology, and market information. Tiwari et al. (2024) highlight that in developing countries like Nepal, fluctuations in resources and market demand perpetuate poverty among microenterprises. Cui et al. (2013) note that women-owned microenterprises face additional health and economic barriers, requiring multifaceted support. Technological gaps also limit growth; Kpossilande et al. (2020)

demonstrate that many women lack access to advanced technologies that could improve productivity and product quality, making it difficult for them to meet the needs of urban consumers.

Limited participation in international markets is another challenge, exacerbated by trade barriers and a lack of knowledge. Khoiri et al. (2024) and Rahman et al. (2017) emphasize that SMEs face financial and information constraints, complicating international expansion. The COVID-19 pandemic has exacerbated these challenges, especially for rural microenterprises, exposing a digital divide that limits the adoption of digital tools necessary for resilience (Räisänen & Tuovinen, 2021). Furthermore, limited financial inclusion limits access to funds needed for operations and growth (Tita & Opperman, 2023).

The specificity of service businesses

Service businesses rather deliver intangible value through experiences and solutions. Their production and consumption are inseparable, requiring direct customer interaction, which creates unique challenges in quality control, customer satisfaction, and strategy.

Dinh and Thi (2012) highlight the growing role of service design and innovation, promoting collaborative models based on shared information. Cheng et al. (2014) emphasize that innovative service models help firms gain a competitive advantage. Delivering high-quality service is crucial for customer satisfaction and loyalty.

Customer-centric approaches are vital in competitive sectors like banking and hospitality. Lingga and Sembiring (2021) stress meeting customer expectations and building trust, while Ramli (2023) confirms the link between service quality, trust, and brand loyalty. However, as Antony et al. (2004) note, service quality is subjective and hard to measure.

Key dimensions such as reliability, assurance, and empathy shape customer perceptions (Parasuraman et al., 1985), and managing these well ensures satisfaction and long-term success (Fabian et al., 2024). Responding to globalization and sustainability, Özbekler and Öztürkoğlu (2020) argue for integrating environmental and social practices to enhance competitiveness. Kett (2011) adds that digital technologies and integrated service engineering are transforming services into strategic, market-oriented solutions.

Service businesses range from professional firms like consultancies to personal services such as salons (EBC, 2024). Kotler and Armstrong (2017) note that they sell intangible offers that do not transfer ownership but provide customer satisfaction, requiring adaptable management with a focus on the human element.

Marketing strategy and its importance for microenterprises

Marketing strategy is essential for microenterprises to survive and grow in competitive markets. With limited financial and human resources, these businesses need clear strategies to gain visibility and differentiate themselves. Saiyed et al. (2023) highlight entrepreneurial marketing as crucial for improving small craft businesses, especially in emerging markets.

Flexible marketing strategies help microenterprises adapt quickly, particularly during crises like the COVID-19 pandemic. Zaidi et al. (2023) show that adaptive approaches and simple management help small businesses stay competitive and find new customer channels.

Digital tools offer affordable promotion and direct engagement. Grisales Castro & Hernández Torres (2023) emphasize social media as effective marketing channels, while Cajamarca-Ramos et al. (2023) note e-commerce's role in expanding customer reach and sales with low investment.

Marketing strategies must consider local and sector-specific contexts. Ngenoh et al. (2020) illustrate how small agricultural enterprises tailor marketing to local consumer habits and distribution challenges, overcoming typical structural constraints.

Strategic planning aligns marketing with microenterprise goals. López-Lemus et al. (2021) argue that even very small firms benefit from structured planning integrating marketing with mission and vision.

Nuño De León (2012) defines strategy as an action plan based on small enterprise realities. In microenterprises, strategy often emerges informally through everyday decisions, as Mintzberg (2005) and Mintzberg et al. (1997) suggest, highlighting strategy as an evolving learning process shaped by experience. Kotler and Keller (2008) describes marketing as a value exchange focused on selecting a market, offering suitable products, and using cost-effective promotion.

Methodology

This study was conducted as a qualitative case study of a microenterprise providing refrigeration services located in the municipality of Isla del Bosque, Escuinapa, in the state of Sinaloa, Mexico. The qualitative approach served as the central methodological framework, enabling an in-depth understanding of the organizational context through a theoretically and methodologically grounded case study design. This approach facilitated an interpretive analysis of the experiences and perceptions of key stakeholders, aimed at capturing the organizational reality of the microenterprise studied.

Case study was used as the research strategy to understand the phenomenon based on its intensive explanation (Becker, 1979); on in-depth analysis and examination (Hamel, 1992); and addressing the microservices enterprise with 13 years in the market that faces changes in revenue, personnel, office closures and openings, among others; gradually transforming itself, considering the actions of its entrepreneurial manager who implements strategies focused on customer needs and satisfaction.

The analysis was holistic, encompassing individual and organizational life cycle events as well as administrative processes to understand the dynamics of the applied marketing strategies. Considering the fact that the research questions focus on how and why certain phenomena occur, the case study was justified in exploring complex processes and causal mechanisms (Yin, 1984), reflecting patterns of strategies identified in comparative analysis with similar studies in Latin America and challenges characteristic of the sector.

Data collection included semi-structured interviews with the company owner and two employees. Additionally, direct observation of daily organizational activities was conducted, supplemented by analysis of internal company documents. Field visits to the organization provided rich empirical data, allowing the researcher to observe practices and processes in a natural work environment.

Following the triangulation practice proposed by Yin (1984), for whom “the sole strength of a case study is its ability to address a variety of evidence – documents, artifacts, interviews, and observations,” offering valuable insights for the theory and practice of service microenterprises, laying the groundwork for future research and the formulation of applicable recommendations. Yin (1984) points out that the single-case design is justifiable when it represents a critical test of an existing theory; and it is valuable when it meets the criteria of confirming, expanding, or challenging the theory, in this case, the theory of marketing in microenterprises.

Case study

The MSME sector in the state of Sinaloa is a key component of the state's economy. There are 137,583 economic establishments (National Institute of Statistics and Geography, INEGI, 2023), of which 92.6% are microenterprises, 7.2% are SMEs, and 0.2% are large companies (see Table 3), 43.8% of the establishments belong to the services sector, 41.5% to commerce.

Table 3. Companies by size and establishments in Sinaloa

Size	%	Establishments
Micro	92.6	127,402
Small and medium	7.2	9,906
Large	0.02	28

Source: INEGI (2023)

In Escuinapa, Sinaloa, MSMEs play a crucial role in the local economy, in sectors such as commerce, services, and agriculture; they constitute more than 90% of economic units (INEGI, 2023).

According to IMSS records (2021), primary activities such as agriculture and fishing, in addition to commerce and related services, predominate in Escuinapa. Although MSMEs are well represented, challenges include access to technology, training, and financing to improve their competitiveness. The study was conducted in a microenterprise founded in 2012 in the entrepreneurial vision of the family, offering domestic refrigeration services such as the maintenance, repair, and installation of equipment, generators, and smart home devices.

It started with the owner as the sole employee, serving around 50 clients and keeping manual records in notebooks. In 2014, due to growth, it hired its first assistant and expanded its service offer with the sale of Mini Split equipment. By 2019,

it had added more services, such as plumbing and billing, and opened its first warehouse, generating an increase in its client base (230). In 2022, it opened a traditional office for personalized service, equipment displays, and the addition of smart home configuration, increasing its monthly customer base to 300 clients. It currently serves 380 clients and is centrally managed by the founder, who handles all the service processes.

One of the traditional marketing strategies that the company uses is pricing, since it focuses on determining the monetary value of the service, including production factors, competition and the value perceived by the customer, with the purpose of generating profitability by establishing low prices with the objective of quickly attracting a large client portfolio, gaining a market share and in this way generating profits. The director opts for this strategy, arguing that “we have been 13 years in the market and since we started, and until today, we have maintained the same price in the maintenance and installation service.” Ferrell et al. (2012) argue that “When customers see that all competing products offer the same features and benefits, their purchasing decisions are driven primarily by price.” However, an effective strategy should consist of differentiation when offering services and thereby establishing prices different from the competition because currently cost differentiation may not be enough to stand out, as Galaviz et al. argue (2013) “Price and cost approaches are not sufficient against the monsters that face the shelf inventory, especially in the mass consumer goods market.”

The company purchases merchandise during periods of low demand to take advantage of low prices, guaranteeing equipment availability at the start of the service demand season, offering competitive prices, benefiting from cost optimization, ensuring equipment availability, and its supply with a margin of negotiating power. This strategy not only improves the competitiveness of the service company but also allows it to offer more attractive prices to its customers, maintaining a constant flow of inventory without setbacks.

Likewise, another marketing strategy is the promotion of guaranteed services, as the director argues: “A job with us is always guaranteed; any issue that occurs with the equipment, the guarantees are attended to promptly, at no cost,” this with the benefit of offering customers added value and satisfaction, seeking to ensure their loyalty. In this regard, Ferrell et al. (2012) mention that “third-party evaluations and service recommendations are not as dominant as tangible goods, making it difficult to obtain a good evaluation. One way companies address this issue is by providing satisfaction guarantees to customers.” In this regard, guarantees function as a strategic marketing tool, allowing the company to differentiate itself from the rest, representing security and trust to customers, and offering support in case of dissatisfaction or product failures.

Another strategy is introducing new products and services to their portfolio, taking into account customer needs. This is based on the company owner's belief in seeking differentiation from the competition. According to Ferrell et al. (2012), “key themes in product strategy relate to the introduction of new products, whose development and marketing are a vital part of a company's efforts to sustain growth and

profits over time.” They also argue that product line breadth is an important marketing strategy as it allows companies to cover diverse market segments by offering multiple options within the same category. Each product or variant within the line is designed to meet the specific needs of different types of customers, which helps maximize consumer reach and satisfaction.

For its part, the recognition program strategy that the service company follows has allowed it to retain its customers since its foundation and the addition of new ones, thanks to word-of-mouth advertising that customers themselves generate, providing them with exclusive benefits, making them feel unique and prioritized, offering them services 24 hours a day, seven days a week and exclusive discounts, which encourage recurring purchases. Estrada et al. (2014) maintain that “recognition programs may be simple, but they have the ability to foster user loyalty and also word-of-mouth advertising,” and Ferrell et al. (2012) state, “the simple truth is that customers will maintain relationships with companies that best meet their needs or solve their problems.” Thus, the combination of recognition and benefits has managed to position the company throughout its 13-year history, demonstrating that seemingly simple, yet well-established strategies generate loyalty and growth.

In addition to the constantly offered promotions, the marketing strategy is based on offering services with preferential prices on holidays and relevant events to encourage the hiring of services and increase sales, with the goal of attracting new customers. To this end, special discounts or service packages are designed with visually attractive material that reinforces the promotional message. This tactic not only generates an increase in demand during low sales seasons but also encourages greater interaction between the customer and the company. As Ferrell et al. (2012) point out, this approach corresponds to mass marketing, which “is a non-profit approach. Differentiated marketing assumes that all customers in the market have similar needs and desires that can be reasonably satisfied with a single marketing program.”

Likewise, they promoted their products through the radio. However, they have left that medium behind due to customer disuse. The director explains: “we have been innovating together with the people, we changed to advertising and promotion strategies on social networks such as WhatsApp statuses, Facebook and new platforms that emerge; we try to be there,” hence this evolution in marketing strategies reflects an adaptation to changes in the consumption habits of their target audience and to technological trends, trying to be present with their public, as Ferrell et al. (2012) point out “changes in the use of the media and the availability of new media establishments have forced companies to rethink the way they communicate with potential customers” since currently consumers are more informed and more critical. As Estrada et al. (2014) point out “social media is truly playing an important role in creating a connection between consumers and businesses; as a result, consumers have become more demanding regarding the information, products, and services they receive.”

Table 4 summarizes the main marketing strategies implemented by the microenterprise, presenting their specific actions, objectives, observed outcomes, and theoretical links.

Table 4. Marketing strategies, objectives, outcomes, and theoretical links

Type of Strategy	Specific Actions	Objective	Observed Outcomes	Theoretical Link
Traditional – Pricing	Stable, low prices maintained for 13 years	Attract a broad customer base quickly; gain market share	Built trust, customer loyalty, and market recognition, but limited differentiation	7P – Price: pricing as competitive tool; RBV: stable pricing as a unique resource signalling trust
Traditional – Advance Purchasing	Buying equipment in low-demand periods	Reduce costs and ensure product availability	Improved competitiveness and stable inventory supply	RBV: efficient use of resources to secure advantage
Traditional – Service Guarantees	Post-sale warranty and free repair for any issue	Build trust and signal reliability	Increased customer satisfaction and loyalty	SERVQUAL – Reliability/Assurance: reduces uncertainty; 7P – Process: strengthens service delivery
Traditional – Product/Service Diversification	Expanded from refrigeration to plumbing, smart home devices, and billing	Meet emerging customer needs; differentiate from competitors	Growth in customer base; higher service portfolio value	7P – Product: portfolio expansion; RBV: leveraging innovation and capabilities
Traditional – Recognition Program	Loyalty discounts, 24/7 service, exclusive offers	Retain clients and encourage repeat purchases	Strong customer retention and positive word-of-mouth	SERVQUAL – Empathy: personalized attention; 7P – People: customer focus
Traditional – Seasonal Promotions	Discounts during holidays and low-demand periods	Increase sales during slow periods	Attracted new customers; boosted short-term demand	7P – Promotion: targeted campaigns; RBV: adaptive use of limited resources
Traditional – Local Media Advertising	Radio advertising (later abandoned)	Reach local target market	Initial visibility, but declined as media habits changed	7P – Promotion: traditional communication channels
Digital – Social Media	Marketing Use of Facebook and WhatsApp for contests, promotions, referrals	Engage with customers, attract new ones	Increased visibility, broader reach, and stronger customer interaction	7P – Promotion: digital channels; SERVQUAL – Responsiveness: quick interactions with clients

Source: Summary based on case study

Marketing strategies in Latin American microenterprises: similar studies

Analyzing ten studies on Latin American microenterprises, these studies show widespread adoption of WhatsApp and Facebook as basic digital tools and predominant platforms, acknowledging that they lack formal strategic planning.

Reliance on traditional word-of-mouth marketing was also identified as the most valued strategy, highlighting the importance of personal relationships in the context of service microenterprises. This finding confirms that relationship strategies are essential for customer loyalty and acquisition in this segment, with critical gaps such as 80% without a website, 75% without a presence on Instagram/TikTok, and a limited ability to measure the impact of advertising investment.

The findings show that Latin American microenterprises operate in a hybrid environment where traditional and digital strategies coexist, requiring adapted theoretical frameworks that consider limitations in economic and technical resources, social capital, results measurement with simple indicators, and cultural adaptation to local contexts.

The hybrid marketing management model represents a viable alternative for microenterprises with resource constraints, demonstrating that effectiveness does not depend exclusively on technological sophistication but on consistent value delivery and building lasting customer relationships.

The case study of the services microenterprise shows the coincidence in the use of the same options as the Latin American microenterprise, although with the implementation of differentiable strategies (24/7, personalized attention, price stability for a decade, focus on a specific niche and early diversification of its offer), evidencing personal branding. Salas and Solanilla (2018) mentions that “individuals need to stand out above other competitors, highlighting the personal image that is intended to be built and projected as a factor that can become crucial when achieving work success,” creating actions to project a reliable image, with personal strategies to position themselves in their market, differentiating themselves from their competition with their own designs focused on their clients.

Conclusion

The case of this thirteen-year-old microbusiness providing services demonstrates how marketing strategies adapted to the local context and limited resources can drive business growth. The organization has implemented a model that combines traditional and digital strategies. Its stable pricing policy for over a decade, advanced purchasing to optimize costs, post-sale warranties that generate trust, and recognition programs that foster loyalty through exclusive benefits stand out.

The company has evolved from radio advertising to social media such as WhatsApp and Facebook, demonstrating its adaptability to technological changes. Its diversification reflects an understanding of the market. Seasonal promotions and a focus on personalized interaction, despite being a microenterprise, highlight that in the services sector, the human factor is irreplaceable and is enhanced by digital tools.

This case confirms that seemingly simple, yet well-executed and context-adapted strategies can build resilient brands in the competitive services market. In an increasingly competitive and constantly evolving technological environment, the results of this research demonstrate that the success of a microservices company does not lie solely in having large audiences or budgets, but rather in the ability to adapt, innovate, and connect with their customers by implementing marketing strategies tailored to the current situation. The microenterprise's experience reinforces the importance of a comprehensive and flexible marketing strategy as a central element in the sustainability and growth of this type of business, recognizing that managing marketing strategies, such as creating a unique value proposition, is an opportunity to build a strong brand presence.

This case study provides in-depth insights but is limited by its focus on a single microenterprise, which restricts the generalizability of the findings. The specific local context and small sample size may influence the applicability of results to other settings. Additionally, the study primarily considers marketing strategies, without extensive exploration of other organizational factors.

For microentrepreneurs, marketing strategy research involves identifying market opportunities, understanding customer needs, making informed decisions for service development, improving market segmentation, reducing risk, and creating a sustainable competitive advantage through pricing, promotion, and customer service strategies.

The theoretical implications of research on microenterprises are that they enrich and adapt preexisting conceptual frameworks (such as those of management, entrepreneurship, or economic development) to the specific reality of these businesses, revealing the need for new models that address their specificities in terms of innovation, digitalization, talent management, sustainability, financing, as well as local and global socioeconomic impact.

The methodological implications for case studies include the need for depth and contextual detail to understand complex phenomena, the flexibility to integrate qualitative and quantitative techniques (triangulation), and the rigor to ensure validity and reliability across multiple data sources and researchers. Furthermore, a well-executed case study will foster theoretical, non-statistical generalizations and strengthen or weaken existing theories, contributing to both scientific knowledge and practice.

Future research could expand by examining multiple microenterprises across different industries and regions to enhance generalizability. Longitudinal studies could track how marketing strategies adapt over time. Incorporating customer perspectives and quantitative data would also deepen the understanding of marketing effectiveness and business sustainability.

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ZARZĄDZANIE STRATEGIAMI MARKETINGOWYMI DLA USŁUGOWYCH MIKROPRZEDSIĘBIORSTW

Streszczenie: Zarządzanie strategią ma kluczowe znaczenie dla sukcesu każdej organizacji, w tym mikroprzedsiębiorstw, ponieważ kieruje zmianami i ułatwia podejmowanie decyzji, stawiając czoła wyzwaniom związanym z przetrwaniem lub utrzymaniem się na rynku. Celem badania była identyfikacja strategii marketingowych mikroprzedsiębiorstwa świadczącego usługi w Escuinapa, Sinaloa, w Meksyku. W badaniu zastosowano podejście jakościowe i opisowe, gromadząc dane za pomocą wywiadów częściowo ustrukturyzowanych, obserwacji i analizy dokumentów. Wyniki wskazują, że zarządzanie strategiami marketingowymi na rzecz rozwoju tego mikroprzedsiębiorstwa z trzynastoletnim doświadczeniem, świadczącego usługi chłodnicze dla gospodarstw domowych, początkowo obejmowało reklamę usług w mediach tradycyjnych i utrzymywanie kontaktu z klientami. Rozszerzono również ofertę nowych usług i nagradzano lojalnych klientów programem rabatowym, całodobową obsługą klienta i promocjami poza sezonem. W kolejnym etapie wykorzystano Facebook i WhatsApp do organizowania konkursów ze stałymi klientami i nowymi użytkownikami poprzez polecenia. Wniosek jest taki, że mikroprzedsiębiorstwa zarządzają zarówno strategiami tradycyjnymi, jak i cyfrowymi, zwiększając zakres usług i zapewniając obsługę klienta. Aby przetrwać lub utrzymać się na rynku, mikroprzedsiębiorstwa muszą wdrażać skuteczne strategie skupiające się na różnicowaniu, innowacyjności, dostosowywaniu się do potrzeb klientów i efektywnym zarządzaniu zasobami.

Słowa kluczowe: zarządzanie, mikroprzedsiębiorstwo, strategia marketingowa

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THE PERCEPTION OF DISCRIMINATION FROM THE GENDER PERSPECTIVE IN CONSTRUCTION WORKERS

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Abstract: This article presents an exploratory study that aims to examine the relationship between the perception of labor discrimination and Psychosocial Risk Factors (PSRF), utilizing two normative instruments: Reference Guide III (NOM-035-STPS-2018) (STPS, 2018) and the Workplace Climate and Non-Discrimination Perception Questionnaire (NMX-R-025-SCFI-2015) (Secretaría de Economía, 2015). The methodological integration of both instruments allowed for a comprehensive organizational diagnosis, demonstrating how psychosocial risk factors are linked to structural discriminatory practices. The findings reveal an increased exposure to psychosocial risk among women, particularly in dimensions such as workload, workplace violence, leadership and organizational belonging, compared to their male counterparts. Additionally, differentiated perceptions of unequal treatment and exclusion were identified. The study concludes with organizational recommendations and policy implications aimed at promoting substantive equality and preventing psychosocial risks in male-dominated work environments.

Keywords: gender equity, labor discrimination, psychosocial risk factors, NMX-R-025, NOM-035-STPS-2018

JEL Classification: L74, J28

Introduction

Gender-based discrimination perpetuates persistent inequalities in salaries, access to education, representation and workplace conditions (Rodríguez-Carrasquillo, 2024). Women face structural barriers rooted in cultural, economic and social norms,

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often exacerbated by traditional gender roles (Jiménez Figueroa & Hernández Reveco, 2020). Despite such challenges, labor participation has increased, motivated by economic necessity and shifting social paradigms, leading women into male-dominated fields like construction. However, mistreatment of women in positions of subordination continues to occur in male-dominated areas (McKinsey & Company, 2024).

The gender gap persists due to organizational practices such as wage disparities, underrepresentation in leadership, rigid schedules and hostile work climates (Jiménez Figueroa & Hernández Reveco, 2020). For women, especially those from low-income backgrounds, demanding shifts and insufficient emotional support contribute to psychosocial strain and exposure to Psychosocial Risk Factors (PSRF) (Zárate Negrete & Sánchez Ramos, 2022; ILO & WHO, 1984).

In this study, PSRF stands for Psychosocial Risk Factors, workplace conditions that can negatively impact emotional well-being, mental health and performance. These include excessive workload, unclear roles, lack of recognition, poor leadership, harassment and limited growth opportunities. Identifying these factors helps prevent stress, burnout and conflict. In Mexico, the NOM-035-STPS-2018 provides a framework to address such risks, recognizing their effects on health and productivity. International bodies like the ILO and WHO also stress the need for psychologically safe work environments (WHO & ILO, 2022). This research uses PSRFs to examine how working conditions shape well-being and organizational dynamics, aligning with the WHO–ILO report that identified these risks as key determinants of workers' physical and mental health (ILO & WHO, 1984). In construction, high workloads, unsafe conditions and instability intensify stress and diminish self-esteem among female workers (San Juan Pérez, 2021). Discriminatory environments hinder their integration and limit access to professional growth (Pellegrini, 2024), while negatively impacting organizational climate and emotional well-being (Meza Barajas, 2017).

Unfavorable conditions, linked to poor recognition and limited training, fuel turnover and reduce productivity. The absence of effective strategies to mitigate PSRF results in precarious work settings (Vargas Jaimes et al., 2021). Therefore, analyzing these risks from a gender perspective is essential to uncover harassment, exclusion and workplace invisibility.

This study aims to examine the relationship between discrimination and PSRF utilizing two normative instruments: Reference Guide III (NOM-035-STPS-2018) (STPS, 2018) and the Workplace Climate and Non-Discrimination Questionnaire (NMX-R-025-SCFI-2015) (Secretaría de Economía, 2015), contributing to more equitable and healthy organizational practices in the Mexican construction industry.

Literature review

The analysis of the documentary indicates that, despite widespread recognition of the gender gap both nationally and internationally, it continues to pose a persistent challenge. According to the report by the International Labor Organization (ILO), gender inequalities remain significant barriers to equitable job opportunities in Latin

America and the Caribbean. By the end of 2024, women represented 52.1% of the workforce compared to 74.3% of men, highlighting the impact these disparities have on women participation in the labor market (ILO, 2025).

In Venezuela, Atagua-Díaz (2024) exposes that the increasing visibility of gender issues in recent years has led to a misleading perception of gender equity. While the gap between the genders may appear to have narrowed on the surface, a more thorough examination indicates that the underlying inequalities remain. Although some changes in practices have occurred, substantial structural reforms are still necessary. As stated by Atagua-Díaz (2024), it is essential to recognize that inclusion policies and regulations alone are not sufficient. There is a pressing need for cultural transformation that challenges patriarchal paradigms within the workplace.

Furthermore, the research conducted by Quiroz Vences et al. (2023) in Ecuador underlines the various manifestations of gender inequalities, particularly in access to education, job opportunities, and the distribution of family roles. The authors argue that public policies play a fundamental role in fostering change aimed at reducing the gender gap, job opportunities and securing fundamental women rights. Such advancement could facilitate greater economic independence for women and contribute to reducing disparities (Serrano et al., 2020; Quiroz Vences et al., 2023).

According to these authors, the persistence of gender inequality in Ecuador is attributed to deeply entrenched cultural norms that are transmitted across generations, which perpetuate stereotypes and the idea that women's work is of lesser merit. This cultural condition hinders women's progression to leadership positions and underscores the need for increased awareness and education about equality and women's fundamental rights. As a result, achieving a profound cultural change and establishing a more equitable society will require a concerted effort. In Peru, research by Mejía Alvites (2024) examines working conditions, gender discrimination and emotional labor, asserting that mutual recognition serves as the cornerstone of trust-based labor relationships.

In Mexico, Magaña Carrillo (2023) emphasizes that gender inequality continues to be a significant barrier to economic and social development. Despite the progress in policies and legislation, notable gender gaps persist in employment, wages and the representation of women in senior management roles, leading to adverse economic outcomes for women. The implementation of effective policies to promote gender equality is challenged by various obstacles, including the pressing need for initiatives that facilitate work-family balance.

According to data from the World Economic Forum (2024), the consequences of the gender gap extended beyond the female population; the exclusion of female talent results in a 20% reduction in global Gross Domestic Product (GDP) disproportionately affecting developing nations. It is projected that achieving full gender parity may take up to 134 years, and economic parity may require as long as 152 years. However, in some of the world's leading economies, the gender gap has been reduced to over 80%.

In Spain, Grupo Atico34 (2023) explains that the gender gap is reflected in the unemployment rate for women, which was 3.7% higher than for men in 2022. Furthermore, women held only 26% of leadership positions. This underrepresentation

can be attributed to both direct and indirect discrimination, wage disparities, the glass ceiling phenomenon and sexual harassment. Data from Grupo Atico34 (2023) indicates that 17.3% of working women reported experiencing some form of harassment from colleagues or superiors in 2021. Additionally, San Juan Pérez (2021) highlights that discrimination against women in the Spain is rooted in androcentric patriarchy framework and the prevailing gender stereotypes. Her research emphasizes that occupational health issues have predominantly focused on men and their difficulties, often overlooking the unique challenges faced by women. The study identifies critical psychosocial risks from a gender perspective, such as sexual harassment, challenges in work-family balance and work-related stress. San Juan Pérez (2021) concludes that these psychosocial risks uniquely impact women due to the entrenched gender stereotypes and the broader societal tendency to render women's issues invisible.

Therefore, it is essential to establish rights and protections within the workplace, guided by the organization culture. When organizations foster a supportive environment, they can enhance employee performance and job satisfaction, regardless of their gender (Meza Barajas, 2017).

Although the literature on discrimination and gender gaps is extensive, especially in social and labor contexts, there is limited analysis linking these issues to Psychosocial Risk Factors (PSRF) and their gendered impact, particularly in male-dominated sectors like construction. This gap hinders a multidimensional understanding, as PSRF affect men and women differently. Addressing them from a gender perspective reveals specific effects on workers' psycho-emotional well-being and contributes meaningfully to equity and occupational health. This approach not only enhances organizational diagnosis but also provides essential tools for the design of interventions that foster substantive equality and labor inclusion, in alignment with NOM-035-STPS-2018 and NMX-R-025-SCFI-2015.

Research methodology

Instrument

For this research, we measured the perception of the work environment using the "Questionnaire of Perception of Work Environment and Non-Discrimination" suggested by the Mexican Standard NMX-R-025-SCFI-2015 (Secretaría de Economía, 2015); from now on, it will be referred to as NMX-R-025. This validated tool assesses employees' perception of policies, practices and behaviors related to organizational climate and non-discrimination. This instrument consists of 56 items, evaluating 9 dimensions:

- I. Recruitment and selection of personnel.
- II. Education and training.
- III. Permanence and promotion.
- IV. Co-responsibility in work, family and personal life.
- V. A climate free of violence.
- VI. Harassment and bullying.

- VII. Accessibility.
- VIII. Respect for diversity.
- IX. General working conditions.

Each dimension is evaluated using the Likert scale, since this questionnaire does not provide specific guidelines for interpreting the results. For this reason, it was decided to follow the methodology used by Hernández and Cisneros (2022) as shown in Table 1, which applies percentage weighting on a scale from 0 to 100%. Additionally, we utilized the Chi-Square test (χ^2) as an inferential analysis technique; it performed at a significance level of 5% using the statistical software Statgraphics Centurion XVI (Version 16.1.03) for data processing. This test was pertinent to evaluate the independence between variables and explore differential patterns in the perception of workers, thereby strengthening the rigor of the analysis (Table 1).

Table 1. Percentage interpretation scale of the questionnaire applied

Percentage (%)	Rating
0-25	Very negative
26-50	Negative
51-59	Neutral
60-74	Positive
75-100	Very positive

Source: Adapted from (Hernández, Cisneros 2022)

The purpose of using this percentage scale is to link the findings obtained with the main results obtained from Reference Guide III, corresponding to NOM-035-STPS-2018, which will henceforth be referred to simply as Reference Guide III, facilitating a comparative analysis between the indicators of the organizational environment and the perceptions. The data collection period is designated for the month preceding the administration of the instruments, adhering to the established guidelines. This temporal framework is intended to ensure an accurate and current representation of the organizational environment, thereby mitigating potential distortions that could arise from outdated or irrelevant work experiences at the time of the assessment.

Research and sampling design

This study adopts a cross-sectional descriptive methodology, with a non-experimental exploratory design, focusing on the analysis of gender discrimination perception among workers in the construction sector. The research utilized a non-probabilistic sampling approach, specifically intentional and convenience sampling methods. The study comprised a population of 86 workers, with a response of 98% resulting in 84 valid responses that formed the final sample for analysis. The validity of the sample was calculated for a total population; it is important to emphasize that the

selected workers agreed to answer the questionnaire at their workplace and during working hours. The validity of the sample was calculated, for a total of 86 participants, using a margin of error of 5% and a confidence level of 95%, using the

$$\text{formula: } n = \frac{z^2(pq)}{\frac{e^2 + (z^2(pq))}{N}} \quad (1)$$

To ensure the validity of the study, a minimum of 70 participants was required according to the established formula, whose components mean, n:sample size; z:confidence level; p:expected proportion; q:non-occurrence of the phenomenon; e:sampling error; N:population size. Therefore, the 84 responses obtained were sufficient to meet this criterion. This research was conducted in a construction company located in the State of Oaxaca. Participants for the study were selected based on specific inclusion criteria. The participants had to be of legal age, have a minimum of one year of employment with the company and express their willingness to participate freely and voluntarily, by signing an informed consent form. The process ensured that the ethical principles of confidentiality and autonomy were respected.

Data collection procedure

The instrument was administered in person during workdays coordinated with the participating organization. Area supervisors supported the process by facilitating recruitment and ensuring appropriate logistic conditions. Participants were informed about the purpose of the study, assured of confidentiality, and offered assistance during questionnaire completion. Data collection occurred in controlled settings, free from operational interruptions, fostering engagement and focus.

The 98% response rate is attributed to the organizational context. The participants worked in the construction industry, where hierarchical structures and directive compliance are common. With managerial endorsement and integration into regular work activities, participation was encouraged and facilitated. In such environments characterized by operational coordination and institutional trust, high response rates are more likely.

This section presents results from two regulatory tools: Reference Guide III (NOM-035-STPS-2018) and the Work Climate and Non-Discrimination Questionnaire (NMX-R-025-SCFI-2015). Their application aimed to identify organizational conditions affecting psychosocial well-being and gender-based discrimination, focusing on risks and equity for women in construction. Reference Guide III (NOM-035-STPS-2018) identifies key Psychosocial Risk Factors (PSRFs) such as work environment, workload, leadership, recognition and relationships. The perception questionnaire complements this by revealing gender-based exclusion and discrimination, linking workplace conditions to inclusion or segregation. Comparing both tools highlights risks and barriers to equal access to work. Their integration enables a comprehensive, regulation-aligned diagnosis of equity and occupational health. To explore possible associations between the participants' gender and their perceptions regarding the different dimensions, a Chi-Square independence test (χ^2) was

used. This statistical approach assesses whether there is a significant relationship between employees' gender and their perception regarding different aspects of the work environment. An association with a p-value of < 0.05 was considered statistically significant. The findings are presented in Table 2, facilitating the identification of any statistically significant differences in how the employees perceive the aspects related to the work environment and issues of non-discrimination.

Table 2. Summary of results of the test of independence between gender and perception by dimension

Variable	χ^2	p-value	Statistical result
1. Staff recruitment and selection	1.937	0.164	Not significant
2. Training and development	2.469	0.481	Not significant
3. Permanence and promotion	1.117	0.773	Not significant
4. Co-responsibility in working life	3.021	0.388	Not significant
5. Violence-free work environment	1.466	0.690	Not significant
6. Harassment and bullying	0.701	0.402	Not significant
7. Accessibility	7.474	0.0582	Trend (marginally significant)
8. Respect for diversity	4.578	0.2055	Not significant
9. General working conditions	9.645	0.0218	Significant ($p < 0.05$)

Source: Authors' elaboration based on the analysis in Statgraphics Centurion XVI of the data collected through the NMX-R-025 questionnaire

The information presented in Table 2 indicates that eight of the nine dimensions did not demonstrate statistically significant differences between male and female respondents. This finding suggests that perceptions of the work environment are largely consistent across genders, which may be interpreted as a positive indication of progress toward equity or a reflection of a cohesive organizational culture. However, the dimension related to General Working Conditions did reveal significant differences, highlighting a gender perception gap in structural areas such as benefits, perks and formal conditions. Additionally, the Accessibility dimension had a P-Value close to the threshold (0.0582), which should be considered in future qualitative studies.

However, comparing the results in a more detailed way was carried out through a percentage weighting on a scale of 0-100%, following the methodology proposed by Hernández and Cisneros (2022) (Table 1). This approach facilitated the categorization of responses and the visualization of significant trends in relation to the work environment as perceived by employees (refer to Table 3). Additionally, percentages of the perception of the work environment were compared between men and women (illustrated in Figures 1 and 2). Notably, in the dimension of "Recruitment and selection", women perceived this process much more favorably. They assessed the hiring process as fair and did not identify any discrimination in accessing employment, whereas men have a less clear perception of the situation. These findings are supported by a non-significant p-value ($p = 0.164$), indicating a difference in the mean.

For the dimension of “Education and training”, men maintained a neutral perception, while women considered that access to training was not equitable. Although the difference between both groups was not statistically significant ($p = 0.481$), this finding could have practical implications, especially in relation to development opportunities. Regarding the dimension of “Permanence and promotion”, both groups perceived equality in this area. The lack of difference was also supported by the chi-square result ($p = 0.773$), making it the dimension with the highest level of perceptual agreement between the genders.

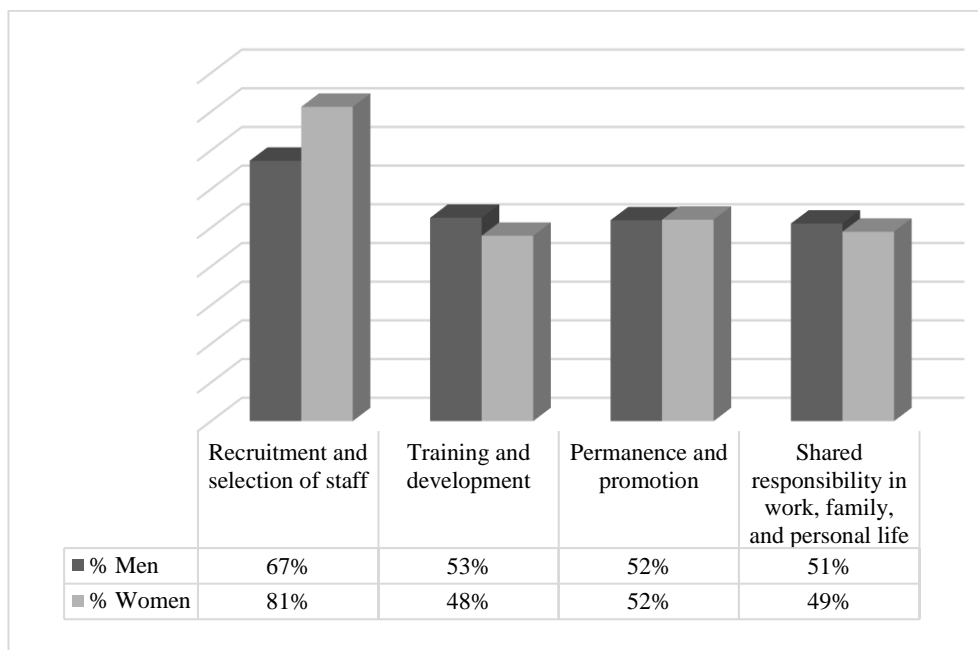


Figure 1. Percentage of perception of the work environment in men and women

Source: Authors' elaboration based on the analysis in Statgraphics Centurion XVI of the data collected through the NMX-R-025 questionnaire

In terms of “Co-responsibility in work and family life”, women perceived slightly more obstacles in balancing work and family life, though the difference was relatively low and not statistically significant ($p = 0.3884$). This may reflect concrete experiences regarding flexibility or organizational support. Nevertheless, both men and women agreed in identifying deficiencies in work-family balance, which transcends gender.

Regarding the dimension of “Work climate free of violence”, both groups similarly distinguished the importance of respect and the absence of workplace violence. The consistency observed with the chi-square test ($p = 0.6902$) indicates that there is no significant perceptual difference between the two groups.

Table 3. Percentage of perception of the work environment by gender and size

Sample classified by gender							
Variable	Mean (score) Men	Men (%)	Classification men	Mean (score) Women	Women (%)	Classification women	Difference
1. Staff recruitment and selection	8.08	67	Positive	9.75	81	Very positive	+ 14 points in favor of women
2. Training and development	6.31	53	Neutral	5.75	48	Negative	- 5 points in favor of men
3. Permanence and promotion	9.35	52	Neutral	9.38	52	Neutral	- 0 points
4. Co-responsibility in working life	13.79	51	Neutral	13.22	49	Negative	- 2 points in favor of men
5. Work environment free of violence	21.58	51	Neutral	21.25	51	Neutral	- 0 points
6. Harassment and bullying	13.85	58	Neutral	12.75	53	Neutral	- 5 points in favor of men
7. Accessibility	7.31	49	Negative	8.13	54	Neutral	+ 5 points in favor of women
8. Respect for diversity	3.0	50	Negative	3	50	Negative	- 0 points
9. General working conditions	6.62	55	Neutral	6.63	55	Neutral	- 0 points

Source: Authors' elaboration based on the analysis in Statgraphics Centurion XVI of the data collected through the NMX-R-025 questionnaire

For the dimension of “Harassment and bullying”, men reported a greater sense of respect for physical and sexual integrity. While the difference was not statistically significant ($p = 0.402$), it may warrant further attention due to the sensitive nature of the topic. In the dimension of “Accessibility”, a relevant difference was observed: men considered that the physical space or working conditions were less accessible, with a marginally significant p-value of 0.058.

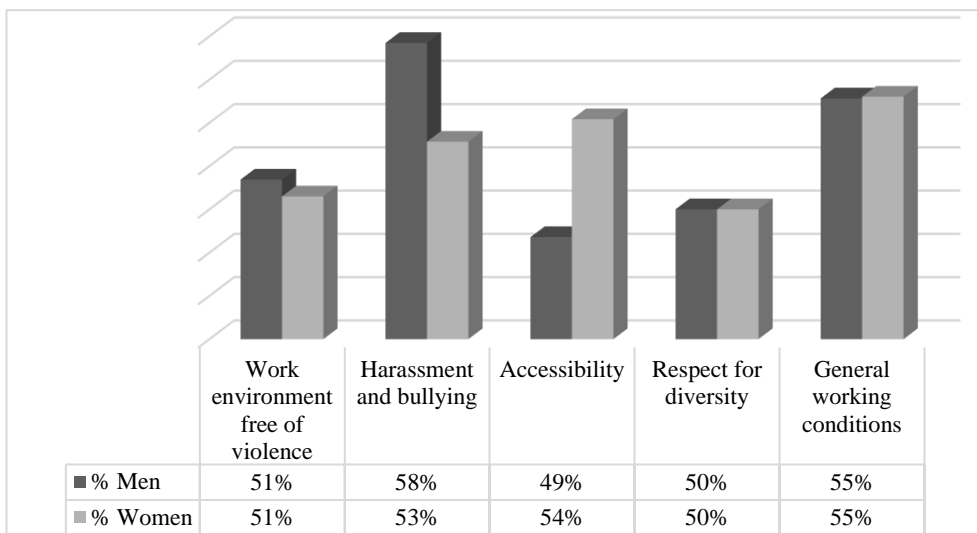


Figure 2. Percentage of perception of the work environment in men and women

Source: Authors' elaboration based on the analysis in Statgraphics Centurion XVI of the data collected through the NMX-R-025 questionnaire

In relation to “Respect for diversity”, both groups displayed a low perception level, suggesting that there is a possible area for improvement in fostering inclusion and respect for differences. In regard to “General working conditions”, although the average percentage was the same, the distribution of responses varied statistically between genders, indicating a potential perceptual gap concerning specific working conditions.

Table 4. Correspondence between the dimensions of Guide III and the categories of the perception questionnaire

NOM-035 Domains	Dimensions NMX-R-025	Linked indicators
Workload	General working conditions	Equal pay, distribution of tasks, perception of overload
Leadership and Relationships at Work	Work environment free of violence / Harassment and bullying	Dignified treatment, respect, follow-up on complaints, open leadership
Working time	Work-family co-responsibility	Flexibility, leave, reconciliation of schedules
Recognition	Permanence and promotion / Performance recognition	Fair Assessment, Promotion Opportunities, Equal Treatment
Workplace violence	Harassment and bullying / Respect for diversity	Offensive comments, unequal treatment, discrimination based on gender, age, appearance
Belonging and job instability	Accessibility / General working conditions	Inclusion, stability, perception of belonging

Source: Own elaboration based on the NOM-035 and NMX-R-2015 standards

In order to establish a relationship between the obtained results and the PSRF, we present the findings derived from the application of Reference Guide III below. The results are organized in two blocks, as illustrated in Figures 3 and 4, to facilitate the comparison between men and women. These figures represent the domains of “Conditions in the Work environment”, “Working hours”, “Lack of Control Over Work” and “Interference Between Work and Family”. Additionally, Figures 5 and 6 show the domains of “Leadership”, “Relationships at Work”, “Violence”, “Recognition of Performance” and “Insufficient Sense of Belonging” and “Instability”. These domains show the greatest impact on workers and provide comparative data on men and women, which is essential for assessing psychosocial risk by gender. The connection between the domains and the dimensions of the applied questionnaires is detailed in Table 4.

This crossover allows us to connect the findings and demonstrate how PSRF are linked to discriminatory practices, thus reinforcing a gender perspective. In relation to the general conditions of the work environment, most women reported experiencing high risk levels, while men, for the most part, indicated a zero or negligible risk level. This suggests that perceptions of the organizational environment differ according to gender.

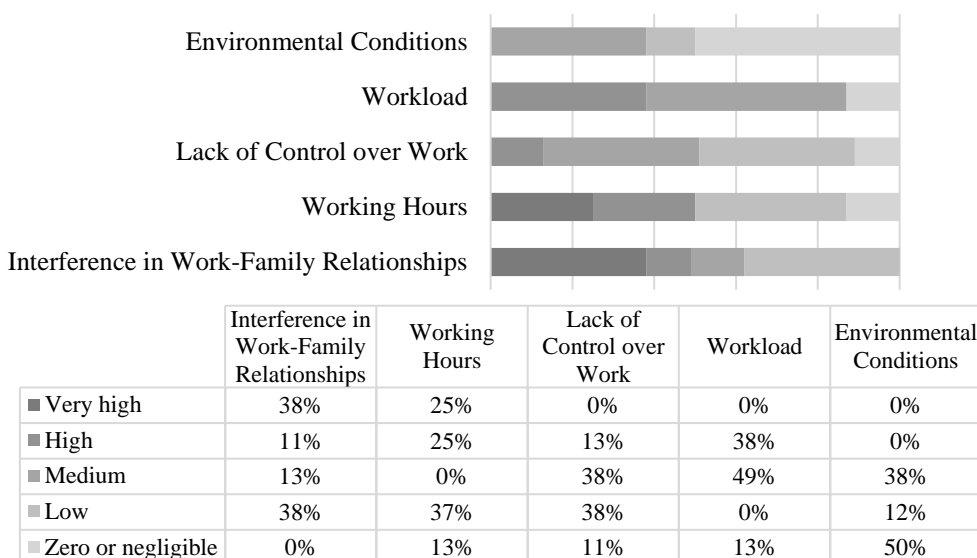


Figure 3. Dominance of men

Source: Own study based on research

When examining the workload, it was observed that men were mostly at medium risk levels, while women reported high-risk levels in their responses, evidencing a greater perceived impact. In terms of lack of control over work, both groups agreed that their experiences fell between medium and high-risk levels. These findings reflect a shared perception of limited autonomy in work performance (Martínez & Martínez, 2023).

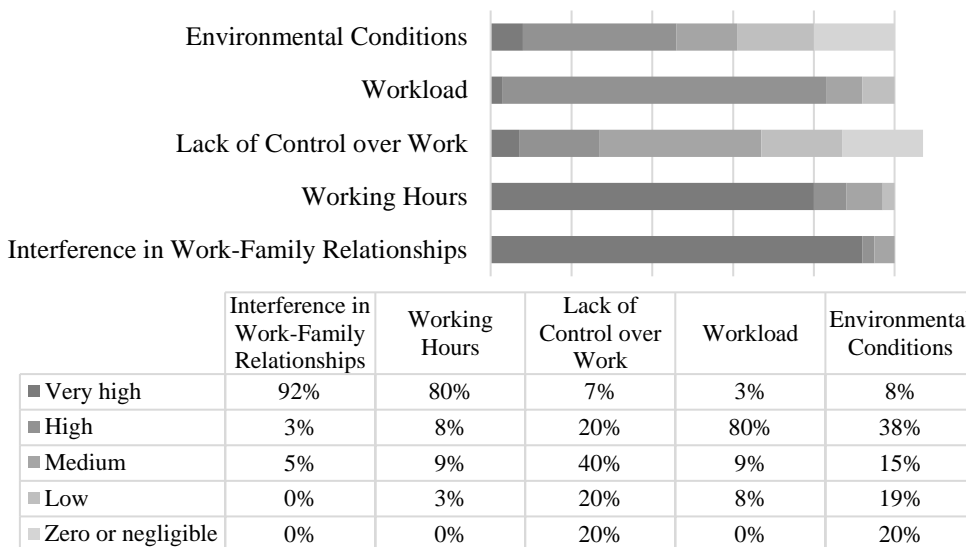


Figure 4. Women's domain

Source: Own study based on research

As to the working time, 80% of women considered it as a very high-risk situation, in contrast to 50% of men who placed it at a high/medium risk, in the same category. For the work-family interference domain, most women perceived it as having a very high level of risk, while only about a third of men shared this perception (Aguilar Guzmán & Arrieta Sancho, 2022).

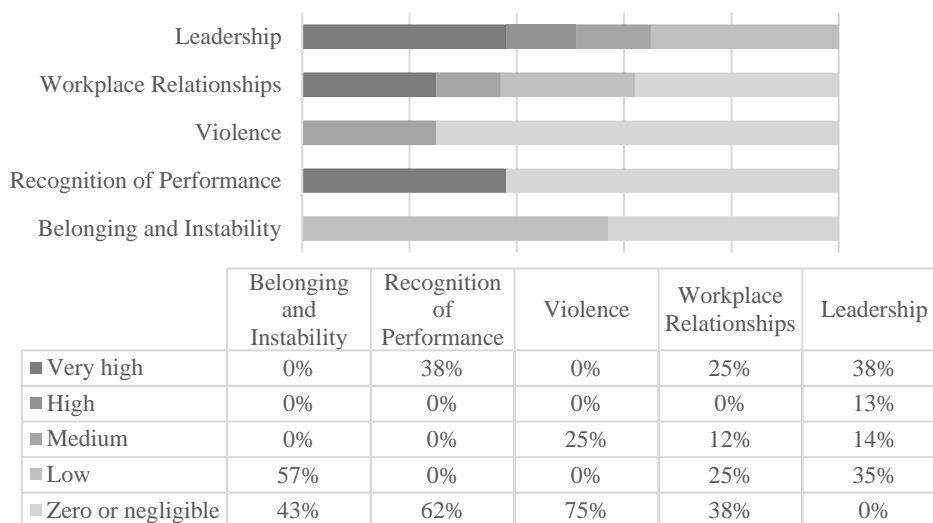


Figure 5. Men's dominance

Source: Own study based on research

When it comes to leadership style, women were mostly positioned at a very high-risk level, in contrast to men, who expressed a more varied distribution of opinions. For the dimension of labor relations, women were also predominantly at very high risk, while most men expressed their perceptions at zero or negligible risk levels.

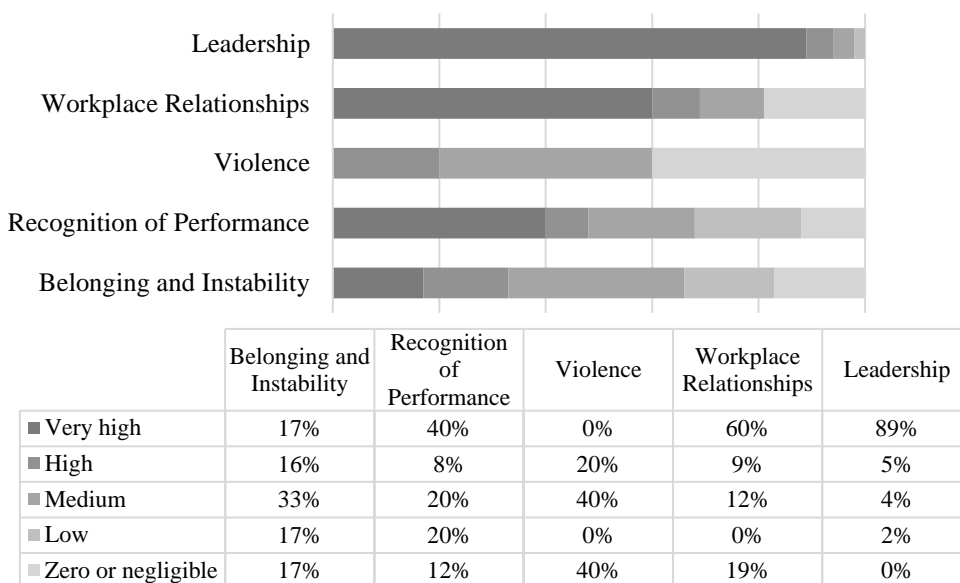


Figure 6. Women's domain

Source: Own study based on research

In the domain of workplace violence, men reported zero or negligible risk, while women reported medium or high risk. Regarding the recognition of performance, both genders placed it as a very high risk. Additionally, women perceived greater risk concerning the feeling of belonging and instability, compared to men. These findings show a gender-specific impact on psychosocial factors, emphasizing the need to implement specific actions to promote substantive equality in the workplace (STPS, 2018; NMX-R-025-SCFI-2015).

The analysis of the results from Reference Guide III and the NMX-R-025 showed significant correlations regarding perceptions of unequal treatment, limited opportunities for advancement, hostility towards women and the absence of preventive measures against discrimination. These findings reinforce the presence of PSRF and show how structural discriminatory practices affect women workers in a distinct way. The methodological convergence of these findings reveals that PSRF are interrelated with experiences of exclusion and lack of recognition, contributing to a workplace environment that jeopardizes psychosocial well-being. This comprehensive approach strengthens the organizational diagnosis and guides the design of strategies aligned with NOM-035 and NMX-R-025 to promote equality and the prevention of psychosocial risks within the workplace.

Conclusion

This study reveals a strong link between psychosocial risk factors (PSRFs) and labor exclusion practices rooted in gender inequality within the construction sector. These risks are not only individual but embedded in organizational structures that perpetuate unequal treatment. Women reported higher perceptions of risk across most dimensions, indicating limited access to opportunities, recognition and stability, while men perceived lower levels of risk, reflecting a differentiated workplace experience.

The findings underscore that PSRFs are not gender neutral and require an intersectional lens to understand how workload, leadership and recognition relate to explicit and symbolic discrimination. As Aguilar Guzmán and Arrieta Sancho (2022) note, male-dominated environments often obscure the impacts on excluded groups. Ridgeway & Markus (2022) similarly highlight that organizational culture remains a barrier to equity despite some progress.

International research supports these conclusions. Edirisinghe et al. (2024) identify “pipeline leaks” in female participation across Australia, the U.S., the U.K. and Brazil due to masculinized cultures and weak inclusion mechanisms. Monash Lens (2022) shows that even in regulated contexts, women face structural barriers to leadership, affecting their well-being and retention. Norberg & Johansson (2021) examine how idealized gender norms reinforce stereotypes and hostile environments, while Triana et al. (2019) link perceived gender discrimination to poorer health outcomes, especially in less egalitarian cultures.

These insights contribute to global debates on labor equity and highlight the urgency of gender-sensitive organizational policies with robust evaluation and participatory mechanisms. The findings support the need to strengthen regulatory frameworks like NOM-035-STPS-2018 and NMX-R-025-SCFI-2015 through effective monitoring and enforcement, particularly in sectors with entrenched gender gaps.

Incorporating gender indicators into national well-being assessments and promoting women’s participation in policy design are essential. Organizational measures, such as inclusive leadership, balanced workloads, antiviolence protocols, transparent recognition criteria and ongoing climate monitoring, are critical to fostering equity.

Bennett (2024) warns that many corporate efforts fail due to a lack of direct oversight and continuous evaluation. This study confirms structural inequalities in construction and proposes future research lines, using larger samples, intersectional variables, and mixed methods to deepen the analysis of labor equity. Despite limitations, such as non-probabilistic sampling, cross-sectional design, and limited emotional depth, the research offers a solid foundation for understanding exclusion and PSRFs from a gender perspective and informs more inclusive, transformative approaches.

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POSTRZEGANIE DYSKRYMINACJI Z PERSPEKTYWY PŁCI U PRACOWNIKÓW BUDOWLANYCH

Streszczenie: W niniejszym artykule przedstawiono badanie eksploracyjne dotyczące psychospołecznych warunków pracy i postrzegania dyskryminacji ze względu na płeć wśród pracowników firmy budowlanej w mieście Meksyk. Zastosowano dwa instrumenty normatywne: Przewodnik Referencyjny III z NOM-035-STPS-2018 oraz Kwestionariusz Percepcji Klimatu w Miejscu Pracy i Niedyskryminacji z NMX-R-025-SCFI-2015. Wyniki wskazują na większe narażenie na ryzyko psychospołeczne wśród kobiet, szczególnie w takich wymiarach jak obciążenie pracą, przemoc w miejscu pracy, przywództwo i przynależność do organizacji, w porównaniu z mężczyznami. Ponadto zidentyfikowano zróżnicowane postrzeganie nierównego traktowania i wykluczenia. Metodologiczna integracja obu instrumentów pozwoliła na kompleksową diagnozę organizacji, pokazując, jak psychospołeczne czynniki ryzyka są powiązane ze strukturalnymi praktykami dyskryminacyjnymi. Badanie kończy się zaleceniami organizacyjnymi i implikacjami politycznymi mającymi na celu promowanie istotnej równości i zapobieganie zagrożeniom psychospołecznym w środowiskach pracy zdominowanych przez mężczyzn.

Słowa kluczowe: równość płci, dyskryminacja w pracy, czynniki ryzyka psychospołecznego, NMX-R-025, NOM-035-STPS-2018

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SUSTAINABILITY BENEFITS OF ENVIRONMENTAL PRACTICES IN MSMEs: EVIDENCE FROM GUANAJUATO'S TEXTILE INDUSTRY

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Abstract: This study examines the implementation of environmental practices among micro, small, and medium-sized enterprises (MSMEs) in Guanajuato, Mexico, with a focus on the textile sector, and evaluates their contribution to business sustainability. The study addresses the growing demand for sustainable production models in regional industries that face environmental challenges. A quantitative, non-experimental, cross-sectional design was used, based on data collected through a survey of 244 MSME owners and managers. The Importance-Performance Map Analysis (IPMA) was applied to identify strategic improvement areas by comparing the relevance and execution of environmental practices. The results show an overall implementation level of 49.47%, indicating a significant potential for improvement. Key practices influencing sustainability include process design, energy management, and supplier selection, which positively impact employee motivation, reputation, profitability, and customer satisfaction. Although there is awareness of environmental issues among MSMEs in Guanajuato, the implementation remains limited. Strengthening these practices represents an opportunity to improve sustainability performance and competitiveness. The findings highlight the need for targeted policies and support mechanisms to accelerate the green transition of regional MSMEs.

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Keywords: environmental practices, IPMA, MSMEs, sustainable benefits, textile industry

JEL Classification: Q56, Q01, M14, L67

Introduction

Micro, small and medium-sized enterprises (MSMEs) play an important role in national economies due to their significant contribution to the generation, innovation, and local development of jobs (OECD, 2019). MSMEs represent more than 99% of all businesses in Mexico and generate approximately 70.6% of formal employment (INEGI, 2025a). Within this landscape, the textile industry holds particular socio-economic relevance, especially in states like Guanajuato, where it contributes significantly to local employment and production capacity. However, the sector is also associated with high environmental impacts from intensive resource use, chemical processes, and waste generation (Choudhury, 2017; Kant, 2012).

Although the INEGI 2024 economic census does not yet provide a detailed breakdown of formal employment in Guanajuato's textile sector, the state reported more than 1.1 million formal jobs as of June 2025 (INEGI, 2025b). MSMEs play a central role in this employment landscape, accounting for over 69% of formal jobs and 99.8% of all registered economic units. Additionally, the Guanajuato Ministry of Economy reports a continued strengthening of the economic base in 2024, with a notable increase in formal employment and business consolidation (Gobierno del Estado de Guanajuato, 2025).

Environmental sustainability has become a growing concern in industrial sectors worldwide, including textiles, due to the increasing pressure from regulatory frameworks, consumer expectations, and global climate commitments. This change has led to a heightened interest in how small businesses adopt and benefit from environmental practices. Existing research suggests that implementing such practices can improve environmental performance, operational efficiency, and competitiveness. However, MSMEs often encounter structural barriers, such as limited financial resources, technological gaps, and insufficient expertise, that restrict their ability to adopt sustainable strategies (Dangelico & Pujari, 2010; del Brío & Junquera, 2003). In Mexico, these challenges are compounded by weak institutional support and lax enforcement of environmental regulations (OECD, 2013).

In Guanajuato, a state with a long-standing textile manufacturing tradition, the environmental footprint of MSMEs is a growing concern. Although some companies have begun to adopt cleaner production methods and invest in waste management systems, the overall implementation of environmental practices remains fragmented and underresearched. This lack of comprehensive data hinders the ability of policymakers and industry leaders to design effective strategies for sustainable development.

The focus on Guanajuato as the study region is justified by several factors. Guanajuato is one of the Mexican states with the highest concentration of MSMEs in the textile sector, particularly in industrial clusters such as León, Moroleón, Uriangato, and San Francisco del Rincón, where textile activities play a central role in regional employment and economic output. At the same time, these clusters face significant

environmental challenges related to waste management, water consumption, and pollution, which makes sustainability a pressing issue. Unlike other states with consolidated textile industries, such as Puebla, Jalisco, Nuevo León, or Mexico City, Guanajuato has received relatively limited academic attention in terms of empirical studies on MSME environmental practices. Thus, this research contributes to filling that gap while also offering sociopolitical value insights, given the region's ongoing efforts to design and implement sustainability policies tailored to local industrial dynamics.

The objective of this study is to analyze both the implementation and perceived importance of environmental practices among MSMEs in Guanajuato's textile industry. Specifically, it seeks to identify the extent to which these companies adopt such practices and to evaluate their implications for advancing the goals of sustainable development in the region. In doing so, the study provides empirical evidence that can guide policymakers and industry leaders in promoting environmental responsibility while protecting the competitiveness of the sector.

Literature review

The growing concern about climate change, resource scarcity, and ecological degradation has increased pressure on businesses, particularly small and medium-sized enterprises (SMEs), to adopt environmentally sustainable practices. The Natural Resource-Based View (NRBV) (Hart, 1995) provides a strong theoretical foundation for this shift. NRBV posits that companies can achieve competitive advantage through strategic capabilities that facilitate environmentally sustainable practices, such as pollution prevention, product stewardship, and sustainable development. These capabilities allow companies to not only meet regulatory and societal expectations but also improve operational efficiency, drive innovation, and strengthen long-term viability (Hart & Dowell, 2011).

Several empirical studies support the proposition that environmental practices lead to sustainability-related benefits in SMEs. For example, Khoja et al. (2022), in their study of 49 SMEs in Houston, Texas, found that sustainable internal environmental strategies significantly improve operational, economic, and environmental performance. Their findings confirm that integrating sustainability into internal management processes, such as resource efficiency, waste reduction, and eco-conscious production, produces tangible performance outcomes across multiple dimensions.

Similarly, Yacob et al. (2019) investigated green initiatives in Malaysian manufacturing SMEs and found a positive impact on environmental sustainability. Notably, the intentions of owners or managers towards green practices served as a mediating factor, underscoring the role of individual leadership and vision in the implementation of sustainability efforts. However, the study also revealed that the adoption of green technology alone did not yield significant results, suggesting that technology must be accompanied by a behavioral and strategic alignment.

Consistent with these findings, Alraja et al. (2022) demonstrated that green human resource practices, such as green training programs and sustainability-focused performance evaluation systems, substantially enhance sustainable performance

in small and medium enterprises. This highlights the importance of embedding sustainability into organizational culture and systems, rather than treating it as a peripheral or compliance-driven issue. Furthermore, Omowole et al. (2024) emphasize that embracing green business practices, such as energy efficiency, waste minimization, and eco-design, reduces environmental footprints and enhances operational efficiency and competitiveness. These benefits are particularly important for SMEs, which often operate with limited resources and must find ways to innovate within constraints.

Expanding the strategic scope, Toromade and Chiekezie (2024) argue that innovative approaches, including circular economy principles, the adoption of renewable energy and digital technologies, are essential enablers of sustainability. These practices promote cost reduction and resource optimization and promote competitive advantage, particularly in dynamic markets. Lastly, the role of stakeholders cannot be overlooked. Journeault et al. (2021) identified five complementary roles that stakeholders can play in facilitating sustainability adoption in SMEs. These include acting as enablers, collaborators, monitors, resource providers, and legitimizers. Their study suggests that overcoming institutional and resource-based barriers requires multi-stakeholder engagement to improve both social and environmental performance outcomes.

This literature review also synthesizes recent findings that are particularly relevant to the textile sector, where environmental pressures are intensifying. The textile industry is increasingly scrutinized for its resource-intensive operations, and scholars have emphasized the need to transition toward circular economy principles to address its environmental footprint. For instance, Ferrulli et al. (2021) argue for systemic design approaches to support the adoption of a circular textile model, pointing out that while fashion items receive much of the focus, areas such as home textiles remain critically underexplored, revealing a significant gap in sustainable innovation. Furthermore, wastewater management is identified as a key factor in the sustainability transformation of sustainability of textile companies. Gomes et al. (2023) highlight the interdependence between water use, energy consumption, and environmental results, emphasizing the complexity of achieving sustainability in textile production systems. This reinforces the need for integrated environmental strategies, particularly for SMEs operating within the textile value chain.

Finally, circular supply chain management (CSCM) is emerging as a strategic framework capable of driving sustainable innovation in the textile sector. Ugrinov et al. (2024) analyze the barriers and enablers to CSCM adoption, stressing that the successful implementation of circular models requires coordinated efforts in design, logistics, stakeholder alignment, and capability development.

At the European level, empirical evidence highlights that commitment to resource efficiency actions among SMEs is strongly associated with progress in sustainability transitions, suggesting that targeted environmental practices can translate into measurable performance improvements (Chatzistamoulou & Tyllianakis, 2022). In textile-specific contexts, EU-level mapping reports emphasize both opportunities, such as eco-design, circular business models, and collaborative platforms, and persistent capability gaps that constrain smaller firms (European Commission, 2019). More recently,

Naranjo et al. (2025) documented how sustainability-oriented decision-making among European textile SMEs is becoming increasingly salient as companies seek to balance competitiveness with ecological responsibility.

Polish evidence mirrors these patterns. Large-sample studies of Polish manufacturing SMEs document a broadening portfolio of “green” initiatives and link them to operational outcomes, while also identifying persistent barriers such as financing, knowledge gaps, and technology adoption barriers (Wysocki, 2021). Leadership and organizational culture emerge as pivotal enablers of pro-environmental behavior, while pilot research on ESG implementation shows uneven awareness and readiness for sustainability reporting, with financial and informational constraints frequently cited (Piwowar-Sulej & Iqbal, 2025; Sakiewicz et al., 2024).

The reviewed studies consistently highlight that the adoption of environmental practices enables SMEs to improve operational efficiency, reduce ecological impacts, and build long-term competitiveness. In addition, evidence from different contexts, from manufacturing in Malaysia to textile production in Europe and Poland, indicates that integrating sustainability into internal processes, human resources, and supply chain strategies creates measurable environmental and performance outcomes. These findings are particularly relevant to the textile industry in Guanajuato, which faces growing pressure to reconcile economic viability with environmental stewardship. Based on the NRBV and the empirical evidence synthesized, it can be inferred that the implementation of environmental practices should improve the environmental performance of MSMEs operating in this sector.

H1: Environmental practices contribute to improved environmental performance in MSMEs.

Research methodology

This research applied a quantitative approach using a non-experimental, cross-sectional design. The analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), a second-generation statistical technique suitable for complex models and small to medium-sized samples. Additionally, the Importance-Performance Map Analysis (IPMA) was used to explore strategic improvement priorities, using SmartPLS 4 software (Ringle et al., 2022) to conduct all analyses.

To estimate the measurement model, the PLS algorithm was utilized, ensuring internal consistency and construct validity. Furthermore, PLS predict was applied to evaluate the predictive power (Shmueli et al., 2019), while IPMA was specifically used to identify the gap between the importance and execution of environmental practices.

The sampling frame was based on data from the National Statistical Directory of Economic Units (DENUE) in Mexico. A sample size of 224 MSMEs (firms with 3 to 250 employees) was calculated in the Guanajuato textile manufacturing sector, assuming a 95% confidence level of 95% and a 5% margin of error, with $P = Q = 0.5$. Owners and managers of these companies were randomly selected to complete a structured questionnaire.

Measurement of variables

This study adopted a seven-item reflective scale adapted from Mengistu and Panizzolo (2021) to assess environmental practices. Items were rated on a five-point Likert scale, ranging from “not important” to “very important.” A five-item unidimensional scale adapted from Lima et al. (2023) and validated by Cuevas-Vargas et al. (2024) was used to measure sustainability benefits. This scale captures perceived improvements in employee motivation, competitive advantage, corporate image and reputation, profitability, and customer satisfaction, with responses measured on a five-point Likert-type scale from strongly disagree to strongly agree.

Common method bias

To address potential common method bias, full collinearity tests were conducted using the variance inflation factor (VIF) following Kock (2015). All VIF values were below the 3.3 threshold, indicating that common method variance is not a significant concern in this dataset (Table 1).

Table 1. Full collinearity test to evaluate common method bias

Variable	VIF value
Environmental practices	1.282
Sustainability benefits	1.282

Source: Own calculations based on PLS-SEM outcomes

Reliability and validity of the measurement variables

The reliability and convergent validity using the PLS-SEM algorithm. All item loadings exceeded the recommended threshold of 0.70 proposed by Hair et al. (2022), except for one item from the environmental practices construct, which had a loading of 0.696, still within an acceptable range to ensure indicator reliability. Model fit indices further supported the adequacy of the model, with a Standardized Root Mean Square Residual (SRMR) of 0.055 and a Normed Fit Index (NFI) of 0.898, indicating a satisfactory model fit. These results are consistent with the benchmarks suggested by Henseler and Sarstedt (2013), confirming the absence of significant misspecifications between the estimated and saturated models.

Regarding construct reliability, Cronbach’s Alpha values for all constructs surpassed the 0.70 threshold recommended by Nunnally and Bernstein (1994), confirming strong internal consistency. Furthermore, composite reliability (CR) also exceeded the 0.70 benchmark, further validating the consistency of the measurement scales (Hair et al., 2022). Additionally, the extracted average variance (AVE) was calculated to assess convergent validity. According to the criterion established by Fornell and Larcker (1981), an AVE value greater than 0.50 indicates adequate convergent validity. In this study, all constructs exceeded this threshold, confirming that the measurement scales used in the instrument demonstrate both reliability and convergent validity (Table 2).

Table 2. Reliability and convergence validity

Variable	Loading ranges	Cronbach's Alpha	CR	AVE
Environmental practices	0.696 to 0.866	0.915	0.932	0.663
Sustainability benefits	0.832 to 0.905	0.923	0.942	0.765

Source: Own calculations based on PLS-SEM results (Ringle et al., 2022)

However, discriminant validity was assessed using the Fornell and Larcker (1981) criterion, one of the most widely accepted methods for this purpose. This approach requires that the square root of the AVE for each construct (shown in bold along the diagonal of the correlation matrix) be greater than the correlations between that construct and any other. In this study, the highest correlation was 0.434, which is well below the corresponding diagonal values, providing strong evidence that each construct captures a distinct concept (Table 3).

Table 3. Discriminant validity based on the Fornell–Larcker criterion

Variable	Environmental practices	Sustainability benefits
Environmental practices	0.814	
Sustainability benefits	0.434	0.874

Source: Own calculations based on PLS-SEM results (Ringle et al., 2022)

Thus, based on the results of these psychometric assessments, there is sufficient evidence to confirm that the measurement scales included in the research instrument are both reliable and valid.

Results

First, to assess the predictive validity of the structural model, the cross-validated predictive ability test (CVPAT) was applied, comparing the model's PLS-SEM-based prediction errors with those from a naïve benchmark using the indicator average (IA) approach (Sharma et al., 2023). The evaluation focuses on whether the PLS model offers superior predictive accuracy relative to this baseline. As shown in Table 4, the endogenous variable yielded a PLS loss of 1.258, while the IA benchmark recorded a higher loss of 1.450, resulting in a negative average loss difference of -0.192. This negative value indicates that the PLS model outperforms the benchmark in terms of prediction accuracy (Liengard et al., 2021). The result is statistically significant, well below the conventional 0.05 threshold.

These findings provide strong empirical evidence that the structural model has robust out-of-sample predictive power for the outcome variable (Cuevas-Vargas & Fernández-Escobedo, 2025). Therefore, it can be concluded that the model not only fits the data well but also performs reliably in predicting sustainability benefits beyond the estimation sample (Hair et al., 2022).

Table 4. Predictive power through CVPAT – PLS-SEM vs indicator average

Endogenous variable	PLS loss	IA loss	Average loss difference	t-value	p-value
Sustainability benefits	1.258	1.450	-0.192	3.124	0.002

Source: Own calculations based on PLS-SEM results (Ringle et al., 2022)

To test the proposed hypothesis, the PLS-SEM bootstrapping procedure was conducted with 10,000 subsamples (Hair et al., 2022). The results yielded a path coefficient of 0.434, indicating a moderate and statistically significant effect of environmental practices on sustainability benefits. Thus, Hypothesis H1 is supported, providing empirical evidence that the adoption of environmental practices by MSMEs in the Guanajuato textile sector is positively associated with improved sustainability outcomes. These findings align with the predictions of the Natural Resource-Based View (NRBV) of the firm (Hart, 1995; Hart & Dowell, 2011), which posits that firms can gain a competitive advantage by developing capabilities that foster environmental sustainability. The observed results may include improvements in organizational reputation, employee motivation, customer satisfaction, and overall business performance (Table 5).

Table 5. Structural model results

Hypothesis	β	t-value	p-value	Decision
H1: Environmental practices → Sustainability benefits	0.434	8.038	0.000	Supported

Source: Own calculations based on PLS-SEM results (Ringle et al., 2022)

Furthermore, an importance-performance map analysis (IPMA) was performed to identify strategic areas for improvement by examining both the importance (total effect) and the performance (average latent variable scores) of the key constructs of the model (Hauff et al., 2024). The results indicate that environmental practices have an importance score of 0.434 in relation to sustainability benefits, signifying a strong influence on the outcome variable (Figure 1).

Regarding performance, environmental practices recorded a relatively low score of 49.472, while sustainability benefits achieved a higher performance level of 70.237. This gap suggests that, although environmental practices significantly influence sustainability results, their current level of implementation remains limited among MSMEs in Guanajuato's textile sector. Consequently, the IPMA highlights environmental practices as a high-priority area for strategic improvement. Enhancing the execution of these practices may lead to substantial gains in sustainability performance, underscoring the need for targeted support, training, and policy interventions aimed at strengthening environmental capabilities in regional MSMEs.

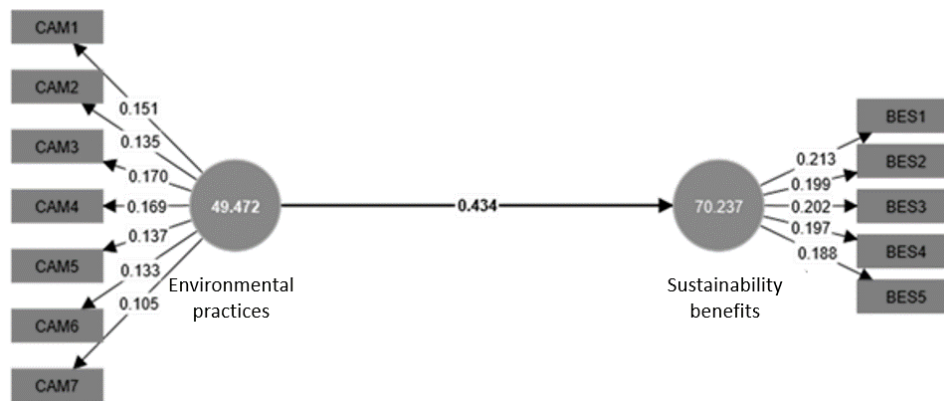


Figure 1. Importance-performance map analysis

Source: Own elaboration based on research results (Ringle et al., 2022)

Consistent with previous empirical studies (Alraja et al., 2022; Khoja et al., 2022; Yacob et al., 2019), the findings confirm that environmental practices, such as energy efficiency, responsible process design, and supplier selection, are associated with tangible improvements in organizational performance. These benefits, including improved reputation, employee motivation, and customer satisfaction, reinforce the multidimensional value of green practices, particularly in resource-constrained SME contexts. Furthermore, the relatively low performance score (49.472) for environmental practices, compared to the performance of sustainability benefits (70.237), indicates a significant implementation gap. This is in line with Omowole et al. (2024), who note that while SMEs increasingly recognize environmental concerns, actual practice often lags due to financial and organizational constraints.

Furthermore, the IPMA’s identification of environmental practices as both highly important and underperformed highlights a critical leverage point for improving sustainability outcomes. This aligns with Journeault et al. (2021), who stress the need for coordinated stakeholder engagement to address barriers and support the adoption of sustainable practices by SME. The findings also resonate with Toromade and Chiekezie (2024), who argue that innovation-enabling mechanisms, such as circular economy models and digital technologies, must fully complement environmental practices to realize performance gains.

In the context of the textile industry, these findings are particularly relevant. The sector is characterized by significant environmental impacts, especially related to water and energy consumption, as highlighted by Gomes et al. (2023). However, sustainable transformation remains uneven, particularly in traditional manufacturing regions such as Guanajuato. Studies by Ferrulli et al. (2021) and Ugrinov et al. (2024) emphasize the need for systemic and cross-functional approaches, such as circular supply chain management (CSCM), to achieve meaningful progress. This study supports this perspective, suggesting that isolated efforts in environmental management are insufficient; rather, integrated strategies supported by public policy and capacity building initiatives are essential to drive sustainable industrial transformation.

Conclusion

This study provides empirical evidence on the implementation of environmental practices among MSMEs in Guanajuato's textile sector and their contribution to business sustainability. The findings indicate that, while environmental awareness is present, the actual level of implementation remains limited. Practices related to process design, energy efficiency, and responsible supplier selection were found to have a significant positive effect on sustainability results, including enhanced reputation, employee motivation, profitability, and customer satisfaction.

From a managerial perspective, the results underscore the strategic importance of integrating environmental practices into core business operations. MSME owners and managers are encouraged to prioritize practices with the highest impact on sustainability performance, as identified through the Importance-Performance Map Analysis (IPMA). Addressing high-importance but low-performance areas represents a critical opportunity to increase competitiveness and ensure long-term viability in an increasingly sustainability-oriented market.

Regarding public policy, the study highlights the need for institutional support to enable the green transition of MSMEs. Policymakers should design targeted interventions, such as financial incentives, technical assistance, training programs, and supportive regulatory frameworks, that reduce adoption barriers and foster environmental innovation. Tailored support mechanisms for MSMEs in traditional manufacturing sectors, such as textiles, are essential to ensure inclusive and regionally balanced progress toward sustainable development goals.

Limitations and future research

This study is subject to certain limitations that should be acknowledged. First, the data were collected through self-reported questionnaires completed by company owners and managers, which may have introduced social desirability bias. As documented in research on corporate social responsibility (CSR) and sustainability, respondents may tend to present their businesses as more environmentally responsible than they actually are, potentially leading to an overestimation of the implementation of environmental practices. Future studies could address this limitation by triangulating data sources, for example, through environmental audits, on-site observations, or the use of secondary performance indicators, to provide a more objective assessment of the sustainability practices of MSMEs.

Second, this study is limited by its cross-sectional design and sector-specific focus, which may constrain the generalizability of the findings beyond the textile industry or the regional context of Guanajuato. Future research could employ longitudinal approaches to assess the evolution of environmental practices over time or expand the analysis to other sectors and regions. Additionally, incorporating variables such as digital capabilities, innovation intensity, or stakeholder pressure could further illuminate the drivers and barriers that influence sustainability adoption in MSMEs.

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Ethics Declaration: The study relied solely on survey data provided voluntarily and anonymously by MSME representatives, with informed consent obtained prior to participation.

AI Declaration: ChatGPT was used to support the translation of selected sections of the article from Spanish to English and Polish, perform proofreading, and improve the syntactic clarity of the manuscript.

KORZYŚCI DLA ZRÓWNOWAŻONEGO ROZWOJU WYNIKAJĄCE Z PRAKTYK ŚRODOWISKOWYCH W MŚP: DOWODY Z PRZEMYSŁU WŁÓKIENNICZEGO W GUANAJUATO

Streszczenie: Niniejsze badanie analizuje wdrażanie praktyk środowiskowych w mikro-, małych i średnich przedsiębiorstwach (MŚP) w stanie Guanajuato, w Meksyku, ze szczególnym uwzględnieniem sektora tekstylnego, oraz ocenia ich wkład w zrównoważony rozwój działalności gospodarczej. Praca odpowiada na rosnące zapotrzebowanie na zrównoważone modele produkcji w regionach przemysłowych zmagających się z wyzwaniami środowiskowymi. Zastosowano ilościowe, nieeksperymentalne badanie przekrojowe, oparte na danych zebranych wśród 244 właścicieli i menedżerów MŚP. Do identyfikacji strategicznych obszarów wymagających usprawnień wykorzystano analizę mapy ważności i efektywności (IPMA), porównując znaczenie i poziom realizacji praktyk środowiskowych. Wyniki wskazują na ogólny poziom wdrożenia na poziomie 49,47%, co świadczy o istotnym potencjale poprawy. Kluczowe praktyki wpływające na zrównoważony rozwój to: projektowanie procesów, zarządzanie energią oraz wybór dostawców – wszystkie mają pozytywny wpływ na motywację pracowników, reputację firmy, rentowność oraz satysfakcję klientów. Pomimo istnienia świadomości ekologicznej wśród MŚP w Guanajuato wdrażanie praktyk środowiskowych pozostaje ograniczone. Wzmocnienie tych działań stanowi szansę na poprawę wyników w zakresie zrównoważonego rozwoju i konkurencyjności. Uzyskane wyniki podkreślają potrzebę wdrożenia ukierunkowanych polityk publicznych i mechanizmów wsparcia przyspieszających zieloną transformację regionalnych MŚP.

Słowa kluczowe: praktyki środowiskowe, IPMA, MŚP, korzyści ze zrównoważonego rozwoju, przemysł tekstylny

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IMPACT OF INTERNAL AUDIT ON FINANCIAL PERFORMANCE OF TRANSPORTATION COMPANIES IN CENTRAL REGION OF COAHUILA, MEXICO

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Abstract: In the increasingly demanding economic environment and competitive market, transportation companies constantly face challenges. In this context, internal auditing is a key tool to strengthen control systems, improve decision making, and optimize resources. The aim of this article is to analyze the impact of internal auditing on the financial performance of transportation companies located in the central region of Coahuila, Mexico. The study followed a quantitative, descriptive, non-experimental, and correlational approach, applying a structured questionnaire. In the central region of Coahuila, 128 companies operate in long-distance transportation. This research focused exclusively on medium-sized companies in this sector, resulting in a final population of 15; however, information was obtained from only 14 companies. The independent variable was internal auditing, based on the evaluation of internal controls and audit frequency. The dependent variable was financial performance, assessed through profitability, liquidity, asset utilization efficiency, and debt level. The results reveal a positive relationship between the implementation of internal audits and the financial performance of companies. More frequent audits are associated with better financial indicators. It was concluded that efficiently applied internal auditing represents an effective strategy to strengthen internal control and financial performance in transportation companies.

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Introduction

Currently, due to the high level of competitiveness, companies face various challenges, including entering into and remaining in the market, managing cost reductions, in addition to maintaining competitive pricing for customers. They must also handle collections and payments, use fixed assets efficiently, maintain optimal inventory levels, and identify the appropriate financial structure for the organization.

It is essential for companies to establish controls and periodic reviews in order to make the most of available resources, reduce costs, and improve the quality of operations by preventing asset waste and the mismanagement of resources. Despite its importance, some companies in the region still fail to evaluate how internal auditing improves efficiency or drives significant changes.

Although internal auditing is widely recognized as a valuable tool, there is still empirical evidence in the central region of Coahuila, Mexico, demonstrating its real impact on financial performance. This gap in knowledge represents a key issue that this study aims to address. By exploring this under-documented area, the authors' research seeks to generate useful insights that transportation companies in the region can apply to optimize their operations and enhance their competitiveness.

The activities of transportation companies are highly relevant to the country's economy as they enable commerce, services, the transformation of raw materials into goods, the supply of inputs to the primary sector, among others. For this reason, the transportation industry was selected as the focus of this study.

The objective of this study is to examine how internal auditing influences the financial performance of transportation companies located in the central region of Coahuila, focusing on four financial performance aspects: profitability, liquidity, efficiency in asset use, and level of debt.

Literature review

The Institute of Internal Auditors (2020) defines internal auditing as an independent activity that offers assurance and advisory services aimed at improving organizational performance and creating value. Dzikrullah et al. (2020), emphasize its role in preventing financial statement fraud while providing independent advice and assurance to support decision making.

Various studies, such as those by Arens et al. (2018) and Guerrero Contreras (2018), have shown that the proper implementation of internal audits positively impacts financial indicators such as profitability, liquidity, and operational efficiency.

Vega Garcia (2006) mentions that auditing is a process that aims to study, discover, identify and evaluate a situation basing its practice on internal control processes and the global diagnosis of organizations. Internal auditing helps control activities that management cannot personally control. It is essential to identify and

minimize risks to the lowest possible level, obtain reports with reliable and accurate information, as well as make corrective decisions that guide the company towards its objectives (Spencer-Pickett, 2007). Montes Salazar et al. (2018) stress that internal audit is based on risk analysis within the internal control system, aiming to generate actions that ensure continuous improvement. Internal audit plays a fundamental role in risk assessment. In this way, it contributes to improving organizational management and achieving objectives.

However, it is not enough to create an internal audit department or to carry out periodic reviews. These activities must be implemented effectively. Research indicates that internal auditing contributes to better decision making and continuous improvement when it is applied through a systematic and professional process (Alava Rosado et al., 2023). Internal audit requires a systematic and disciplined approach that adds value and improves operations, in order to manage risks and maintain control of processes (Spencer-Pickett, 2007).

Likewise, it is important to consider the personality of the internal auditors. Albawwat et al. (2021) found that personality traits significantly affect internal audit quality and, indirectly, the reliability of financial information. It is necessary to consider experience, emotional stability and conscientiousness traits in the personnel who will work in these positions. These findings are consistent with Dzikrullah et al. (2020), whose research supports the importance of qualified auditors.

According to Türegün (2022), evaluation of the company's financial performance is essential for decision making by managers, creditors and investors. It allows organizations in the same sector to be compared in a competitive economic environment. This process is based on the analysis of financial statements, helping to identify strengths and weaknesses in areas such as liquidity, growth and profitability. Similarly, Block et al. (2014) state that the financial performance of a company is determined by means of tools that evaluate profitability, liquidity, efficiency in the use of assets and the level of debt. Furthermore, Mangoejane and Christian (2025) measured financial performance through liquidity, solvency, and profitability.

On the other hand, with regard to debt financing, Mogha and Williams (2021) point out that determining the ideal capital structure remains a complex and debated issue. Executives of large corporations and owners of small and medium-sized businesses must decide on the most appropriate financing strategies. Their findings indicate that corporate culture influences debt-to-book ratio decisions, especially in the short term.

Arroyo-Rosales et al. (2025) conducted a study on the impact of the internal control system on the financial performance of industrial companies. They concluded that establishing appropriate internal control policies reduces operating costs as well as improves performance and liquidity.

Villavicencio-Tenempaguay and Villarreal-Cherrez (2025) designed internal audit techniques to improve accounting processes. They concluded that implementing these practices contributes to improvement in transparency and regulatory compliance, which in turn fosters organizational growth.

Vega Garcia (2006) argues that it is necessary to develop a line of activity in information auditing within organizations. This practice is important for information management, business intelligence and knowledge management.

The reviewed literature emphasizes that internal auditing is a fundamental mechanism to strengthen internal control, mitigate risks, and enhance decision making (Institute of Internal Auditors, 2020; Spencer-Pickett, 2007; Montes Salazar et al., 2018). Several studies highlight its positive influence on financial performance, organizational transparency and regulatory compliance (Albawwat et al., 2021; Villavicencio-Tenempaguay & Villarreal-Cherrez, 2025). At the same time, research on financial performance underlines the relevance of evaluating dimensions such as profitability, liquidity, efficiency in asset utilization, and debt management (Block et al., 2014; Türegün, 2022; Mangoejane & Christian, 2025). However, there is limited empirical evidence regarding the relationship between internal auditing and financial outcomes in transportation companies in the central region of Coahuila. This gap justifies the present study, which seeks to provide insights into how internal auditing influences the financial performance of medium-sized enterprises in this strategic sector.

Research methodology

The study followed a quantitative approach with a non-experimental, descriptive, and correlational design. The independent variable was internal auditing, based on the evaluation of internal controls and audit frequency, while the dependent variable was the financial performance of the companies, assessed through four dimensions: profitability, liquidity, asset utilization efficiency, and debt level.

The research aims to identify the financial performance of transportation companies in the central region of Coahuila as a result of internal audit implementation. The objective of this research is to analyze the impact of internal auditing on the financial performance of transportation companies located in the central region of Coahuila, Mexico.

According to Hernandez et al. (2006), descriptive research seeks to detail the properties, characteristics, and relevant aspects of the phenomenon under study, showing the behavior of a specific group. Therefore, the scope of this study is considered quantitative and descriptive. Since no manipulation of variables was applied, the research is classified as having a non-experimental design (Hernandez et al., 2006).

To achieve this main objective, the following specific objectives were established:

1. Determine whether there is a statistically significant difference between the financial performance of companies that conduct internal audit activities and those that do not.
2. Determine whether the implementation of internal auditing significantly influences the profitability of transportation companies.
3. Determine whether the implementation of internal auditing significantly influences the liquidity of transportation companies.

4. Determine whether the implementation of internal auditing significantly influences the efficient use of assets in transportation companies.
5. Determine whether the implementation of internal auditing significantly influences the debt level of transportation companies.

The following general hypothesis and null hypothesis were established for this research:

H₁: The implementation of internal auditing in transportation companies in the central region of Coahuila significantly impacts their financial performance in terms of profitability, liquidity, asset utilization efficiency, and debt level.

H₀: The implementation of internal auditing in transportation companies in the central region of Coahuila does not have a significant impact on their financial performance in terms of profitability, liquidity, asset utilization efficiency, and debt level.

The specific research hypotheses and the corresponding null hypotheses are the following:

Statistical difference between groups

H₁₁: There is a statistically significant difference in the financial performance between the group of companies that conduct internal audit activities and the group of companies that do not conduct internal audit activities.

H₀₁: There is no statistically significant difference in the financial performance between the group of companies that conduct internal audit activities and the group of companies that do not conduct internal audit activities.

Profitability

H₁₂: The implementation of internal auditing has a significant influence on the profitability of transportation companies.

H₀₂: The implementation of internal auditing does not have a significant influence on the profitability of transportation companies.

Liquidity

H₁₃: The implementation of internal auditing has a significant influence on the liquidity of transportation companies.

H₀₃: The implementation of internal auditing does not have a significant influence on the liquidity of transportation companies.

Efficient use of assets

H₁₄: The implementation of internal auditing has a significant influence on the efficient use of assets in transportation companies.

H₀₄: The implementation of internal auditing does not have a significant influence on the efficient use of assets in transportation companies.

Level of indebtedness

H₁₅: The implementation of internal auditing has a significant influence on the level of indebtedness in transportation companies.

H₀₅: The implementation of internal auditing does not have a significant influence on the level of indebtedness in transportation companies.

A list of registered companies in the state of Coahuila, Mexico, was obtained from the National Statistical Directory of Economic Units. This list was then filtered to include only companies located in the central region of the state, specifically the

municipalities of Monclova, Frontera, and Castaños, resulting in a total of 8.863 companies.

A second filter was applied to identify companies in the transportation sector, resulting in 128 firms dedicated to local and long distance freight transportation, specialized cargo, hazardous materials, waste, and construction materials. From this group, only medium-sized transportation companies were selected, giving a final population of 15 companies.

Based on this listing, a simple sampling was conducted using the Netquest Sample Calculator, considering a population of 15 companies, a confidence level of 95%, and a margin of error of 5%. This resulted in a required sample of 15 representative companies for analysis.

A structured questionnaire, based on the theoretical framework of the research, was administered to the 15 selected companies. The survey was conducted in person. In each company, it was answered by the administrative manager or, alternatively, by a staff member with sufficient knowledge of the subject. Valid responses were obtained from 14 companies.

The study included all medium-sized transportation companies in the central region of Coahuila. Nevertheless, the final sample consisted of only 14 firms, which limits the generalization of the findings to the transportation sector. The results should be interpreted within the context of this specific group of companies.

To collect the information, a structured questionnaire was created with questions aligned to the variables under analysis (Hernandez et al., 2006), focusing on internal auditing and financial performance. The latter was divided into four dimensions: profitability, liquidity, asset utilization efficiency and debt level.

The instrument, entitled “Internal Auditing and Financial Performance in Companies in Coahuila” contained a total of 21 items. The independent variable, internal auditing, was measured on a nominal scale with two possible responses (yes or no), while the dependent variables were assessed using a Likert scale.

As shown in Table 1, the instrument consisted of a structured questionnaire divided into three sections. The first section (A1–A4) collected general information about the company, such as the name of the company, years of operation, number of employees, and the respondent’s position. The second section (B1–B5) included items related to internal auditing practices, addressing the existence of an internal audit department, the formalization and frequency of audits, and their adequacy in evaluating internal controls. The third section (C1–C12) assessed financial performance through four dimensions: profitability (C1–C3), liquidity (C4–C6), asset utilization efficiency (C7–C9), and debt level (C10–C12). All the items in sections C were measured using a five-point Likert scale. This design ensured that the questionnaire captured both the presence and quality of internal audit practices, as well as their relationship with the key aspects of financial performance.

Table 1. Questionnaire items by dimension

Section	Code	Question	Dimension
A. Company Information	A1	Company name (optional)	Company information
	A2	Company's age (in years)	Company information
	A3	Position of the respondent	Company information
	A4	Approximate number of employees	Company information
B. Internal Audit Practices	B1	The company has an internal audit department	Internal auditing
	B2	The company has a formal internal audit process	Internal auditing
	B3	Internal audits are carried out at least once a year	Internal auditing
	B4	The frequency of internal audits is sufficient to prevent risks	Internal auditing
	B5	Internal audits adequately evaluate internal controls	Internal auditing
C. Financial Performance	C1	The company has maintained satisfactory profitability in recent years	Profitability
	C2	Established profitability goals are met	Profitability
	C3	Profit margins are adequate for the type of operation	Profitability
	C4	The company has sufficient liquidity to cover short-term obligations	Liquidity
	C5	Cash is managed efficiently	Liquidity
	C6	Liquidity problems do not occur frequently	Liquidity
	C7	The company's assets are used efficiently	Asset utilization
	C8	Idle assets are avoided	Asset utilization
	C9	Assets generate good returns in operations	Asset utilization
	C10	The level of debt is adequate and sustainable	Debt level
	C11	The company can meet its debt obligations without difficulty	Debt level
	C12	The use of debt does not put business operations at risk	Debt level

Source: Authors' own elaboration

In this study, financial performance was operationalized through self-reported perceptions using Likert-type items. Profitability was assessed with questions on whether profitability goals were met and whether the profit margins were adequate for operations. Liquidity was measured through items related to cash management and the ability to cover short-term obligations. Asset utilization efficiency was evaluated by asking about the avoidance of idle assets and the generation of returns from operations. Finally, debt level was assessed with questions regarding the sustainability of debt and the company's ability to meet its obligations. Although the respondents did not provide specific financial ratios such as ROA or the cash ratio, the items were designed to capture the managers' perceptions of performance in each dimension.

The questionnaires were filled out in February 2025, and the data processing was analyzed between March and May 2025.

To guarantee the survey's reliability, two experts, one in finance and the other in research methodology, reviewed the wording, layout, and response options of each item. Their review ensured that everything was clearly presented and easy for the participants to understand.

Additionally, a pilot test was carried out among three companies that were not part of the main study. The results confirmed that the questions were clear and that the overall structure of the questionnaire did not create confusion for the respondents.

The reliability of the instrument was assessed using Cronbach's Alpha coefficient, calculated with the Statistical Package for the Social Sciences (SPSS) software. The result was 0.855, which indicates acceptable internal consistency.

After the data were collected, the database was processed using the SPSS software. First, the Shapiro-Wilk test was conducted to assess the normality of the data, as the sample size was less than 50, which justifies the use of this test.

To follow a conservative and unified approach, in addition to considering that normality tests have low statistical power with small samples, the Mann-Whitney U test was employed. This test was used to determine whether there were statistically significant differences in financial performance across all four dimensions between the companies that implemented internal auditing and those that did not.

Additionally, Spearman's rank correlation was used to analyze the relationship between internal auditing and the variables that did not follow a normal distribution. The Pearson correlation was applied to examine the relationship with the variables that show a normal distribution. All the statistical analyses were performed using SPSS version 27.

Results

The sample consisted of 15 companies in the transportation sector, from which valid information was obtained from 14, as one company did not complete the questionnaire. These companies have been operating between 20 and 45 years, indicating an established market presence. A total of 86% of the surveys were answered by administrative staff knowledgeable about the company's finances, while the remaining responses came directly from company owners.

In terms of company size, the organizations employ between 60 and 160 individuals. Only five companies reported having a formally established internal audit department. Nine companies indicated that they perform internal audit activities at least once a year. In four of these nine cases, the audits were conducted by internal personnel, usually the company's accountant, rather than by a formal department.

On the other hand, 3 companies indicated that they do not carry out any type of internal audit; these coincide with being the companies with the fewest employees. Lastly, eight companies expressed that the frequency of internal audit activities is insufficient to prevent operational or financial risks, highlighting the need to strengthen these processes in the sector.

According to Ghasemi and Zahediastl (2012), the Shapiro-Wilk test is more suitable for samples of 50 or fewer observations due to its greater power in detecting deviations from normality in small samples. Based on this, the following hypotheses were established:

H₂ (Alternative Hypothesis): The data are not normally distributed.

H₀ (Null Hypothesis): The data are normally distributed.

Ghasemi and Zahediastl (2012) explain that when the p-value resulting from the Shapiro-Wilk test is less than 0.05, the null hypothesis is rejected, and the alternative hypothesis is accepted. As shown in Table 2, the variables liquidity, asset utilization efficiency, and debt level follow a normal distribution, confirming the null hypothesis. Nonetheless, the variable profitability does not follow a normal distribution, confirming the alternative hypothesis.

Table 2. Shapiro-Wilk normality test results

Dimension	Significance
Profitability	0.032
Liquidity	0.532
Asset utilization	0.500
Debt level	0.209

Source: Authors' calculations using obtained data

Since one of the financial performance variables did not follow a normal distribution, the non-parametric Mann-Whitney U test was selected for the analysis, with a significance level of 0.05 and a 95% confidence interval. In addition, composite variables were created for internal auditing and for each financial performance dimension, based on their respective means.

To maintain a conservative and unified approach, the Mann-Whitney U test was applied to all variables, including those with a normal distribution. The test aimed to determine whether there were statistically significant differences in the median financial performance between companies that implemented internal auditing and those that did not.

Ayala et al. (2020) explain that the Mann-Whitney U test is a non-parametric method utilized to compare two independent groups when the data does not follow

a normal distribution. It is also applied when variables are measured on ordinal or interval scales with a small sample size. This situation applies to the present study, which involves 14 companies and includes a dimension of the dependent variable that does not exhibit normality. This test was chosen to address one of the research’s specific objectives. The null hypothesis assumes that the medians of both groups are the same. The alternative hypothesis suggests that the medians differ (Farias Montemayor et al., 2025a; Farias Montemayor et al., 2025b).

As shown in Table 3, the significance values obtained from the Mann-Whitney U test for all the four financial performance variables: profitability, liquidity, asset utilization efficiency, and debt level, were below 0.05. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted in each case.

Table 3. Mann-Whitney U test results

Dimension	Significance
Profitability	0.001
Liquidity	0.003
Asset utilization	0.003
Debt level	0.001

Source: Authors’ calculations using obtained data

Schober et al. (2018) note that the Pearson correlation is best suited for continuous data that follow a bivariate normal distribution. On the other hand, when the data are ordinal or deviate from normality, Spearman’s rank correlation is more appropriate, as it is a non-parametric method that does not require a normal distribution and handles outliers more effectively.

To better explore the relationship between internal auditing and financial performance, as well as to meet the study’s specific objectives, Spearman’s correlation was employed to assess the link between internal audit practices and profitability. This decision was based on the Shapiro-Wilk test, which showed that profitability did not follow a normal distribution, consistent with the guidelines of Ortiz Ozuna and Flores Amador (2025).

Meanwhile, the Pearson correlation was applied to examine the connection between internal auditing and the three financial dimensions that followed a normal distribution: liquidity, efficiency in asset utilization, and debt level. This approach aligns with the methodology used by Núñez Rojas et al. (2024), who also relied on the Shapiro-Wilk test before applying Pearson’s correlation to normally distributed variables.

Table 4 presents the type of correlation utilized, the correlation coefficient obtained, and the significance level for each dimension of the financial performance variable.

Table 4. Correlation results

Dimension	Correlation	Correlation coefficient	Significance
Profitability	Spearman's	0.884	0.000
Liquidity	Pearson	0.777	0.001
Asset utilization	Pearson	0.779	0.001
Debt level	Pearson	0.785	0.001

Source: Authors' calculations using obtained data

Following the interpretation criteria proposed by Farias et al. (2025), the results indicate that:

- for profitability, Spearman's rank correlation coefficient reveals a very strong positive relationship between the implementation of internal auditing and company profitability;
- for liquidity, the Pearson correlation coefficient indicates a strong positive relationship between internal auditing and the company's liquidity;
- regarding asset utilization efficiency, the Pearson correlation coefficient suggests a strong positive correlation between internal auditing and asset usage;
- for debt level, the Pearson coefficient also shows a strong positive relationship between internal auditing and the company's ability to manage debt effectively.

In all four dimensions, the significance values were below 0.01, showing that the correlations are statistically significant at the 1% level. In this sample, a higher degree of internal audit implementation is therefore associated with higher profitability, greater liquidity, more efficient asset utilization, and a healthier debt level.

The results of the Mann-Whitney U test, along with the Pearson and Spearman's correlation coefficients, provide strong evidence for the study. These findings support both the overall hypothesis and the specific alternative hypotheses.

Conclusion

The objective of this research was to examine how internal auditing influences the financial performance of transportation companies in the central region of Coahuila. The analysis focused on four financial performance aspects: profitability, liquidity, efficiency in asset use, and debt level.

The research confirmed the existence of a positive and statistically significant correlation between the implementation of internal auditing and the financial performance of transportation companies in the central region of Coahuila, Mexico.

The evidence confirms that companies with robust internal audit mechanisms reported higher levels of profitability and liquidity. They also showed more efficient asset utilization and maintained healthier debt levels compared to companies that do not implement internal audits. These relations indicate that internal auditing acts as a catalyst for financial practices fostering greater discipline in internal controls and operational efficiency. Consequently, the findings support the alternative hypotheses

and provide evidence that strengthening internal auditing is associated with financial benefits for transportation companies.

Based on the above, it is recommended that transportation companies formalize the internal audit function within their organizational structure. This requires hiring qualified personnel who are independent and free from conflicts of interest. Companies should also establish periodic programs to review and improve internal controls. Finally, it is recommended to promote an organizational culture focused on transparency and continuous improvement so that audit processes are perceived in a positive and constructive way.

While the study provides valuable evidence on the relationship between internal auditing and financial performance, its scope is limited by the small sample size of 14 medium-sized companies from a single region. As a result, the findings cannot be generalized to all transportation companies in Mexico. Future research should therefore consider larger samples and comparative analyses across different regions as well as company sizes to strengthen external validity.

An additional limitation of this study is that company size was not included as a control variable in the analysis. Although the results suggest that smaller firms, in terms of the number of employees, are less likely to conduct internal audits, this potential correlation was not formally tested. It is possible that firm size influences both the adoption of internal auditing practices and the resulting financial performance, which could affect the interpretation of the findings. Future research should consider including company size as a variable to provide a more comprehensive understanding of these relationships.

Another limitation of this study is that the internal auditing variable was operationalized as a binary measure. This approach does not capture important differences in audit quality, frequency, independence, or scope. As a result, the analysis may overlook variations in how internal auditing is implemented across companies. Future studies should consider developing a composite index that includes these dimensions, which would allow a more nuanced evaluation of the relationship between internal auditing and financial performance.

This study did not control external variables that may also influence financial performance, such as company age, the number of employees, level of process digitalization, or the type of cargo transported. These factors could partially explain the differences in profitability, liquidity, asset utilization, and debt management, independent of internal auditing. As a result, the relationship observed in this study should be interpreted with caution. Future research should incorporate these variables as controls or moderators to better isolate the specific contribution of internal auditing to financial performance.

For future research, it is proposed to conduct longitudinal studies that analyze companies before and after the implementation of internal auditing practices. This would allow documentation of the observed changes. Another possible research direction could be to apply the instrument used in this study to other industries in the same region. The sample could also be expanded to include transportation companies from other regions of Mexico.

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WPLYW AUDYTU WEWNĘTRZNEGO NA WYNIKI FINANSOWE FIRM TRANSPORTOWYCH W CENTRALNYM REGIONIE COAHUILA W MEKSYKU

Streszczenie: W coraz bardziej wymagającym środowisku gospodarczym i konkurencyjnym rynku firmy transportowe nieustannie stają przed wyzwaniami. W tym kontekście audyt wewnętrzny stanowi kluczowe narzędzie do wzmocnienia systemów kontroli, poprawy podejmowania decyzji oraz optymalizacji zasobów. Celem niniejszego badania jest analiza wpływu audytu wewnętrznego na wyniki finansowe firm transportowych znajdujących się w centralnej części stanu Coahuila w Meksyku. W badaniu przyjęto podejście ilościowe, opisowe, nieeksperymentalne oraz korelacyjne, stosując strukturalny kwestionariusz. W centralnej części stanu Coahuila działa 128 firm zajmujących się transportem na długich dystansach. W badaniu skoncentrowano się wyłącznie na firmach średniej wielkości w tym sektorze, co dało ostateczną populację 15 firm. Jednak informacje pozyskano jedynie od 14 firm. Zmienną niezależną był audyt wewnętrzny, oparty na ocenie kontroli wewnętrznych oraz częstotliwości audytów. Zmienną zależną były wyniki finansowe, oceniane na podstawie rentowności, płynności, efektywności wykorzystania aktywów oraz poziomu zadłużenia. Wyniki badań ujawniają pozytywną zależność między wdrażaniem audytów wewnętrznych a wynikami finansowymi firm. Bardziej regularne audyty są związane z lepszymi wskaźnikami finansowymi. Stwierdzono, że efektywnie przeprowadzony audyt wewnętrzny stanowi skuteczną strategię wzmocnienia kontroli wewnętrznej i wyników finansowych w firmach transportowych.

Słowa kluczowe: wyniki finansowe, audyt wewnętrzny, firmy transportowe

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FINANCIAL EDUCATION IN RURAL COMMUNITIES: A DEMOGRAPHIC ANALYSIS

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Abstract: Financial education is a key asset in people's life planning. Evaluating knowledge and skills on this topic among residents of rural areas is a challenge. This study aimed to identify the degree of association between the level of financial education of people living in rural communities of the municipality of Cajeme and demographic factors, using a non-parametric statistical test. The type of research was descriptive, correlational, and non-experimental. The subjects studied were 346 people living in the rural communities of the aforementioned municipality. An instrument with 10 questions on demographic aspects and 13 more on financial education was applied, the latter on a Likert scale. The financial education variable was analyzed in its dimensions of knowledge, competence, and management. The results showed that the demographic variables significantly associated with financial education are the municipal community where they live and the level of education. In contrast, the demographic variables that have no association with the level of financial education are gender, marital status, the number of inhabitants living per household, and the number of inhabitants earning income in the household. These findings describe the quantitative aspects that strengthen demographic factors and influence the improvement of financial literacy in the households of rural communities.


Keywords: demographic factors, financial education, rural economics

JEL Classification: G53, R23, J10

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Introduction

In recent years, there has been an observed interest in financial education, mainly because individuals and consumers of financial products do not making sound decisions for their individual economic well-being and that of their family unit. In this regard, Taofeek et al. (2015) point out that an individual's economic situation is closely related to the level of knowledge they possess in financial education.

In the field of financial education, various authors have highlighted its importance as a tool that improves economic well-being. In this sense, Lusardi et al. (2013) note that knowledge in finance is considered a form of investment in human capital, as this knowledge and the skills to analyze information and make informed financial decisions influence an individual's ability to generate wealth, manage their debts, and prepare for retirement. This perspective allows us to understand how differences in the level of financial knowledge translate into inequality in the optimal management of wealth and future economic security.

In the study by Van Nguyen et al. (2022), a comprehensive view of how demographic factors influence the financial literacy of the adult population in a developing country like Vietnam is presented. Their results provide evidence that variables such as age, gender, and income level are significantly associated with the level of financial literacy. Younger adults showed greater competence in cash management, saving, credit, and investment compared to older adults. Gender gaps were also found, with women showing lower levels of financial literacy compared to men. On the other hand, people with higher incomes showed better performance in resource management. It is concluded that there is a need to design differentiated educational strategies that take into account the demographic characteristics of the population to strengthen the financial competencies of the most vulnerable groups.

Research has shown that financial decisions in some environments have become increasingly complex due to the limited information available on financial matters, which represents a significant obstacle to sound financial management. This situation affects rural communities to a greater extent, who are more vulnerable to falling into bad practices with the use of money.

This issue is also related to some variables such as age, gender, educational level and working conditions, among other demographic dimensions. In this regard, the ENIF 2024 presented by the CNBV (2025) reports that, at the national level, 66% of rural communities have at least one financial product, with the most common being the savings account, which is where workers' salaries are deposited in formal financial institutions.

A curious fact is that, in the same survey, a result is presented regarding the percentage of rural and urban populations with a bachelor's degree or higher who have at least one financial product. The results show that 92% of the respondents were from urban areas and 91% from rural areas, which suggests that the level of education has an impact on the use of financial products regardless of whether one lives in urban areas or rural communities. The same does not happen at other levels of education, as the percentage decreases considerably in relation to the urban area.

Taking into account, on the one hand, the economic conditions and on the other the impact of globalization, rural communities have managed to transform their approaches and population patterns, incorporating new dimensions of analysis to adapt to the new social and demographic configuration, which has also allowed them to adopt a vision aimed at improving living conditions (Fornero & Lo Prete, 2023).

The present research was conducted in the 5 districts of the municipality of Cajeme, where its main seat is Ciudad Obregón, Sonora, Mexico. The districts are as follows: Cócorit, Esperanza, Providencia, Pueblo Yaqui, and Tobarito (Marte R. Gómez), with a total of 88,070 inhabitants.

The objective is to identify the degree of association between the level of financial education of people living in rural communities of the municipality of Cajeme and demographic factors, through a non-parametric statistical test. The present research provides empirical evidence on the demographic situation of rural communities in the municipality of Cajeme, analyzing how the level of financial education is associated with demographic factors such as age, sex, the municipal community where they live, marital status, the level of education, the number of inhabitants living in the household, and the number of inhabitants earning income in the household, thus identifying the variables that impact the financial literacy of these communities.

The study is conducted in the 5 districts with distinct socio-cultural and economic characteristics, thus contributing to the understanding of these demographic barriers that affect financial inclusion in rural contexts. The results are indicators for monitoring National Policies in Mexico on this topic.

Financial education is important in all areas because it provides the necessary tools to make informed decisions and thereby achieve stability, especially in rural communities where there are people with greater vulnerability in accessing financial services, which guarantees the financial security of these communities.

Literature review

Financial education in rural areas

In recent decades, financial education has been recognized as an essential tool to improve people's economic well-being and promote financial inclusion, especially in vulnerable contexts such as rural communities. Financial education is essential for improving economic well-being and promoting financial inclusion, especially in vulnerable rural contexts. It refers to understanding financial concepts and using them to make responsible decisions (OECD, 2024). In Mexico, financial literacy is low, particularly in rural areas due to limited services, informal employment, and digital gaps (CONDUSEF, 2022). INEGI (2021) reports that 23% of the rural population lacks formal financial products, and 40% manage their finances without planning. Studies show that financial education enhances individual well-being and strengthens local development through collective savings and better decision-making (Lusardi & Mitchell, 2014). Yet, many programs focus on urban or digital contexts, overlooking rural realities.

Mexico has over 184,000 rural localities representing 21% of the population. In Sonora, 12% of the population lives in rural areas (INEGI, 2020b). These communities participate in various economic sectors and are increasingly diverse. Financial education has become a fundamental skill for citizenship. This need responds to the current challenges arising from the complexity of markets, the digitalization of financial services, and the increasing autonomy required to make responsible economic decisions (Zhou et al., 2023). Financial education, in this context, not only seeks to transmit technical knowledge but also to promote a critical economic culture that enables individuals to navigate their financial environment effectively and ethically.

Financial education focused on inclusion

The benefits offered by financial education impact both personal and national economies by fostering a more conscious, resilient, and capable citizenry in optimally managing their resources. Shen and Yang (2023). In this regard, it has been identified that adequate financial education significantly contributes to reducing the stress associated with money management and increasing people's overall well-being (Csiszárík-Kocsir, 2023). This aspect becomes even more relevant due to the continuous transformation of the financial system, making the development of financial skills indispensable for the increasingly efficient management of personal resources (Lubis & Sutirman, 2023).

The growing need for the efficient use of financial resources has motivated various institutions, both public and private, to develop training programs aimed at improving the financial literacy of the population. However, these efforts have focused more on general awareness than on promoting specific skills such as investment or credit management (Fitriaty et al., 2023; Oppong et al., 2023). García et al. (2013) point out that this lack of structured training has led to the persistence of inadequate financial habits, which highlights the need to implement more effective and continuous educational strategies. Montaña and Ferrada (2021) agree that, although there is a growing awareness of the importance of financial education, greater intervention is still needed in rural areas to promote the acquisition of knowledge, the efficient use of credit, and better access to financial products.

The above may contribute to improving financial education, but it does not guarantee favorable results by itself. On the other hand, the coverage of financial institutions in rural areas of Mexico remains notably limited, with only 7% presence per 10,000 inhabitants (CNBV, 2021). This figure reflects a significant gap in access to formal financial services, which translates into structural disadvantages for the rural population. Although the expansion of financial infrastructure might seem like a logical solution, various studies indicate that merely increasing supply does not guarantee effective use or the expected positive impact on the economic development of these communities. Grohmann et al. (2018) point out that access must be accompanied by the ability to adequately use financial services; that is, effective financial inclusion not only involves availability but also understanding and appropriation of

products such as formal savings, insurance, and responsible credit. In fact, in contexts where financial literacy levels are low, the use of services can be inadequate or even counterproductive (Lusardi & Mitchell, 2014).

Moreover, the World Bank (2022) emphasizes that financial inclusion should be understood as a multifactorial process that requires comprehensive policies aimed at improving financial education, building institutional trust, and adapting services to the cultural and economic realities of rural areas.

Methods

To identify the association between the level of financial education and the demographic factors of rural communities, a quantitative study was conducted, of a descriptive and explanatory type, with a non-experimental design. The research subjects belong to five rural districts of the municipality of Cajeme, selected for their representativeness in terms of the demographic and economic characteristics typical of the rural environment (Table 1).

Table 1. Number of inhabitants in each precinct of Cajeme, Sonora

Name of the precincts	Number of inhabitants	% Population
Cócorit	7,424	8.43
Esperanza	40,000	45.42
Providencia	4,146	4.71
Pueblo Yaqui	24,000	27.25
Tobarito (Marte R. Gómez)	12,500	14.19
Total	88,070	100

Note: Rural police stations in the municipality of Cajeme, Sonora, based on the National Institute of Statistics, Geography, and Informatics (INEGI, 2020a).

Source: Own research

The sampling was non-probabilistic by convenience selecting participants based on their accessibility and availability to answer the instrument within the rural police stations of the municipality of Cajeme, resulting in a total of 346 participants with a 95% confidence level. Regarding the materials, an instrument based on McMillan and Schumacher (2005) was adapted, divided into 2 parts. The first part collected demographic data such as sex, marital status, dependents, community of residence, ethnicity, education level and number of household members, among others. The second part presented the variable of financial education on a Likert scale and included questions related to knowledge, competence, and management, as well as other factors that are not analyzed in this research.

The instrument was validated by expert judges, who issued their judgment based on the scale proposed by the methodology of Escobar and Cuervo (2008). Additionally, the document was submitted to the review of the Institutional Ethics Committee

of the Technological Institute of Sonora. The procedure carried out for the application of the instrument and the interpretation of the results was as follows: (1) the variables under study were identified (2) the population was identified and the sample was determined, (3) an expert committee was formed for the validation of the construct and the validity of the instrument, (4) the information was systematized in the Statistical Package for the Social Sciences (SPSS) version 2021, (6) the analysis with contrasting variables of the demographic factor and the level of financial education was carried out through the Chi-square test.

Results

The following presents the comparison of proportions or hypothesis testing through Pearson's Chi-square test, to estimate if there is an association between two categorical variables. This means that their association indicates that part of the variability can be explained by the other variable, where the variables considered as independent are: age, sex, municipal community where they live, marital status, level of education, number of inhabitants living per household, number of people earning an income per household, compared to the dependent variable, which was the level of financial education.

Thus, the Chi-square test is shown to determine whether the contrasting variable (age) is associated with the level of financial education and to confirm the following hypotheses:

H0: There is no significant association between the age variable and the level of financial literacy. There is no significant association between the variable of age and the level of financial education.

H1: Yes, there is a significant association between the variable of age and the level of financial education.

Consequently, Table 2 is presented, showing the cross-tabulation to visualize the descriptive data among the aforementioned categorical variables.

Table 2. Cross-tabulation of age and financial literacy level

		Age					Total
		18-25	26-33	34-40	41-47	48 and more	
Level of Financial Literacy	Low	17	16	9	5	17	64
	Medium	35	52	39	25	56	207
	High	9	17	6	13	30	75
Total		61	85	54	43	103	346

Source: Own research

To elaborate on the above, Table 2 is presented, showing the significance level of the p-value for the age variable with the level of financial education, obtaining a level of 0.609 greater than 0.05, which means that there is not enough statistical

evidence to assert that there is a significant association between age and the level of financial education in the rural communities of the municipality of Cajeme, Sonora.

That is to say, young and adult individuals show financial education levels within the same ranges, which means that the null hypothesis (H0) is accepted, confirming the non-existence of a significant association between age and the level of financial education, and H1 is rejected. Therefore, it is explained that the inhabitants of the rural communities of the municipality of Cajeme who participated in the study, age differences do not seem to significantly influence the level of financial education.

Table 3. Chi-square tests of the age variable with the level of financial education

	Value	gl	Sig. bilateral asymptomatic
Pearson's Chi-squared	107.274a	112	0.609
Reason of likelihoods	130.929	112	0.107
Linear association by linear association	10.135	1	0.001
N of valid cases	346		

Source: Own research

In the same vein, the Chi-square test is now presented to determine whether the contrasting variable (gender) is associated with the level of financial education and to confirm the following hypotheses:

H0: There is no significant association between the variable of sex and the level of financial education.

H1: Yes, there is a significant association between the variable of sex and the level of financial education.

Thus, Table 4 is presented, showing the cross-tabulation to visualize the descriptive data among the aforementioned categorical variables.

Table 4. Cross-tabulation of sex and level of financial education

		Sex		Total
		Man	Women	
Level of Financial Literacy	Low	28	36	64
	Medium	104	103	207
	High	35	40	75
Total		167	179	346

Source: Own research

On the other hand, Table 5 is presented, which shows the significance level of the gender variable with the level of financial education, obtaining a p-value of 0.630 greater than 0.05. This means that there is not enough statistical evidence to assert that there is a significant association between sex and the level of financial education

in the rural communities of the municipality of Cajeme, Sonora. Therefore, it is explained that the inhabitants of the rural communities of the municipality of Cajeme who participated in the study, the heterogeneity in sex does not seem to significantly influence the level of financial education. That is to say, between the male and female sexes, similar levels of financial education are identified, which means that the null hypothesis (H0) is accepted, confirming the non-existence of a significant association between sex and the level of financial education, and H1 is rejected.

Table 5. Chi-square tests of the variables of sex and the level of financial education

	Value	gl	Sig. bilateral asymptomatic
Pearson's Chi-squared	0.923a	2	0.630
Reason of likelihoods	0.925	2	0.630
Linear association by linear association	0.082	1	0.774
N of valid cases	346		

a. - 0 cells (0.0%) have an expected frequency of less than 5. The minimum expected frequency is 30.89.

Source: Own research

Moreover, the Chi-square test is shown to determine whether the contrasting variable (municipal community where they live) is associated with the level of financial education and to confirm the following hypotheses:

H0: There is no significant association between the variable of the municipal community where one lives and the level of financial education.

H1: Yes, there is a significant association between the variable of the municipal community where one lives and the level of financial education.

Consequently, Table 6 is presented, showing the cross-tabulation to visualize the descriptive data among the aforementioned categorical variables.

Table 6. Cross-tabulation of the municipal community where they live and the level of financial education

		Municipal community where you live					Total
		Cócorit	Esperanza	Pueblo Yaqui	Tobarito	Providencia	
Level of Financial Literacy	Low	21	27	4	11	1	64
	Medium	24	43	45	31	64	207
	High	17	14	25	17	2	75
Total		62	84	74	59	67	346

Source: Own research

From this, it follows that Table 7 presents the significance level of the variable of the municipal community where they live, with the level of financial education, obtaining a p-value of 0.000 less than 0.05. This means that there is indeed sufficient

statistical evidence to assert that there is a significant association between the municipal community where one lives and the level of financial education of the inhabitants of the rural communities of the municipality of Cajeme, Sonora.

Table 7. Chi-square tests of the variable municipal community where they live with the level of financial education

	Value	gl	Sig. bilateral asymptomatic
Pearson's Chi-squared	73.288a	8	0.000
Reason of likelihoods	84.119	8	0.000
Linear association by linear association	3.284	1	0.070
N of valid cases	346		

a. - 0 cells (0.0%) have an expected frequency of less than 5. The minimum expected frequency is 10.91.

Source: Own research

From there, a medium-intensity statistical association with Cramer's V of 0.325 is observed in Table 8. Therefore, the alternative hypothesis (H1) is accepted, confirming that there is indeed a significant association between the variable of the municipal community where one lives and the level of financial education, rejecting the hypothesis (H0). That is to say, the municipal community where people live influences their level of financial education.

Table 8. Symmetric measures of the variable municipal community where they live with the level of financial education

		Value	Sig. approximate
Nominal by nominal	Phi	0.460	0.000
	V de Cramer	0.325	0.000
N of valid cases		346	

Source: Own research

On the other hand, the Chi-square test is shown to determine whether the contrasting variable (marital status) is associated with the level of financial education and to confirm the following hypotheses:

H0: There is no significant association between the marital status variable and the level of financial literacy.

H1: Yes, there is a significant association between the marital status variable and the level of financial education.

Consequently, Table 9 is presented, showing the cross-tabulation to visualize the descriptive data among the aforementioned categorical variables.

Table 9. Cross-tabulation of marital status and level of financial education

		Marital Status					Total
		Married	Common-law marriage	Divorced	Single	Widow	
Level of Financial Literacy \	Low	24	9	6	20	5	64
	Medium	78	28	20	65	16	207
	High	31	6	10	18	10	75
Total		133	43	36	103	31	346

Source: Own research

From which it follows that Table 10 presents the significance level of the marital status variable with the level of financial education, obtaining a p-value of 0.687 greater than 0.05. This means that there is not enough statistical evidence to assert that there is a significant association between marital status and financial education level in the rural communities of the municipality of Cajeme, Sonora.

Table 10. Chi-square tests of the marital status variable with the level of financial education

	Value	gl	Sig. bilateral asymptomatic
Pearson's Chi-squared	5.640a	8	0.687
Reason of likelihoods	5.618	8	0.690
Linear association by linear association	0.008	1	0.927
N of valid cases	346		

a. - 0 cells (0.0%) have an expected frequency of less than 5. The minimum expected frequency is 5.73.

Source: Own research

Therefore, the null hypothesis (H0) is accepted, which states that there is no significant association between the marital status variable and the level of financial education, and the alternative hypothesis (H1) is rejected, explaining that differences in marital status do not seem to significantly influence the level of financial literacy.

Additionally, the Chi-square test is shown to determine whether the contrasting variable (level of education) is associated with the level of financial education and to confirm the following hypotheses:

H0: There is no significant association between the variable of education level and the level of financial literacy.

H1: Yes, there is a significant association between the variable of education level and the level of financial literacy.

Consequently, Table 11 is presented, showing the cross-tabulation to visualize the descriptive data among the aforementioned categorical variables.

Table 11. Cross-tabulation of education level and financial literacy level

		Mention your level of education							Total
		Without formal education	elementary school	High school	Baccalaureate	Bachelor's Degree or Engineering	postgraduate	Technical level	
Level of Financial Literacy	Low	2	4	13	26	18	0	1	64
	Medium	8	21	52	57	53	7	9	207
	High	0	9	17	13	20	10	6	75
Total		10	34	82	96	91	17	16	346

Source: Own research

That is why Table 12 presents the significance level of the variable of education level with the level of financial education, obtaining a p-value of 0.003, which is less than 0.05. This means that there is indeed sufficient statistical evidence to assert that there is a significant association between the level of education and the level of financial literacy among the inhabitants of the rural communities of the municipality of Cajeme, Sonora.

Table 12. Chi-square tests of the variable education level with the level of financial education

	Value	gl	Sig. bilateral asymptomatic
Pearson's Chi-squared	29.613a	12	0.003
Reason of likelihoods	31.698	12	0.002
Linear association by linear association	3.479	1	0.062
N of valid cases	346		

a. - 6 cells (28.6%) have an expected frequency of less than 5. The minimum expected frequency is 1.85.

Source: Own research

This confirms a low-intensity statistical association with Cramer's V of 0.207, as shown in Table 13.

Therefore, hypothesis H1 is accepted, confirming that there is a significant association between the level of education and the level of financial literacy in the analyzed rural communities, and hypothesis (H0) is rejected. That is to say, those with higher levels of education tend to have greater financial knowledge or skills compared to those with lower levels of schooling.

Table 13. Symmetric measures of the variable level of education with the level of financial literacy

		Value	Sig. approximate
Nominal by nominal	Phi	0.293	0.003
	V de Cramer	0.207	0.003
N of valid cases		346	

Source: Own research

In this way, the Chi-square test is now shown to determine whether the contrasting variable (number of inhabitants living per household) is associated with the level of financial education and to confirm the following hypotheses:

H0: There is no significant association between the number of inhabitants living per household and the level of financial education.

H1: Yes, there is a significant association between the variable of the number of inhabitants living per household and the level of financial education.

Consequently, Table 14 is presented, showing the cross-tabulation to visualize the descriptive data among the aforementioned categorical variables.

Table 14. Cross-tabulation of the number of inhabitants living per household and the level of financial education

		Number of inhabitants living per household							Total
		1	2	3	4	5	6	7	
Level of Financial Literacy	Low	7	16	17	14	8	2	0	64
	Medium	14	44	62	50	30	6	1	207
	High	9	15	23	20	6	2	0	75
Total		30	75	102	84	44	10	1	346

Source: Own research

Consequently, Table 15 presents the significance level of the variable of the number of inhabitants living per household with the level of financial education, obtaining a p-value of 0.929 greater than 0.05. This means that there is not enough statistical evidence to assert that there is a significant association between the number of inhabitants living per household and the level of financial education in the rural communities of the municipality of Cajeme, Sonora.

Table 15. Chi-square tests of the variable number of inhabitants living per household with the level of financial education

	Value	gl	Sig. bilateral asymptomatic
Pearson's Chi-squared	5.738a	12	0.929
Reason of likelihoods	6.204	12	0.905
Linear association by linear association	0.048	1	0.826
N of valid cases	346		
a. - 5 cells (23.8%) have an expected frequency of less than 5. The minimum expected frequency is .18.			

Source: Own research

Therefore, the null hypothesis (H0) is accepted, which states that there is no significant association between the variable of the number of inhabitants who receive an income in the household and the level of financial education in rural communities, and the alternative hypothesis (H1) is rejected. That is to say, the number of inhabitants who receive an income in the household does not determine their level of financial knowledge.

Finally, the Chi-square test is shown to determine whether the contrasting variable (number of inhabitants who perceive an income in the household) is associated with the level of financial education and to confirm the following hypotheses:

H0: There is no significant association between the variable number of household members earning an income and the level of financial education.

H1: Yes, there is a significant association between the variable of the number of inhabitants who receive an income in the household and the level of financial education.

In this regard, Table 16 is presented, showing the cross-tabulation to visualize the descriptive data among the aforementioned categorical variables.

Table 16. Cross-tabulation of the number of inhabitants who receive household income and the level of financial education

		Number of inhabitants who receive an income in their household					Total
		1	2	3	4	5	
Level of Financial Literacy	Low	30	28	6	0	0	64
	Medium	77	90	25	10	5	207
	High	36	32	4	3	0	75
Total		143	150	35	13	5	346

Source: Own research

Thus, Table 17 presents the significance level of the variable of the number of inhabitants receiving household income with the level of financial education, obtaining a p-value of 0.197, which is greater than 0.05. This means that there is not enough statistical evidence to assert that there is a significant association between the number of inhabitants who receive an income in the household and the level of financial education of the inhabitants of the rural communities of the municipality of Cajeme, Sonora.

Table 17. Chi-square tests of the variable number of inhabitants receiving household income with the level of financial education

	Value	gl	Sig. Bilateral asymptomatic
Pearson's Chi-squared	11.077a	8	0.197
Reason of likelihoods	15.489	8	0.050
Linear association by linear association	0.000	1	0.990
N of valid cases	346		

a. - 5 cells (33.3%) have an expected frequency less than 5. The minimum expected frequency is .92.

Source: Own research

This is why the hypothesis (H0) is accepted, which states that there is no significant association between the number of people who receive an income in the household and the level of financial education, rejecting hypothesis H1. That is to say, the number of people who receive an income in a household does not determine the financial education level of its inhabitants.

Conclusion and discussions

The results indicate that most demographic factors such as age, sex, marital status, number of inhabitants living in the household, and the number of inhabitants earning income did not show a significant association with the financial education level of respondents from rural communities, which contrasts with the findings of Van Nguyen et al. (2022), who report that variables such as age and sex are significantly associated with financial literacy.

On the other hand, the results that did show a significant association (community where they live and level of education) coincide with what Montaña and Ferrada (2021) pointed out, who emphasize the need for targeted interventions in rural communities to improve access to financial education. This is also linked to what was proposed by PNUD (2014), highlighting that limited access to financial services in rural areas perpetuates poverty. Moreover, the findings support what Grohmann et al. (2018) stated, in that access to financial products must be accompanied by effective capabilities for their use. In this sense, the formal educational level appears as a key factor that enables individuals to make informed financial decisions, as mentioned by García et al. (2013), highlighting the need for structured and continuous educational strategies.

Therefore, it is concluded that the municipal community where they live and their level of education are the two demographic factors evaluated that significantly influence the financial education of people living in the rural communities of the municipality of Cajeme, Sonora.

Finally, these findings reaffirm the importance of considering not only individual characteristics, but also local and educational contexts in the design of public policies and educational strategies aimed at improving financial literacy in rural communities. In countries with established economies like Taiwan, higher levels of financial literacy are also associated with participation in derivatives markets. Therefore, understanding complex products drives more attractive investment behaviors (Yu-Jen & Wei-Che, 2018). Evidence shows that financial education, both in developed countries and emerging economies, is a determining factor in individual decision-making. Demographic factors also generate significant differences in the way people apply their knowledge, highlighting the need for financial education strategies tailored to different population groups.

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EDUKACJA FINANSOWA W SPOŁECZNOŚCIACH WIEJSKICH: ANALIZA DEMOGRAFICZNA

Streszczenie: Celem niniejszego badania było określenie związku między poziomem edukacji finansowej mieszkańców społeczności wiejskich gminy Cajeme a czynnikami demograficznymi, z uwzględnieniem narzędzi mierzących związek między zmiennymi kategorialnymi, a tym samym zrozumienie stopnia tego związku. Informacje te pozwolą na opracowanie kompleksowych strategii, które pomogą we właściwym i odpowiedzialnym zarządzaniu produktami finansowymi, wpływającymi na zdolności zarządcze mieszkańców tych społeczności. Badania miały charakter opisowy, korelacyjny i nieeksperymentalny. Uczestnikami badania było 346 osób mieszkających w różnych społecznościach wiejskich gminy Cajeme. Zastosowano narzędzie składające się z 10 pytań dotyczących aspektu demograficznego i 13 dodatkowych dotyczących edukacji finansowej, w tym tych ostatnich w skali Likerta. Stwierdzono, że – ogólnie rzecz biorąc – czynniki demograficzne poziomu wykształcenia i miejsca zamieszkania wykazują istotny związek z edukacją finansową respondentów.

Słowa kluczowe: czynniki demograficzne, edukacja finansowa, społeczności wiejskie

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EMERGING TECHNOLOGIES AND JOB SKILLS: CONVERGENCE OF INDICATORS TO ASSESS STAFF PERFORMANCE

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Abstract: The main feature of Industry 4.0 is the integration of emerging technologies that transform work processes in all organizations. This transformation forces human capital to adapt to new work dynamics, which requires an expansion of professional growth models. Faced with automation and the use of advanced technological tools, workers must specialize, adapting to evolving skill requirements. The objective of this study is to design a comprehensive model that allows for a precise and relevant evaluation of the preparation, adaptation and performance of workers in contexts mediated by technology, through relevant indicators to measure work performance in the current context, where the use of emerging technologies is predominant. The exploratory analysis examines the factors used by automation companies to evaluate personnel, with the aim of developing an assessment model that is aligned with contemporary demands and the principles of sustainable development. The methodology follows a mixed approach, combining descriptive and exploratory information management to identify the parameters that link technology with emerging skills. Data collection is carried out from documentary sources and interviews with company staff. Conclusions reveal that the convergence of indicators can minimize the gap, allowing the staff to perform appropriately. A non-linear equation is also proposed that reflects the changes generated by emerging technologies, incorporating psychosocial dimensions that impact work in a constantly evolving environment.

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Introduction

In the current context of digital transformation and process automation, companies are experiencing structural changes driven by the adoption of emerging technologies, such as digital content or database systems, information and communication technologies, robotics, the Internet of Things, virtual and augmented reality, 3D printing, artificial intelligence, big data, and advanced manufacturing. These disruptive technologies have redefined production systems and organizational structures, demanding that human capital acquire new skills and adapt to dynamic, technology-mediated work environments (Brynjolfsson & McAfee, 2017; Pérez, 2024).

Human Resources Management (HRM) is one of the fundamental pillars of organizational growth and sustainability. However, traditional performance evaluation remains anchored in linear approaches that emphasize productivity, technical skills, or observable behaviors, without fully incorporating digital skills or the psychosocial dimensions of work. As a result, evaluation tools are insufficient to capture the complexity of current work performance, where adaptability, continuous learning, and interaction with technological systems are critical (Guartán et al., 2019; WEF, 2023).

This situation reveals a research gap: although several studies have explored competency-based models, 360-degree evaluations, and behavioral scales, few have systematically integrated technological indicators with labor dimensions to design comprehensive models of staff performance evaluation. There is little evidence of methodologies that combine traditional HRM perspectives with the challenges of Industry 4.0 (Alles, 2010; Matosas et al., 2019).

An early attempt to address performance evaluation through mathematical expressions is the linear equation proposed by Martínez (2002), which incorporated elements such as competencies, security, and attitude. While valuable, its linear structure does not adequately capture the complexity of technology-mediated work environments, nor does it integrate emerging digital skills and psychosocial dimensions.

The purpose of this study is to design a model that converges traditional performance indicators with technological and psychosocial skills, providing both a theoretical contribution to the HRM literature and a practical tool for companies transitioning to technology-intensive contexts. In doing so, the article seeks to reduce the gap between business practice and scientific development in performance evaluation. Therefore, the central issue is how the convergence of traditional and technological indicators can be structured to construct a performance evaluation model suited to the demands of contemporary work environments.

Research context

Performance evaluation has historically been a fundamental tool for human resource management, providing information for decisions related to promotions, compensation, and training. Traditional approaches, such as competency-based models, 360-degree evaluations, critical incident techniques, or behavioral rating scales, have been widely used to assess staff effectiveness and organizational contribution. These models focus primarily on observable skills, technical performance, and productivity, often reinforcing the alignment between employee capabilities and organizational profitability (Chiavenato, 2011; Alles, 2010; Chávez, n.d.; Matosas et al., 2019).

Despite their relevance, these approaches are increasingly insufficient in contexts shaped by digital transformation. Organizations today must assess not only productivity or behavioral consistency, but also the capacity of workers to adapt to technological change, acquire digital skills, and collaborate effectively in technology-mediated environments. In practice, many companies still apply homogeneous evaluation formats, overlooking the differentiation required by technological intensity, job profile, or organizational role. This generates inequities and reduces the relevance of evaluation results, as highlighted in recent studies (OECD, 2021; WEF, 2023; Durán, 2020; Guartán et al., 2019).

Some research has acknowledged the importance of integrating new competencies; the literature lacks comprehensive models that formally converge traditional performance dimensions with technological indicators. Existing proposals tend to remain descriptive, or they are limited to linear structures that cannot adequately reflect the dynamic and multidimensional nature of technology-mediated work (Martínez, 2002).

In this context, the present study addresses the need for a more integrated approach. By situating performance evaluation in the framework of Industry 4.0, it emphasizes that emerging technologies are not only transforming organizational processes but also redefining the very dimensions of performance that must be measured. Therefore, this study positions itself at the intersection of traditional HRM practices and the demands of digital transformation, seeking to advance both scientific understanding and business practice.

Literature review

Emerging technologies

Emerging technologies have accelerated a profound reconfiguration of production and organizational processes, generating not only new work tools but also new logics of human and professional interaction. Unlike the technological revolutions of history, in Industry 4.0 or the fourth revolution, the current change is not focused exclusively on machinery or information, but on the intelligent integration of systems, the use of predictive algorithms, automated networks, and real-time data flows that demand different ways of acting, learning, and deciding in the work environment (Arntz, et al., 2016).

This process has led to a redefinition of job profiles, the creation of new positions, and a total cross-cutting transformation that affects all occupations, as they require skills such as computational thinking, digital literacy, technological autonomy, and the ability to collaborate between humans and machines (Autor, 2015). Consequently, performance is no longer recognized as the evaluation of the activities executed, but the concept is expanded to include the adaptive capacity and the willingness of the individual to integrate into work ecosystems mediated by technology, so that the traditional evaluation procedure is already classified as insufficient.

Technological skills

As the axis of contemporary work performance, the skills derived from the rapid incorporation of emerging technology into work environments have transformed processes and business models and have generated a profound conversion in their execution formats. As organizations automate tasks, integrate other tools such as artificial intelligence into decision-making, and digitize operations, traditional competencies become insufficient, generating the prevailing need for human capital to develop the so-called technological skills (Laar et al., 2017).

These skills constitute the set of knowledge, attitudes, and capabilities that allow people to interact effectively with digital tools, solve technological problems, adapt to automated environments, and contribute to the intelligent use of complex systems. They are not reduced to the basic management of devices or software, but range from digital literacy to critical understanding of data, cybersecurity, virtual collaborative work, task automation, and strategic digital communication (Ferrari, 2013; Gallardo et al., 2015).

From the perspective of evaluation, these skills should be recognized as a cross-cutting dimension, as they have become determinants of the performance of organizational tasks. Employees must master specific technologies and simultaneously demonstrate agility to learn new tools, be quick to adapt to frequent technological change, and actively participate in digital innovation processes (Ehlers & Kellermann, 2019).

Performance evaluation models in human resources management

Performance evaluation has historically been considered a key tool to measure the effectiveness and efficiency of people in their job roles, providing information for decision-making related to promotions, training, compensation, or relocations (Chiavenato, 2011).

Traditionally, it has been based on criteria such as productivity, goal fulfillment, and organizational behavior; however, models have evolved from hierarchical and unidirectional approaches to more comprehensive, participatory, and competency-focused proposals. In current contexts, characterized by digital transformation, performance evaluation requires considering more complex dimensions that incorporate technical, digital, cognitive, social, and attitudinal skills, that is, a multidimensional structure that goes beyond observable performance and becomes essential to capture the adaptive potential of the individual in the face of change (OECD, 2021; WEF, 2023).

Understanding competencies as a set of observable behaviors related to good and recognized performance in a specific job, in a specific organization, the competency-based evaluation model is defined as an analysis of the individual's ability to perform their function based on competencies – knowledge, skills, attitudes, behaviors – and where a profile was previously defined by position or area, and the degree of mastery that it includes is evaluated (Pereda et al., 2011; Alles, 2010).

The 360-degree evaluation involves feedback from various sources: superiors, peers, subordinates and customers, it offers a complete vision of the behavior of the evaluated in their work environment; it is a comprehensive method that combines qualitative and quantitative approaches to evaluate performance by identifying strengths, weaknesses and perceptions; it is followed by the delivery of feedback to the evaluator and also generates feedback to the evaluators, creating in everyone a feeling of protagonism, not only in the evaluation, but in the way in which the data they have contributed is processed (Alles, 2022).

For its part, CIT records and conducts evaluations for critical incidents; it is based on the collection of specific behaviors, positive or negative, that significantly influence work performance. The events are documented in detail to analyze and generate specific feedback and to be able to provide solutions and find ways for the worker to grow based on experience, since the emphasis of the situations must be very positive or very negative, not the natural and everyday ones (Chávez, n.d.).

Behavioral rating scales, or BERS, are constructed with behavioral descriptions anchored to different levels of performance for each criterion, allowing the subjectivity of the evaluation to be reduced. Its purpose is to minimize the impact of the interpretations made by the evaluator when performance is defined in behavioral terms. What differentiates this scale is the use of behavioral examples for the representation of each of the anchor points that constitute the scale of each of the categories to be evaluated (Matosas et al., 2019).

Labor dimensions

The division into labor dimensions is pertinent and methodologically valid to evaluate performance, especially in current contexts. The way of evaluating has evolved from models focused on productivity and the fulfillment of quantifiable objectives to more comprehensive approaches that seek to capture the complexity of behavior and the contribution of the individual in their work environment. In this sense, the use of dimensions represents a methodological strategy that allows structuring the performance analysis through specific, measurable categories adapted to the organizational context.

Dividing performance into dimensions allows key areas of behavior and competencies to be observed and evaluated in a more detailed and objective way. This fragmentation facilitates not only measurement, but also feedback, individual development, and decision-making related to training, promotion, or improvement of the work environment (Chiavenato, 2011).

Additionally, when these dimensions are underpinned by emerging competencies and skills frameworks, they are aligned with the real needs of the contemporary work environment (Alles, 2010; WEF, 2023).

Purpose of the study

The purpose of this study is to design a comprehensive performance evaluation model that converges traditional indicators with technological and psychosocial skills. From a scientific perspective, the article addresses a research gap in the human resource management literature, where performance models have not yet fully integrated the demands of technology-mediated work environments. From a practical perspective, it provides organizations with a framework for evaluating employees more effectively in contexts shaped by emerging technologies, ensuring both adaptability and competitiveness.

At the same time, this article should be understood as part of a broader, integral line of research. The findings presented here constitute an exploratory stage and serve as the basis for the development of more advanced methodologies, particularly the formulation of a nonlinear equation capable of capturing complex relationships between labor dimensions and technological indicators.

This research should be understood as a first exploratory approach to analyzing technological skills within organizations, with the specific purpose of corroborating the need to update existing performance evaluation frameworks. The findings highlight the insufficiency of traditional assessment formats to capture the current demands of the digital and technological environment.

Furthermore, the study provides the basis for further research aimed at integrating psychosocial aspects into performance evaluation. This perspective recognizes that technological adaptation and the acquisition of new skills are not only technical processes but are also influenced by personal, family, and mental health factors. In this sense, the results confirm the relevance of developing updated and more comprehensive evaluation models that address both technological competencies and psychosocial dimensions.

Research methodology

This study, with a mixed approach and descriptive information management, is an exploratory stage within comprehensive research. The objective is to determine the convergence of indicators to evaluate the performance of the organizations' employees based on technological skills, to subsequently integrate them into an updated and well-founded non-linear equation, which evaluates performance based on the demands of the work environment within the structure that permeates Industry 4.0 and its technological differentiation.

The descriptive analysis of the models used in organizational practice to evaluate performance – competency-based model, 360°, CIT and rating scale – carried out by Calle et al. (2024) is the conceptual basis taken in this study; practical basis is extracted through information from semi-structured interviews of seven companies

selected for convenience (Hernández, 2018), based on their degree of technological integration in operational and administrative processes. The sample included:

- mining industry, safety and operational context;
- manufacturing and automation firms, with a strong presence of digital tools and industrial systems;
- electrical and motor production companies, applying advanced monitoring and quality control technologies.

The seven companies from the manufacturing and services sector are in San Luis Potosí, Mexico. The sample was selected based on accessibility and voluntary participation, which allowed us to obtain an initial perspective on the adoption of technological skills in real organizational contexts. Respondents included managers, department heads, and operational staff with direct experience in the use and implementation of technological tools. Most of them had more than 20 years of professional experience and educational background in engineering, management, or information technologies.

Data collection was carried out between February and March 2025, ensuring the inclusion of current practices in performance evaluation and the adoption of digital tools in organizational processes. These were collected through semi-structured interviews with operational managers, team supervisors, and HR personnel. The interviews

Through phases of information collection, the convergence between emerging technologies and work skills is structured based on an approximation made by Martínez (2002), subject to linear equations, redefining what is expected of a person in their job in companies with a high degree of technology in their processes, in terms of technological skills.

Results

Phase 1. Analysis of traditional performance evaluation models

In this phase, a descriptive analysis of four performance evaluation models was carried out, in which evaluated indicators and labor dimensions are saved and presented in Table 1, where some advantages and disadvantages that have been observed in the implementation of the models are also specified.

Table 1. Analysis of Performance Evaluation Models

Evaluation Model	Applicable dimensions	Indicators identified	Advantages	Disadvantages
Competency-Based Assessment	Technical, digital , attitudinal skills	Technical proficiency level, digital troubleshooting	Comprehensive approach, adaptable to different sectors, development aligned to the position	May require complex profile design by area or function

Evaluation Model	Applicable dimensions	Indicators identified	Advantages	Disadvantages
360 – Degree Evaluation	Communication, collaboration, social responsibility	Clarity in communication, effective cooperation, and Team Perception	Complete vision, encourages continuous improvement, and strengthens communication	It can generate biases or resistances if not properly applied
Critical Incidents (CIT)	Security, innovation , decision-making	Quantity and quality of responses to critical events, applied innovation	Identification of key behaviors, useful in risky environments	High subjective load requires continuous and detailed recording
Behavioral Rating Scales (BARS)	Attitudes, technical performance, observable skills	Frequency of expected behaviors, accuracy in technical tasks	Clarity of criteria, comparability, reduces subjectivity	An elaborate design requires systematic observations

Source: Own study based on (Calle et al., 2024)

Based on this information, it is inferred from the models that denote a clear lack of integration of dimensions and indicators that correspond to the current requirements in reference to technological capabilities, although in the competency-based model, digitalization is referred to, and in the critical incidents model, innovation is enunciated. A formal enunciation is not made, nor do the indicators demonstrate how they are evaluated.

Phase 2. Deploying linear equations to evaluate performance

Next, the linear equations that were used in companies in the mining sector and that turned out to be the basis of bonus programs for productivity concepts are expressed; its application was internal and the administrative strategy was not formally included for transcendental decisions about personnel (Martínez, 2002); Its origin, due to the nature of the operation of the mining sector, is in safety. These equations (1-4) are only demonstrative:

$$\text{Security Grade} = \text{System} + \text{Equipment} + \text{Competence} \tag{1}$$

$$\text{Competence} = \text{Experience} + \text{Attitude} \tag{2}$$

$$\text{Experience} = \text{Knowledge} + \text{Skill} + \text{System} \tag{3}$$

$$\text{Attitude} = \text{Work environment} + \text{Freedom of decision} + \text{Teamwork} + \text{Adaptation} + \text{Family harmony} \tag{4}$$

As can be seen, the equations are inclusive, which permeates an extensive equation and its linear structure may not be stable enough in its application; however, it involves elements that can well adapt to current needs and demands and be a reference to lead to a non-linear equation, as argued, and that integrates the modern technological skills.

Phase 3. Fieldwork findings

Seven companies were considered that, in their operational and administrative processes, the use of emerging technologies is common; non-formal interviews were conducted with operational personnel in charge of providing feedback to their teams and personnel who evaluate performance as part of the activities of the Human Resources department. A basic instrument was used for the interviews, specifically looking for information classified as practical and current, and focused on knowing the perception about evaluating performance by integrating contemporary technological skills.

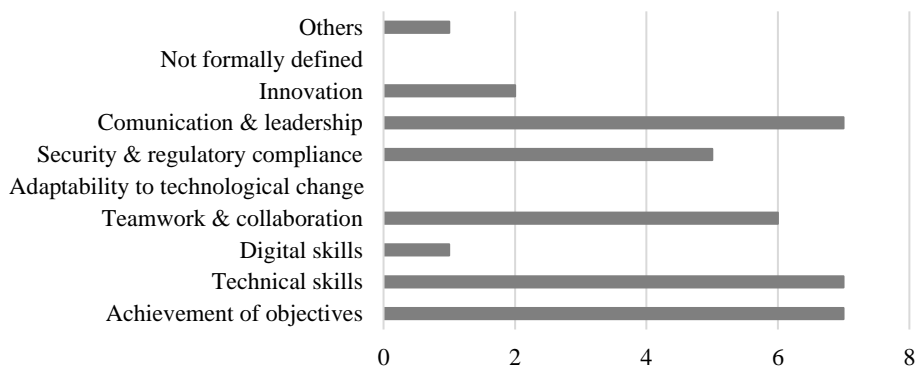


Figure 1. Significant skills for the enterprises

Source: Own elaboration

The results observed in Figure 1 confirm the thesis that emerging technologies are the trigger in companies for changes in processes and, therefore, in the evaluation of the performance of their collaborators, and the coherence with this statement is the evaluation tool through software or digital platforms. The competency-based model is the most widely used, but on the other hand, they state that technological skills are not evaluated, and in addition to this, the responses to the possibility of integrating technological indicators are divided between very and moderately important.

Emphasis is placed on the fact that the evaluations are the same for all personnel regardless of the profiles that occupy the various positions. This should be noted as they are equivalent to 60%, since they are considered strong companies in their field and with significant representation of the use of emerging technologies, which is interpreted as inequitable.

The indicators extracted in this phase are meeting objectives, technical skills, digital skills, teamwork, collaboration, adaptation to technological change, regulatory monitoring, and innovation.

Phase 4. Indicator convergence analysis

First, a graph is constructed that represents the convergence or disparity of the indicators (Figure 2). Indicators or parameters observed from the models (left vertical axis) and those declared by the companies (horizontal axis and the percentage of frequency on the right vertical axis are expressed); this relationship is subjected to a linear equation, assumed to evaluate convergence or disparity. Convergence is the symbol above the bars.

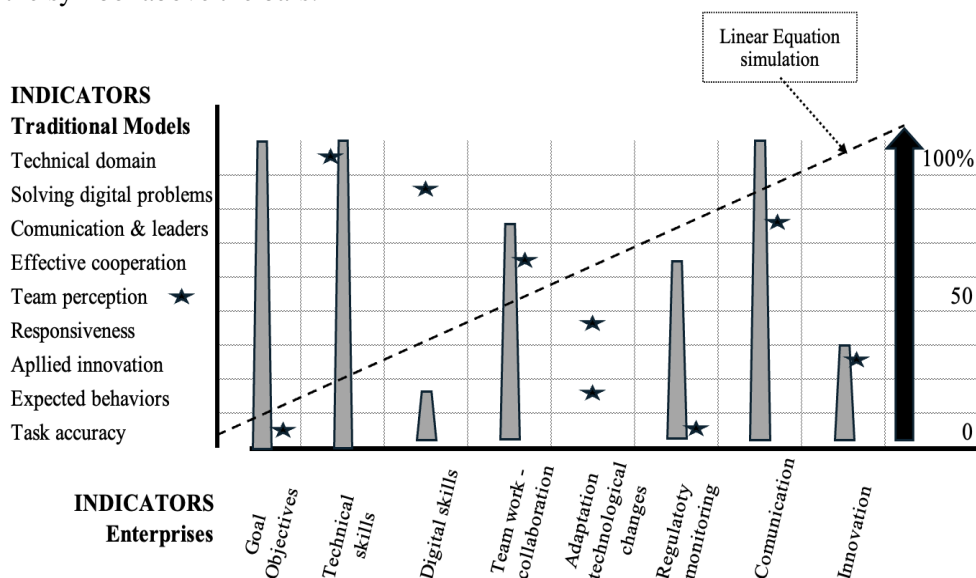


Figure 2. Simple indicator convergence relationship: models vs companies

Source: Own elaboration

Nine indicators that have been extracted from traditional models and eight from companies are considered, and the observations are the following.

- There is a significant dispersion of the coincidences with respect to the line that simulates a linear equation; this finding allows us to consider that it is possible to create a nonlinear equation to evaluate the performance of the (Carrillo, 2011).
- As a critical finding, it is observed that there is an indicator that converges, but there is no frequency of measurement: adaptation to technological change.
- Digital skills and innovation indicators are very rarely used.
- It is observed that the team perception indicator does not converge with the others.

A basic classification of the indicators shown in dimensions (Table 2) is made to perform a second convergence analysis, but this time it will be the indicators classified in established dimensions versus the linear equation expressions provided by Martínez (2002). Elements such as security are mimicked as technical skills. This analysis is presented in Figure 3.

The labor dimensions in this study are created by convenience in basic terms of skills: transversal and technical, adding the technological ones by the focus of this study.

Table 2. Reclassification of indicators in labor dimensions

Labor dimension		
Transverse Skills	Technical Skills	New Technological/Digital Skills
<ul style="list-style-type: none"> - Attitude - Communication - Collaboration - Social responsibility - Team Perception - Effective cooperation - Expected behaviors - Achievement of objectives - Teamwork 	<ul style="list-style-type: none"> - Technical performance - Observable abilities - Technical mastery - Precision in technical - Tasks technical skills - Regulatory monitoring 	<ul style="list-style-type: none"> - Digital troubleshooting - Applied innovation - Digital skills: Adapting to technological change - Innovation

Source: Own elaboration

The importance of Figure 3 lies in the fact that, in order to execute the linear equation expressions today, the emerging technology factor (such as automation, digitalization, or any advanced application: AI, Big Data, 3D, IoT, among many others) must be included, and observe how most of the indicators now depend on the formalization of this new dimension of emerging technologies.

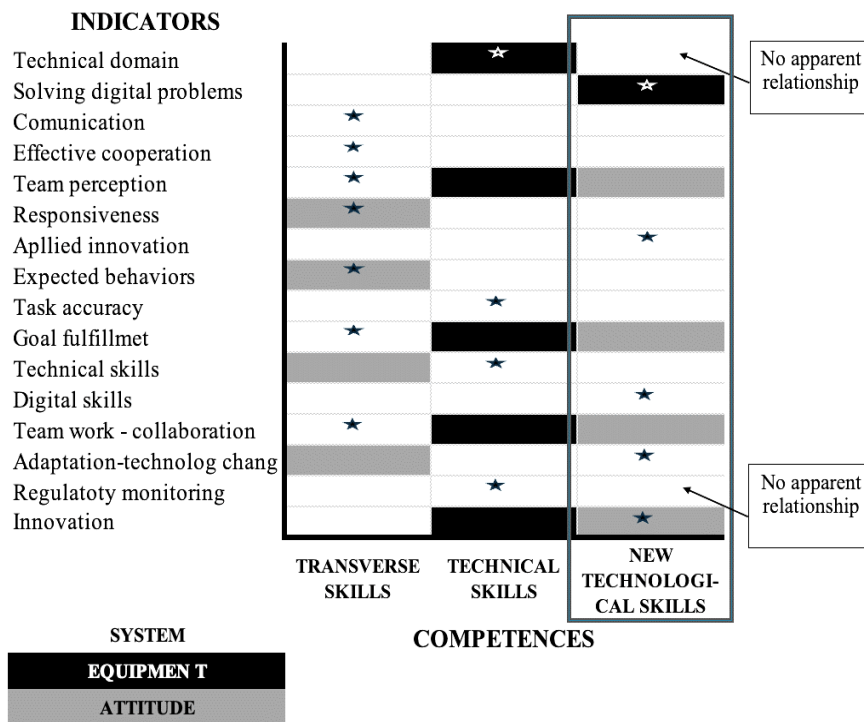


Figure 3. Convergence of indicators within basic labor dimensions

Source: Own elaboration

Thus, the colors show us that:

- a) If we automate/digitize the system, the indicators now also fall into the new dimension (light gray).
- b) Automating the team leads us to evaluate indicators in the new dimension (black).
- c) Not so the natural indicators of technical skills: technical mastery and regulatory monitoring, to which the legend has been placed: "No apparent relationship".

Performance evaluation, once the so-called emerging technologies are integrated, must include a new dimension and must also update and strengthen the monitoring of the indicators observed above, since in each dimension, as there is advanced technology, the indicators to be evaluated increase.

As a particular finding, it is observed that transversal skills do not necessarily include psychosocial indicators, as Martínez (2002) did in his set of linear expressions, and may be one more dimension to be evaluated, substantiated, and integrated into the intended evaluation model.

Research limitations

The limitations were presented: the empirical component was conducted with only seven companies, selected through convenience sampling. While this allowed access to organizations with a high level of technological integration, the small sample size restricts the generalizability of the findings. Instrument used to collect data semi-structured and informal interviews, introduces a degree of subjectivity and limits the possibility of establishing causal relationships, and the exploratory scope promotes preliminary research. Moreover:

- the sample size was limited to only seven companies, which restricts the generalizability of the findings, then promoting the first study of this approach;
- the selection of participants was based on convenience sampling, which may introduce bias;
- the data collected is primarily based on self-reported perceptions, which may carry subjective elements;
- the study reflects a specific timeframe and context, so the results might differ in other economic or social conditions;
- therefore, while the study offers relevant insights into the role of technological skills in organizational contexts, the results cannot be translated into the entire population.

Discussion

The results of this study confirm that traditional performance evaluation models, while valuable, are insufficient for organizations operating in technology-mediated environments. Although competency-based assessments and 360° feedback remain widely used, they do not formally incorporate digital or psychosocial indicators, which are now fundamental to organizational performance (Alles, 2010; OECD, 2021).

The finding that most companies apply the same evaluation standards across diverse job profiles illustrates a lack of sensitivity to the differentiated impact of technology on performance. This aligns with Durán (2020), who argued that rigid systems often fail to reflect the realities of organizations in transition. At the same time, the recognition of skills such as teamwork, innovation, and adaptation to technological change echoes the global trends identified by the World Economic Forum (2023), which highlights these competencies as essential for the future of work.

From a scientific perspective, the study contributes by empirically demonstrating the gap between traditional HRM models and the demands of Industry 4.0. Comparative convergence analysis revealed indicators that are critical but absent from current frameworks, such as explicit digital skills and adaptation to technological change. Furthermore, the identification of psychosocial aspects – such as family balance, stress management, and work environment – suggests that evaluation models must move beyond purely technical or behavioral categories to embrace multidimensional structures (Scherer & Pennycook, 2020).

From a practical perspective, the results highlight the limitations faced by companies when applying homogeneous evaluations. By overlooking technological competencies, firms risk undervaluing key capabilities that drive competitiveness in digitalized contexts. The study provides preliminary evidence that organizations must incorporate technological and psychosocial dimensions into their evaluation practices, even in exploratory or simplified forms, to ensure relevance and fairness.

Finally, the reference to the linear equations applied in the mining sector (Martínez, 2002) emphasizes the historical attempt to mathematically formalize performance evaluation. However, the current findings point to the need for nonlinear approaches capable of representing complex interactions among labor dimensions, traditional skills, and technological indicators. This direction supports the argument that evaluation models must evolve not only conceptually but also methodologically to address the realities of digital transformation.

Conclusion

Models focused on technical competencies, operational results, or behaviors observable in isolation fail to reflect the new demands of the work environment, so it is essential to reconstruct the evaluation system under a logic of contemporary labor dimensions, in which indicators associated with technology are integrated as a transversal axis or even as a dimension of its own.

In work environments mediated by emerging technologies, the adoption of dimensions makes it possible to integrate both traditional skills, security, and technical execution, as well as adaptive and digital competencies that have acquired a central role in the transformation of work (OECD, 2021). For example, the World Economic Forum (2023) states that skills related to problem-solving, emotional intelligence, continuous learning, and digital literacy should be part of any comprehensive performance evaluation. Subject to these premises, a differentiation is made through this study.

Scientific contributions

The study provides empirical evidence of the gap between traditional performance evaluation models and the realities of technology-mediated work environments. By comparing indicators from established HRM frameworks with those identified in companies adopting emerging technologies, the research demonstrates that conventional models fail to capture critical aspects such as digital skills, adaptation to technological change, and psychosocial factors.

Additionally, the study contributes conceptually by proposing the convergence of traditional, technological, and psychosocial indicators as the basis for a comprehensive evaluation model. This sets the groundwork for advancing toward nonlinear methodological approaches that can better reflect the complexity and multidimensionality of contemporary labor performance.

Practical contributions

From a managerial perspective, the findings highlight the risks of maintaining homogeneous evaluation systems that disregard the differentiated impact of technological integration across job profiles. Companies that fail to incorporate digital and adaptive competencies into their performance assessments may underestimate essential capabilities for competitiveness, innovation, and resilience.

The study offers organizations a preliminary framework to rethink evaluation processes by integrating technological and psychosocial dimensions into their HR practices. Even at an exploratory stage, these insights can guide adjustments to existing systems, fostering more relevant and future-oriented evaluations.

Future research directions

This study represents an initial stage within a broader research agenda, and its exploratory nature highlights the need for further validation. Future investigations should expand the empirical base, incorporating larger and more diverse samples to test the robustness of the proposed convergence of indicators. By applying quantitative methodologies and extending the analysis to different sectors, it will be possible to assess the applicability beyond the specific companies considered here, ensuring stronger generalization and comparability of the results (Morales et al., 2024).

At the same time, subsequent research should deepen the methodological framework by developing nonlinear formulations capable of capturing the complex interactions between labor dimensions, technological skills, and psychosocial factors. Such advancements would allow performance evaluation to reflect dynamic and multidimensional realities with greater precision. Furthermore, the integration of digital well-being and ethical considerations in the adoption of technology can contribute to more comprehensive evaluation systems that not only measure efficiency and competitiveness but also promote sustainable, human-centered organizational practices.

In summary, this study should be considered a preliminary step in addressing the need to update performance evaluation formats in the context of technological transformation. Although limited in scope, the findings provide evidence that current assessment models do not fully capture the complexity of technological adaptation in organizations.

Most importantly, the study opens the way for further research that integrates a psychosocial perspective into performance evaluation, acknowledging that the development of technological skills is inherently linked to individual, family, and mental health dimensions. This approach establishes a foundation for more comprehensive and contemporary models of employee performance assessment.

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Authors' Contribution: Dr. Rosa Elia Martínez Torres worked on this study from the idea and its approach, her participation includes the approach with the employees of the companies that participated through informal interviews, she was in charge of the implementation of the method and the future follow-up as director in this project; Dr. Juan Arturo Mendoza Razo, corresponding author, collaborates in this research as a reader and promotes it together with the academic authorities of the ITSLP academic organization. Guillermo Villalpando Romo, contributes to the validation of technologies and collaborates in the field of communication with companies.

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Ethics Declaration: Ethical clearance was not required for the research. Natural acquisitions as acts of confidentiality towards the participating companies.

AI Declaration: Tools to guide the search for valid and reliable sources and tools to support the translation to English and Polish; guide to include some suggested paragraphs.

NOWE TECHNOLOGIE I UMIEJĘTNOŚCI ZAWODOWE: KONWERCENCJA WSKAŹNIKÓW SŁUŻĄCYCH DO OCENY WYNIKÓW PRACY PERSONELU

Streszczenie: Główną cechą Przemysłu 4.0 jest integracja nowych technologii, które przekształcają procesy pracy w organizacjach. Transformacja ta wymusza na kapitale ludzkim dostosowanie się do nowej dynamiki pracy, co wymaga rozbudowy modeli rozwoju zawodowego. W obliczu automatyzacji i wykorzystania zaawansowanych narzędzi technologicznych pracownicy muszą się specjalizować, dostosowując się do nowych wymagań dotyczących umiejętności. Celem niniejszego badania jest zaprojektowanie kompleksowego modelu, który umożliwi precyzyjną i trafną ocenę przygotowania, adaptacji i wydajności pracowników w kontekstach zależnych od technologii, za pomocą odpowiednich wskaźników mierzących wydajność pracy w obecnych warunkach, w których dominują nowe technologie. Analiza eksploracyjna odnosi się do czynników, które firmy z branży automatyzacji wykorzystują do oceny personelu, dążąc do ustanowienia modelu oceny dostosowanego do współczesnych wymagań i zrównoważonego rozwoju. Metodologia ta jest mieszanym, opisowym i eksploracyjnym podejściem do zarządzania informacjami, identyfikującym parametry, które łączą technologię z nowymi umiejętnościami. Gromadzenie danych odbywa

się ze źródeł dokumentacyjnych i wywiadów z personelem firmy. Wnioski pokazują, że konwergencja wskaźników może zminimalizować tę lukę, umożliwiając wydajność personelu w odpowiedni sposób. Zaproponowano również nieliniowe równanie, które odzwierciedla zmiany generowane przez powstające technologie, uwzględniając wymiary psychospołeczne, które wpływają na pracę w stale zmieniającym się środowisku.

Słowa kluczowe: pojawiające się technologie, wymiary stanowiska, ocena wydajności, umiejętności technologiczne

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ANALYSIS OF THE ORGANIZATIONAL MANAGEMENT OF ENTREPRENEURS IN TEHUACÁN AND PROPOSALS

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Abstract: This study analyzes the organizational management strategies of micro and small retail enterprises (MSEs) in Tehuacán, Puebla, Mexico, focusing on their relationship with financial performance and sales growth. Using a quantitative, descriptive, cross-sectional design, data were collected in March 2025 from 593 entrepreneurs via a 30-item Likert-scale questionnaire, applying the computer-assisted personal interview (CAPI) method. Multinomial logistic regression was used to correlate management, sales, finance, innovation, marketing, and operations practices with four income–expense scenarios, each coupled with increased annual sales. Findings reveal that formal strategic planning consistently correlates with positive sales outcomes, particularly when income and expenses fluctuate. Sales growth is often supported by offering credit, while careful monitoring of earnings and supplier costs underpins financial stability. Innovation strategies are primarily externally sourced, through trade shows or outsourced design improvements, rather than internally developed. Marketing investments, especially in advertising, remain central, and operational strategies vary according to financial conditions, favoring either faster delivery or quality improvements. The study concludes that structured planning, financial discipline, and proactive marketing are key drivers of competitiveness among Tehuacán’s MSEs, though innovation practices remain conservative. Recommendations emphasize strengthening internal innovation capabilities to complement existing strategies for sustained market advantage.

Keywords: entrepreneurs, MSEs, organizational management

JEL Classification: M, M21

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Introduction

This paper aims to describe the organizational management actions of entrepreneurs engaged in retail trade in the city of Tehuacán, Puebla, located 253 km south-east of Mexico City. As such, the city has a variety of productive activities, predominantly the trade of goods and services, as well as a small component of industrial production activities for food and maquila clothing for export. Historically, the site has developed its predominant activity in economic cycles; the most notable was textile production, which declined at the beginning of the new century. This gave way to the predominant commercial activity that exists today.

In recent times, business owners have faced limitations due to their organizational structures lacking financial frameworks that allow them to invest in the use of technology and subsequently in innovations. Furthermore, their owners' intentions are not attentive to creating long-term survival planning strategies. Another scenario is that a significant percentage of their market competitors are informal businesses that have no problem establishing themselves and not paying taxes, while established entrepreneurs are subject to numerous regulations by the authorities. There are also positive results, such as better management of advertising and already observed business conduct that observes ethics in management, hiring workers, compliance with government regulations and customer service.

This paper establishes numerical relationships between perceptions of business operating processes and numerical data related to recent experience, comparing cash flows and annual sales results, and observing the predominant statistical incidences. The main objective of this paper is to observe the organizational aspects of merchants, comparing their methods of money management and how they relate to sales, to understand how merchants implement their organizational architectures and understand their business strategies.

Literature review

The processes part of the systems are the operations of the MSEs and define the decision-making of the entrepreneur. MSEs are present in different economic activities, for example, family businesses that make handicrafts. Sánchez Medina (2018) mentions that creating a methodology to measure the processes in small artisan producers requires considering other factors, for example, the context, the environmental strategy, and so on. Other MSEs use intelligent systems to predict customer preferences (Llanes-Font et al., 2023); this includes small businesses that have already begun their digitalization processes. One of the problems of MSEs is their life span, which, as Vargas and Cárdenas (2019) point out, is almost eight years, despite their significant reach in markets and society. In this case, it is necessary to establish strategies for permanence in the markets, which is achieved with proactive and structured financial management, since it is vital for the survival and success of MSE's.

Baque et al. (2020) argue that there are barriers such as those related to organizational management, technological barriers, and others that impact business decision-making. Other studies focus their attention on motivation. A study conducted in

Ecuador on small businesses highlighted that the heterogeneity of owners presents challenges for training and the practical application of motivational strategies (Martínez & Santamaría, 2024). With the effects of globalization (Vinokurova, 2019), some small and medium-sized companies find themselves in need of organizing themselves to achieve productivity and competitiveness objectives; even so, it is important to manage business processes to monitor and solve business challenges (Gómez et al., 2019). As well as the development of people's skills and abilities through improving organizational development strategies (Noriega Niño De Guzmán & Farfán Pimentel, 2025).

Other studies emphasize the need to apply Kanban quality frameworks to improve the internal processes of small businesses and organize value chains (Fierro & Peñaloza López, 2023; Hann et al., 2025). Additionally, the application of project management methodologies to improve the results of business process management, enhancing managerial skills (Bueno-Pascual, 2023). Another strategy is the Organizational Performance Architecture in a supply chain to achieve maturity in the processes of small businesses dedicated to manufacturing (Carballo-Mendivil et al., 2019). Also, human talent management is important to improve structured processes in personnel management (Solano-Castro et al., 2023). Finally, studies that address the use of artificial intelligence using Enterprise Resource Planning (EPR) could benefit small businesses in meeting their fiscal responsibilities (Bonilla Sánchez & Cabral Martínez, 2025).

Research methodology

The aim of the paper is to present a quantitative, descriptive study with a simple cross-sectional approach. Data were collected through questionnaires using the computer-assisted personal interview (CAPI) methodology.

The instrument used was a 30-question questionnaire with Likert-scale response options, measuring the respondent's perception in five points: 1 = strongly disagree; 2 = disagree; 3 = indifferent; 4 = agree; and 5 = strongly agree. The questionnaires were launched in March 2025, and the information was collected by 60 students in the Business and Marketing program.

It is important to note that the sample reflects the size of the business population with the characteristics of merchants established in the city. According to the National Statistical Directory of Economic Units (DENUE), there are 22,602 micro and small businesses dedicated to commerce in Tehuacán, with between 1 and 10 employees and located both in the city and the surrounding areas. The calculated sample was 396 companies, but this study included 593 entrepreneurs. It is also worth mentioning that this group is one of many that exist in the municipalities surrounding the city.

The model best suited to analyzing the processes of micro and small businesses in terms of management, sales management, finance, innovation, marketing, and operations was multinomial logistic regression, which allowed for the dimensions to be examined in terms of perceptions of income, expenses and annual sales. This was done to avoid redundant optimistic responses about the performance of managers,

who typically do not admit to falling behind in management processes (Figure 1). Microentrepreneurs typically respond to questionnaires about their performance with values of 4, which are associated with “agree”, or with the response option of 5, which means “strongly agree”. Linking responses to outcome scenarios allows us to see beyond the responses alone to understand how SMEs are managed.

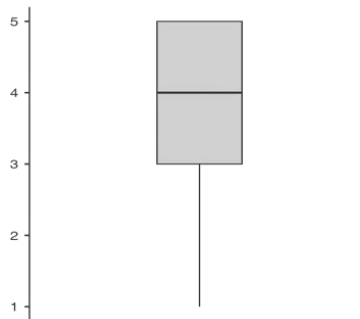


Figure 1. Example of responses regarding business operations, such as actions to achieve sales

Source: Own study based on research

So, the income and expense components, in addition to annual profits, were addressed in four scenarios: 1) increased slightly – increased a lot, with the statement reading: income and expenses increased slightly and the second statement: annual sales increased a lot; 2) Decreased a lot – Increased a lot; 3) Decreased slightly – increased a lot; and 4) Remains the same – increased a lot. Now, these four scenarios were correlated with the dimensions of administrative management to see, with a little more analysis, what the different processes look like. The response values and their correlations with the dimensions were analyzed using statistical software called Jamovi, version 2.6.17. Some results are presented below.

Results

Regarding all data obtained, the reliability analysis, measured in Cronbach's alpha, revealed a level of 0.882, while McDonald's omega was 0.915, which is considered acceptable. The exploratory factor analysis revealed that the Tucker-Lewis index reached a level of 0.901 and the root mean square error reached a level of 0.603, which is acceptable for the proposed model.

For management activities, as an administrative action, the questionnaire included five actions, which in this case is section 12; then, the first question, which is (12a), says: I have a clear mission and vision, I share it with the employed personnel, and we try to carry it out; then (12b) I set specific objectives that we have to achieve in my company; the third question (12c) I set out a business strategy and some actions are carried out by trial and error; the fourth question is (12d), says: I do not usually plan my company's strategy in advance, but rather it arises as I see how to achieve our objectives, and the fifth question, which is (12e), says: My company's

competitive strategy generally results from a formal planning process, that is, the formal plan precedes the action. These questions were related to the perception of income, and expenses increased little, and annual profits increased a lot, using multimodal logistic regression, which yielded a value for each estimator of each of the questions, as well as a constant value. Thus, 12a obtained a value of -0.056 ; 12b of -0.382 ; 12c: -0.643 ; 12d: -0.118 and 12e: 0.150 .

The values obtained from multinomial logistic regression are the correlations between the responses, measured on Likert scales and corresponding to some management action in the administration of small businesses, and the responses regarding income and expenses, as well as annual sales performance. This is also interpreted as the probabilities of occurrence between the variables. For example, Table 1 shows that, of the five administrative actions, the one with a positive correlation to the dimension of income and expenses (increased slightly, but annual sales increased significantly) was action 12e, which has a positive value of 0.150 . The other actions are negatively correlated.

Table 1. Correlation values between management actions, income-expenses and annual sales

Increased slightly of Income and Expenses – Increased a lot of Annual sales				
Predictor	Estimator	SE	Z	p
Constant	5.053	0.81	6.236	<0.001
12a) I have a clear mission and vision; I share it with the employed staff, and we try to achieve it.	-0.056	0.191	-0.294	0.769
12b) I set concrete objectives that we need to achieve in my company.	-0.382	0.223	-1.712	0.087
12c) I propose a commercial strategy, and some actions are carried out through trial and error.	-0.644	0.177	-3.640	<0.001
12d) I don't usually plan my company's strategy in advance, but rather it emerges as I see the best way to achieve our objectives.	-0.119	0.122	-0.971	0.331
12e) My company's competitive strategy generally results from a formal planning process, which means that the formal plan precedes the action.	0.150	0.152	0.989	0.323

Source: Own study based on research

Now, if we take the dimension where income and expenses have decreased a lot, and annual sales have increased a lot (Table 2), it can be seen that the management action with the highest correlation is 12e, which says that my company's competitive strategy generally results from a formal planning process, meaning that the plan precedes the action, with a value of 0.709 , while actions 12a, 12b and 12c have negative correlations. For its part, 12d has a lower correlation of 0.223 .

Table 2. Correlations with the dimension where income and expenses have fallen a lot, and annual sales have grown a lot

Decreased a lot of Income and Expenses – Increased a lot of Annual Sales				
Predictor	Estimator	SE	Z	p
Constant	1.1	1.691	0.651	0.515
12a) I have a clear mission and vision; I share it with the employed staff, and we try to achieve it.	-0.162	0.376	-0.430	0.668
12b) I set concrete objectives that we need to achieve in my company.	-0.517	0.433	-1.196	0.232
12c) I propose a commercial strategy, and some actions are carried out through trial and error.	-0.988	0.320	-3.091	0.002
12d) I don't usually plan my company's strategy in advance, but rather it emerges as I see the best way to achieve our objectives.	0.223	0.319	0.698	0.485
12e) My company's competitive strategy generally results from a formal planning process, which means that the formal plan precedes the action.	0.709	0.379	1.871	0.061

Source: Own study based on research

Thus, taking the correlation values of the other two dimensions, that is: income and expenses fell slightly, and annual sales grew a lot, the strategy that reached the highest correlation value was 12a, which says that the entrepreneur has a clear mission and vision for the business and shares it with his employees, and everyone tries to achieve it (0.179). While for the income and expenses dimension, they remain the same, and annual sales have grown a lot, strategy 12e: my company's competitive strategy generally results from a formal planning process, that is, the formal plan precedes action (0.190), the other strategies had negative correlations.

If we put all the strategies that had positive correlations, in terms of administrative management strategies, and compare them with the perceptions of the results, they would be as follows (Table 3).

Table 3. Correlations with the four dimensions for management

Dimensions for management	Income and Expenses increased slightly – Annual sales increased a lot	Income and Expenses Decreased a lot – Annual sales increased a lot	Income and expenses decreased slightly – Annual sales increased a lot	Income and expenses remained the same – Annual sales increased a lot
Logistic regression	Strategy 12e (0.150)	Strategy 12e (0.709)	Strategy 12a (0.179)	Strategy 12e (0.190)

Source: Own study based on research

For the sales management dimension, which asked five types of questions, income and expenses increased little, and annual sales increased a lot, the statement (13d) “I carry out financing activities (credit) to close some sales” reached the highest value (0.097). For the relationship income and expenses decreased a lot, and annual sales increased a lot, the statement (13d) reached the highest value (0.129). For the relationship income and expenses decreased little, and annual sales increased a lot, the statement 13d reached the highest value with (0.384). The fourth perception that income and expenses remained the same, and annual sales increased a lot, all correlations were negative, the one with the smallest value is the statement (13d) (-0.067).

Regarding the finance dimension, income and expenses increased slightly, but annual sales increased significantly. The strategy with the highest correlation is 14c, which states: “I am very clear about the value of everything I buy or from suppliers each month” (0.038). For the income and expenses dimension, they decreased significantly, but annual sales increased significantly. The strategy that achieved the highest correlation value was 14b: “I am very clear about the value of everything I earn each month” (0.120). For the income and expenses dimension, they decreased slightly, but annual sales increased significantly. The most relevant strategy was 14c (0.346). For the income and expenses dimension, they remained the same, but annual sales increased significantly. All strategies had negative correlations. The one with the lowest value was strategy 14c (-0.032).

Looking at the results of the innovation strategy, we see that in the case of income and expenses, where there was little increase in annual sales, the strategy that achieved the highest correlation value was 15e “I attend trade shows, courses, conferences, or other business-related activities” (0.142); for the dimension of income and expenses, where there was a significant decrease in annual sales, the 15e strategy also achieved a high correlation value (0.436); for the dimension of income and expenses, where there was a significant decrease in annual sales, the most important innovation strategy was 15c “I develop or pay to innovate the way my product or service is sold (design, packaging, promotion, pricing, etc.)” 0.068. This strategy had its highest correlation value with the dimension of income, and expenses remained the same, while annual sales grew significantly (0.277).

In the case of the marketing, the strategy that was repeated in the dimensions of 1) income and expenses increased little and annual sales increased a lot; 2) income and expenses decreased little and annual sales increased a lot and 4) income and expenses remained the same and annual sales increased a lot, was the one that says: “I carry out advertising and promotional activities for my product or service” with values of: 0.032; 0.085 and 0.009. Regarding dimension 3), income and expenses decreased little, and annual sales grew a lot, the strategy “I focus mainly on providing very good service to my customers” reached the highest correlation value with 0.743, while the others had negative correlations.

Two types of actions are observed in terms of the operations strategy (See Table 4), since, on the one hand, the statement “I focus a lot on reducing the time between when the customer requests and receives my product or service” (17b) in the dimension where income and expenses increased little, and annual sales increased a lot had

a weak negative correlation of -0.022 , but in the dimension where income and expenses decreased a lot, and annual sales increased a lot, the correlation has a value of 0.877 . The same type of behavior is observed with strategy (17a) which in the dimension where income and expenses decreased a lot, and annual sales increased a lot, and which is the action of “I focus a lot on the quality of my products or services”, had a correlation of 0.221 . In the dimension where income and expenses remain the same, and annual sales increased a lot, it had a slight negative correlation (-0.004), while the other strategies had negative correlations with higher values.

Table 4. Statements that achieved the greatest value in each dimension of MSE results

Dimension	Income and Expense vs. Annual Profits				
	Increased slightly – Increased a lot	Decreased a lot – Increased a lot	Decreased slightly – Increased a lot	Remains the same – Increased a lot	The most repeated perception
Management	12e	12e	12a	12e	12e
Sales Management	13e	13d	13d	-13d	13d
Finance	14c	14b	14e	14c	14c
Innovation	15e	15e	15c	15c	15e and 15c
Marketing	16d	16d	16a	16d	16d
Operations	-17b	17b	17a	-17a	17a and 17b

Source: Own study based on research

The strategies, once correlated with the business's monetary results, which in this case were called dimensions, are clearly not the same. This shows that each micro and small business owner engaged in commerce in the city defines a series of actions according to the behavior of the relationship between the different results of income and expenses. In the case of annual sales, it was assumed that in all cases they increased significantly between the previous year and the current one.

Discussion

The data analyzed allow us to affirm that this work is in accordance with what was mentioned by (Sanchez, 2018), about the administrative composition of SMEs, that in many cases, their structure is family-based, and that decision-making is centralized. What is clear from this is that merchants have their way of making results according to the type of markets and the type of society, as mentioned by Vargas and Cárdenas (2019). Due to the shape of the markets, it is difficult for small businesses to successfully face the different effects of globalization, and this requires more organization, as mentioned by Gómez et al. (2019), which is not observed in the results of this study. So, what do micro and small entrepreneurs have to do? The answer is hard but firm: entrepreneurs have to look at other strategies to seek quality, as Fierro

and Peñaloza (2023) say, improving project management as Bueno-Pascual (2023) mentions, and making administration mature to improve organizational strategies as Carvallo et al. (2019) mention, and thus have to establish strategies that adapt to changes in the income and expenses of small businesses with the use of tools and technology.

Conclusion

The aim of the paper was to show that, given the four scenarios that are desirable because all of them perceive an increase in annual sales. The values included in the final table have positive correlation values, except for those that state the opposite, but for the administrative management strategies of micro and small commercial companies in the city of Tehuacán, it is interesting to see that entrepreneurs state, in most of the business operation results, that they have a competitive strategy, and that it is the result of a formal planning process that allows them to take action.

Regarding sales management strategies, the results show that sales are imperatively important, given the heightened competition in the SME sector, which leads entrepreneurs to take measures such as using credit to close sales. An interesting finding is the negative correlation between the dominant strategy and the level of unchanged income and expenses. This could suggest that most entrepreneurs experienced changes, rather than a passive relationship between income and expenses.

In line with sales management, for financial strategies, the most common strategy is that micro and small business owners are very clear about the value of all purchases and the settlement of debts with suppliers. Since sales determine expenses and because sales become a defensive act against other competitors, it is evident that they have a clear understanding of income and expenses. This section shows that those business owners who faced a reduction in their income and expenses were very clear about how much they were invoicing in sales, and for the dimension where income and expenses decreased slightly, they paid dedicated attention to the expense components.

Entrepreneurs expressed two innovation strategies for different income and expense dimensions. On the one hand, they purchase what they fail to innovate for its designs, packaging, and so on. The other strategy is attending trade shows, courses, and conferences to improve business. This demonstrates a lack of willingness to create innovations from within the business.

It is important to mention that, in terms of marketing, there is a dominant strategy, which is what drives SMEs to invest in advertising and promotions for the products and services they sell. Perhaps secondarily, for those whose income and expenses have decreased slightly, it is the customer service. That is, marketing actions are essential. Finally, in terms of business operations, it is observed that when income and expenses decrease significantly, they optimize the delivery of sales to customers, and when income and sales decrease slightly, the strategy focuses on product quality, or the quality of the service offered to customers.

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ANALIZA ZARZĄDZANIA ORGANIZACJĄ PRZEDSIĘBIORCÓW W TEHUACÁN I PROPOZYCJE

Streszczenie: W niniejszym badaniu analizuje się strategie zarządzania organizacją mikro- i małych przedsiębiorstw handlu detalicznego (MSE) w Tehuacán, w prowincji Puebla w Meksyku, koncentrując się na ich związku z wynikami finansowymi i wzrostem sprzedaży. W marcu 2025 roku, wykorzystując ilościowy, opisowy i przekrojowy model badania, zebrano dane od 593 przedsiębiorców za pomocą 30-elementowego kwestionariusza skali Likerta, stosując metodę wywiadu osobistego wspomaganego komputerowo (CAPI). Zastosowano wielomianową regresję logistyczną, aby skorelować praktyki zarządzania, sprzedaży, finansów, innowacji, marketingu i operacji z czterema scenariuszami przychodów i wydatków, z których każdy był powiązany ze wzrostem rocznej sprzedaży. Wyniki pokazują, że formalne planowanie strategiczne konsekwentnie koreluje z pozytywnymi wynikami sprzedaży, szczególnie w przypadku wahań przychodów i wydatków. Wzrost sprzedaży jest często wspierany przez oferowanie kredytów, a uważne monitorowanie zysków i kosztów dostawców stanowi podstawę stabilności finansowej. Strategie innowacji są głównie pozyskiwane ze źródeł zewnętrznych, poprzez targi branżowe lub zlecane na zewnątrz usprawnienia projektowe, a nie opracowywane wewnętrznie. Inwestycje marketingowe – zwłaszcza w reklamę – pozostają kluczowe, a strategie operacyjne różnią się w zależności od warunków finansowych, faworyzując szybszą realizację zamówień lub poprawę jakości. Badanie wskazuje, że ustrukturyzowane planowanie, dyscyplina finansowa i proaktywny marketing są kluczowymi czynnikami konkurencyjności wśród małych i średnich przedsiębiorstw Tehuacán, choć praktyki innowacyjne pozostają konserwatywne. Rekomendacje podkreślają potrzebę wzmocnienia wewnętrznych możliwości innowacyjnych w celu uzupełnienia istniejących strategii w celu zapewnienia trwałej przewagi rynkowej.

Słowa kluczowe: przedsiębiorcy, MSP, zarządzanie organizacją

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IMPACT OF TRANSFORMATIONAL LEADERSHIP AND TECHNOLOGICAL INNOVATION ON SUSTAINABLE PERFORMANCE OF MSMEs IN GUANAJUATO

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Abstract: Today's companies have been immersed in new paradigms that demand fully sustainable results; few companies have been at the forefront of micro-environmental issues and have demonstrated that everything depends on comprehensive leadership. The objective of this research is to analyze the impact of transformational leadership and technological innovation on the sustainable performance of micro, small and medium-sized enterprises (MSMEs) in Valle de Santiago, Guanajuato, Mexico, and its surroundings. The design focuses on a quantitative, explanatory, and correlational method, with a representative sample of 100 participating companies in the state of Guanajuato. The research used a survey with 114 Likert-type questions based on three respective covariates: sustainable performance, transformational leadership, and technological innovation. In this sense, the results revealed that transformational leadership had a positive influence in 63.7% of cases, which had a significant impact on the sustainable performance of MSMEs. However, technological innovation had a minimal positive correlation of 54.0%, which means that companies still need to employ innovation strategies. This research is relevant because it shows that there is little theoretical evidence on the subject, especially in technological innovation; however, good transformational leadership has a positive effect on organizations seeking change for the good of all involved and to increase environmental sustainability.


Keywords: sustainable performance, technological innovation, transformational leadership

JEL Classification: M, M1, O3, O32


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Introduction

Today, organizations are looking for better sustainable alternatives that promote strategies with respect to the business environment (Miranda-Torrez, 2021). With this approach, it is necessary to have leaders who contribute to an interest in their workers and the organization, to improve intellectual capabilities and generate value (Sánchez et al., 2021). In the modernized industry, significant competitive changes have been made through a globalized approach, capable of transforming authoritarian mindsets into more open ones in accordance with organizational needs. In this way, leadership becomes a force that inspires the development of more sustainable models aimed at the same objective (Cárdenas Contreras et al., 2023).

Transformational leadership empowers human capital to be generators of more changeable sustainable environments and disciplines workers to foster unique and unmistakable advantages (Carrillo et al., 2023). According to Muralidharan and Pathak (2018), their findings indicate that transformational leadership theory is supported by sustainable cultures, conditions, and environments for society, which positively influence organizations.

Sustainable performance leads to protecting, conserving and protecting resources toward a society that involves awareness, responsibility, sensitivity towards nature; as well as ecological, economic, social, and cultural policies; to improve people's lifestyle by developing strategies for the common good (Santacruz et al., 2020). Taking into account the above, the aim is to increase profitability, productivity, and sustainability in MSMEs through business performance directed at workers (Secretaría de Competitividad, 2018). This is achieved by supporting companies in implementing changes (Clancy & Román, 2013).

The relationship between transformational leadership and sustainable performance is of interest to micro, small and medium enterprises (MSMEs), especially in terms of how leadership intervenes to create knowledge, creativity, and innovation and become more productive (Varela Medina & Marín Balcázar, 2021).

The aim of this paper is to analyze the impact of transformational leadership and technological innovation and sustainable performance on micro, small and medium enterprises (MSMEs) in and around Valle de Santiago, Guanajuato, Mexico. The following sections are proposed for this paper: first, the introduction framework is presented, highlighting the problems identified; the second section presents the literature framework, discussing the theories found according to the recommended authors; the subsequent section reports the general results of the study using inferential statistics; and finally, the conclusions and discussion are presented.

Literature review

Transformational leadership

Avolio and Bass (2000) state that transformational leadership commits workers to follow the same objective, to focus collectively, forgetting individuality, and becoming aware that they are capable of facing commitments to the organization.

Leithwood and Jantzi (2000) note that for transformational leadership to be effective, mutual support is necessary, oriented toward the organization, where motivation, ethics, harmony, and well-being contribute to greater productivity.

According to González and González (2008), transformational leadership is defined as a process that interacts with various members of a group, in which the leader acts as a facilitator who motivates change. For Bass et al. (2003), they claim that transformational leadership focuses on raising awareness of employees to become followers who are committed to the organization. Leaders under transformational leadership foster trust among their employees, encourage them to take risks, and have a vision to achieve the organization's goals (Pertuz, 2018).

In this sense, Pando et al. (2022) point out that in transformational leadership, it is necessary to encourage employees to participate in the work with impetus, emotion, enthusiasm, and the necessary confidence to achieve the objectives. To understand the leadership theories of the 20th century, three types of leadership are considered: transactional, *laissez-faire* and transformational; the latter is the most popular due to the characteristics such as effectiveness, discretion, knowledge, communication, creativity, and innovation (Fauzi et al., 2021; Teymournejad & Elghaei, 2017). Reference is made to the theory proposed by Bass (1987), which states that the leadership model presents the traits of a transformational leader who attends to the needs of the group, makes greater efforts for people, and fulfills shared objectives and goals (Minaya, 2021).

From this arises the first hypothesis, which is stated as follows:

H1: Transformational leadership has a significant positive effect on sustainable performance.

Technological innovation

The issue of innovation is crucial for companies that want to be productive and competitive, as values and challenges shape sustainable development. This has been demonstrated by companies that have invested in innovation and achieving inclusive, sustainable and resilient societies (Schwab & Zahidi, 2020). It is relevant to mention that there is a consensus in innovation studies regarding transformational leadership as an integral collaborator (Bass et al., 2003), in which leaders introduce new ideas to the organization with the aim of meeting specific goals and objectives while also encouraging the creation of innovative initiatives (Harborne, 2003). In some organizations, innovation can be seen as a shared responsibility, bringing with it economic and social costs, leading to changes in order to avoid going bankrupt (Garzón & Ibarra, 2013).

Technological innovation comes from innovation, which is an important factor in being able to create competitive advantages and sustainable benefits for the organization. A technologically capable company can outperform any other company by improving its efficiency and will be able to perform better (Bowonder et al., 2010). Therefore, the following hypothesis is proposed:

H2: Innovation is positively related to sustainable performance.

Sustainable performance

On the other hand, the theory of performance proposed by Campbell et al. (1990) covers three basic behaviors that refer to know-how according to knowledge, personal skills, and motivation that is related to the behaviours of individuals. In addition to the above, in order to respond to these behaviors, it is necessary to envision a future that is environmentally friendly. Sustainable development serves as a tool to combat harmful practices, focusing on creating greater value for environmental companies and fostering awareness to produce innovative and eco-friendly products (Severo & De Guimarães, 2022). Today's entrepreneurs must encourage the partnership among their members towards sustainable development, contributing to better practices with innovative results that help a better sustainable environment, and establishing common goals that help to foster excellent living conditions (Ki-Mon, 2014).

Some case studies

In Mexico, a non-experimental, cross-sectional study was conducted with a maquiladora company in the automotive industry on the northern border of Mexico. Transformational leadership had a positive effect on the company's operational performance with a sample of 300 middle managers (Vargas-Salgado & Gómez-Bull, 2021). In another study with a sample of 100 managers of an entertainment company in Mexico City, transformational leadership in managers was found to influence the performance of their staff with behavioral subscales (stimulation, idealized influence, and individual consideration), which was measured with structural models (Mendoza et al., 2014).

In a study conducted in the province of Huaura, Peru, employees participated in a transformational leadership program, committing themselves to sustainable changes through new values, improved policies, innovation and risk-taking in line with their organizational culture (Coronado et al., 2023). Another very particular case was in a health care institution in Peru, where a study was conducted that revealed important data on the relationship between transformational leadership and organizational health and well-being; These were positive when implementing leadership skills among employees (Perilla-Toro & Gómez-Ortiz, 2017).

In the case of Colombia, research was carried out with 210 companies, where it was found that the relationship between transformational leadership and organizational performance had a positive impact on their sustainability (Morales García et al., 2023). However, in other cases, such as the hotel sector, transformational leadership has been found to have an impact on the work of employees as personal burn-out (Kloutsiniotis et al., 2022), as well as on the health sector (Chen et al., 2022). In the case of Germany, a meta-analysis was conducted with 58 cases, where personality traits and their performance with the leader were measured, showing important data where the traits are indirectly and differentially related to the subdimensions of transformational leadership (Deinert et al., 2015).

Finally, in a savings and credit cooperative in the province of Bolivar, Ecuador, a study was conducted with 99 workers to assess employee performance. The results showed low performance due to a lack of motivation, inadequate work environment, rigid schedules, product-related processes, poor physical conditions, and limited opportunities. These factors indicated that the company demonstrated little leadership towards its members (Durán et al., 2024). In such cases, transformational leadership is observed to be inherent in every organization, particularly through certain traits of the leader that encourage collaborators to assume joint responsibility. This is reflected in the new ideas promoted by the workers themselves, allowing ideas to flow and generate change, while fostering technological innovation as a fundamental tool for sustainable products or services. Ultimately, this leads to greater business performance.

Methodology

The purpose of the paper is to analyze the impact of transformational leadership and technological innovation on the sustainable performance of micro, small, and medium enterprises (MSMEs) in Valle de Santiago, Guanajuato, Mexico, and its surroundings. Therefore, in this research, we used the quantitative method with a descriptive and correlational approach through multiple linear regression analysis. The sample consisted of 100 MSMEs managers in Valle de Santiago, Guanajuato, Mexico, and its surroundings, representing different sectors such as the automotive industry, services, and commerce. Most companies are owned by natural persons whose minimum level of education is high school or a bachelor's degree. In relation to the literature, it is highlighted that in the model of Avolio and Bass (2000), workers should focus only on collective decisions and follow the same objective. These previous studies were taken into account to obtain the findings in relation to the constructs presented and their respective scales.

The instrument consisted of 114 items, with Likert-type questions from which only some of the categories of the five blocks were chosen, such as innovation, sustainable performance, sustainable marketing, business performance, and transformational leadership. Having said this, the correlations of the variables studied were analyzed and validated with the Cronbach alpha tool (Cronbach, 1951) with a value of 0.982 (see Table 1). The software used was SPSS V.25.

Table 1. Reliability statistics

	Cronbach's alpha	Cronbach alpha based on the typed items	N of elements
Variables	0.917	0.982	99

Source: Own elaboration

Results

Figure 1 shows the main municipalities surrounding the city of Valle de Santiago. Silao, Salamanca, Moroleón, León, Jaral del Progreso, Irapuato, Guanajuato Capital, Cortazar, and Celaya, Guanajuato, Mexico. Among the companies, 73 are individual entrepreneurs and 27 are legal entities. Of these, 54 are commercial, 11 are industrial, and 35 are service-oriented. In terms of gender, 52 are men and the rest are women. Regarding educational levels, 11 have completed high school, 7 have a technical or commercial qualification, 25 have basic education, 39 hold a bachelor’s degree or engineering qualification, and 13 hold a post-graduate degree.

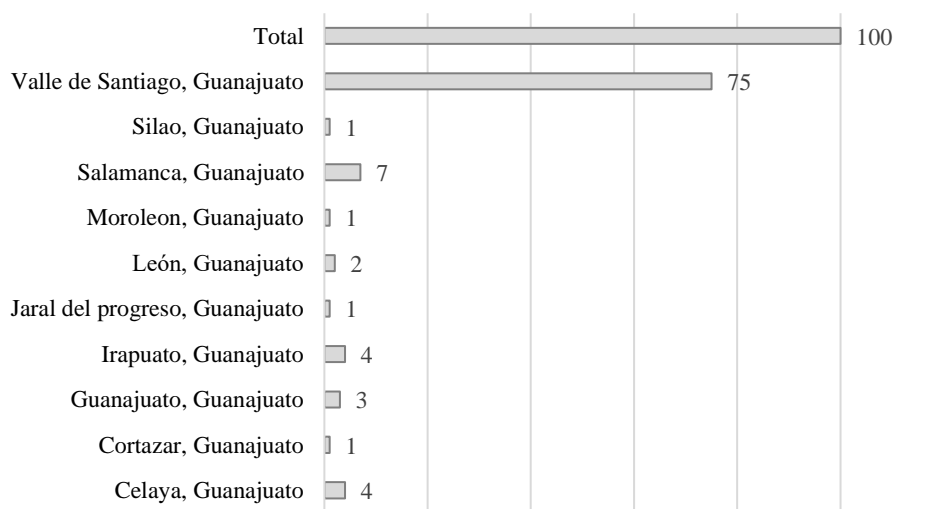


Figure 1. Municipalities

Source: Own elaboration

Table 2 shows the descriptive statistics of the mean of the data, which are composed of the constructs. The dependent variable (Sustainable Performance) is observed with a total of 118.170, while the independent variables (Transformational Leadership) and (Innovation) resulted in values of 20.580 and 41.560, respectively.

Table 2. Descriptive statistics

Variables	Media	N
Sustainable Performance	118.170	100
Transformational Leadership	20.580	100
Technological Innovation	41.560	100

Source: Own elaboration

In relation to the Pearson correlations, it is highlighted that the data are within values less than 1, where the independent variable Transformational Leadership shows a value of 0.637 and the innovation variable was 0.540, these parameters are strongly correlated with the dependent variable Sustainable Performance and are significant positive with values of 0.000 in both cases (see Table 3).

Table 3. Correlations

		Sustainable P.	Transformational L.	Technological I.
Pearson correlation	Sustainable P.	1.000	0.637	0.540
	Transformational L.	0.637	1.000	0.352
	Technological I.	0.540	0.352	1.000
Sig. (unilateral)	Sustainable P.		0.000	0.000
	Transformational L.	0.000		0.000
	Technological I.	0.000	0.000	

Source: Own elaboration

Table 4 presents the summary of the model obtained in successive steps. The results indicate that the most important variable appears in Model 2, where the R value reached 0.721, corresponding to a reliability of 72.1%.

Table 4. Summary of the model

Model	R	R square	R-squared corrected	Standard error of estimation	Durbin-Watson
1	0.637a	0.406	0.400	15.095	
2	0.721b	0.520	0.510	13.639	2.285
a. Predictor variables: (Constant), Transformational L.					
b. Predictor variables: (Constant), Transformational L., Technological I.					
c. Dependent variable: Sustainable P.					

Source: Own elaboration

For ANOVA in Model 2, the F value was 52.560 and a significance of 0.000, which is statistically significant (see Table 5).

Table 5. ANOVA

Model		Sum of squares	gl	Root mean square	F	Sig.
2	Regression	19556.356	2	9778.178	52.560	0.000c
	Residual	18045.754	97	186.039		
	Total	37602.110	99			

Source: Own elaboration

For the testing of the hypotheses, the coefficients typified by the Beta values of Model 2 were used. As can be seen in Table 5, the transformational leadership variable had a result of 0.510, which represents 51.0%; therefore, the alternative hypothesis is accepted. The significance level was .000, which is considered significant according to the criterion of $p < 0.001$ at 99% reliability. The variable of technological innovation obtained a result of 0.361, equivalent to 36.1%. This indicates that the second alternative hypothesis is also accepted, although it had a lower but still positive value (see Table 6).

Table 6. Coefficients^a

Model	Unstandardised coefficients		Typified coefficients	t	Sig.	95.0% confidence interval for B		Collinearity statistic		
	B	Error tip.	Beta			Lower limit	Upper limit	Tolerance	FIV	
2	C	37.034	8.147		4.546	0.000	20.865	53.204		
	T.L.	2.239	0.330	0.510	6.792	0.000	1.584	2.893	0.876	1.141
	T.I.	0.844	0.176	0.361	4.799	0.000	0.495	1.193	0.876	1.141

C = (Constant)

T.L. = Transformational L.

T.I. = Technological I.

a. Dependent variable: Sustainable P.

Source: Own elaboration

Finally, to verify the mathematical equation of the linear regression, based on the descriptive data provided, the following model was obtained:

$$Y = \beta_0 + \beta_1(\text{Transformational Leadership}) + \beta_2(\text{Technological Innovation})$$

$$Y = 37.034 + 20.580(2.239) + 41.560(0.844)$$

$$Y = 118.17$$

Discussion and conclusion

The objective of this research was corroborated by the proposed hypotheses. These were accepted in their entirety with the inferential statistic of multiple linear regression, which yielded positive information with a reliability of 72.1%. In terms

of descriptive data, most of the companies belong to the municipality of Valle de Santiago, Guanajuato, Mexico. Most of these companies are sole proprietorships, which means that they are owned by a single owner, the predominant gender is male, and their level of education is a bachelor's degree and engineering. In this sense, the results show that sustainable performance is closely related to transformational leadership, with a value greater than 63.7%. The study was corroborated by Bass et al. (2003), who found that the greater the interaction between employees and their leaders, the greater their commitment to the organization. Similarly, it agrees with Leithwood and Jantzi (2000), who state that mutual support between workers and managers makes the organization more productive. This means that business leaders are increasingly committed to participating favorably in the achievement of fully sustainable environments. In terms of technological innovation, it obtained a positive result, although less than 54%, which was confirmed by the theory proposed by Bowonder et al. (2010), who state that a company breaks down barriers by improving its efficiency to achieve greater organizational performance. Consequently, in the study proposed by Schwab and Zahidi (2020), innovation goes hand in hand with sustainable development, as it shows that companies that invest become more competitive and profitable. As observed in this study, transformational leadership was identified as a key factor in companies seeking sustainable solutions, since it measures the opinions, experiences and proposals of employees towards the same common and shared goal. It was also observed that there is effective and organized motivation with elements that have had a positive impact on a culture of technological innovation. Therefore, the study provides a basis for future research on the transformation of leaders who share common values and a unified vision. On the other hand, technological innovation also played an important role, as most entrepreneurs use a level of innovation in their production processes. Similarly, innovation should be considered a beneficial component designed for sustainability.

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WPŁYW PRZYWÓDZTWA TRANSFORMACYJNEGO I INNOWACJI TECHNOLOGICZNYCH NA ZRÓWNOWAŻONE WYNIKI MŚP W GUANAJUATO

Streszczenie: Współczesne przedsiębiorstwa funkcjonują w nowych paradygmatach, które wymagają w pełni zrównoważonych rezultatów. Niewiele firm znalazło się na czołowej pozycji w kwestiach mikrośrodowiskowych i wykazało, że wszystko zależy od kompleksowego przywództwa. Celem niniejszych badań jest analiza wpływu przywództwa transformacyjnego oraz innowacji technologicznych na zrównoważone wyniki mikro-, małych i średnich przedsiębiorstw (MŚP) w Valle de Santiago, Guanajuato (Meksyk) i jego okolicach. Projekt badawczy opiera się na metodzie ilościowej, wyjaśniającej i korelacyjnej, z reprezentatywną próbą 100 firm uczestniczących z terenu stanu Guanajuato. W badaniu wykorzystano ankietę składającą się ze 114 pytań zgodnie z metodologią skali Likerta, opartą na trzech zmiennych: zrównoważone wyniki, przywództwo transformacyjne i innowacje technologiczne. W tym kontekście wyniki wykazały, że przywództwo transformacyjne miało pozytywny wpływ w 63,7% przypadków, co istotnie wpłynęło na zrównoważony rozwój MŚP. Z kolei innowacje technologiczne wykazały minimalną pozytywną korelację na poziomie 54,0%, co oznacza, że firmy nadal muszą wdrażać strategie innowacyjne. Niniejsze badanie jest istotne, ponieważ wskazuje na niewielką ilość istniejących dowodów teoretycznych w tym zakresie, zwłaszcza w odniesieniu do innowacji technologicznych. Niemniej jednak zauważa się, że dobre przywództwo transformacyjne ma pozytywny wpływ na organizacje dążące do zmian z korzyścią dla wszystkich zaangażowanych stron oraz w celu zwiększenia zrównoważonego rozwoju środowiska.

Słowa kluczowe: innowacje technologiczne, przywództwo transformacyjne, zrównoważone wyniki

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IMPLICATIONS OF INVESTMENTS IN SUSTAINABLE DEVELOPMENT. OUTLINE OF IMPACT ON COMPONENTS OF AN ORGANIZATION'S FINANCIAL STATEMENTS IN ACCORDANCE WITH REQUIREMENTS OF NATIONAL ACCOUNTING STANDARDS

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Abstract: The changes introduced by companies investing sustainably are undoubtedly managerial in nature, but they also significantly impact accounting. They require appropriate representation in the financial reporting system. The National Accounting Standards do not yet directly address ESG, and it is essential to adequately account for such events in financial statements. Based on the general guidelines of accounting standards and an analysis of the possible specifics of the mentioned investments, this publication proposes framework schemes for presentation and accounting as well as indicates the consequences of presenting and accounting for these actions for individual components of financial statements. The aim of this study is to provide a concise characterization of the specifics of investing in sustainable development within the accounting system of organizations and to characterize the main components of financial statements. Based on the general guidelines of accounting standards and an analysis of the possible specifics of the aforementioned investments, the publication proposes framework schemes for presentation and accounting as well as indicates the presentation and accounting consequences of reflecting these actions for the individual components of the financial statement.

Keywords: accounting standards, financial statement, investments in ESG, sustainable development reporting

JEL Classification: F65, M41, Q56, G31

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Introduction

Sustainable development has ceased to be merely an ethical concept and has become an economic necessity. Companies that invest in environmentally friendly, social, and corporate governance solutions are increasingly gaining a competitive advantage.

The aim of this study is to provide a concise characterization of the specifics of investments in sustainable development within the framework of an organization's accounting system, as well as to characterize the main components of the financial statement. The outcome is the proposed model of a mapping of the connections between the statement and the recorded economic events that reflect the investments in achieving the organization's sustainable development goals. Based on the general guidelines of accounting standards and an analysis of the potential specifics of these investments, the publication proposes framework schemes for presentation and accounting, as well as indicates the presentation and accounting implications of reflecting these actions for the individual components of the financial statement.

The article is based on a review of both national and international literature, along with reasoning. Given the specificity of the topic related to national accounting standards based on which financial statements are prepared, the study will be predominantly grounded in national literature concerning accounting-related issues.

Financial statement in the organization's accounting system

The place and specifics of financial reporting in literature are mainly defined by works that have the nature of legal regulations and comprehensive studies that contain specific guidelines resulting from their interpretation. Among of the most important guidelines in the literature on this subject are the legal guidelines established by the International Accounting Standards Committee, which in 1989 defined accounting as “a system of information about the financial position and performance and changes that are useful for a wide range of users in making their economic decisions” (IASB, 1989). Accounting, as a field, has been perceived in many diverse ways over the years, independent of the above definition. It is seen as a profit-oriented science, useful for decision-making and informational-economic purposes (Sojak, 2011); a specific, original system for measuring, which enables organizations to achieve reporting, control, and decision-making goals (Jarugowa & Skowroński, 1986). The perception of accounting as a system determines the indication of its various properties such as:

- a record system
- information system
- information and control system
- measurement system (Micherda, 2002).

From the perspective of the issue addressed in this article, Micherda's view is adopted, that accounting is a “universal and flexible information and control system reflecting the processes and results of the activities of economic entities” (Micherda, 2002).

The most important from the perspective of the issues addressed in this article are the following functions:

- Internal information function – it involves providing information of an economic nature for the needs of managing the organization. It supports the implementation of functions such as planning, organizing, coordinating, and finally motivating or controlling.
- External information function – involves providing stakeholders from the organization's environment with information aimed at supporting their decision-making processes.

Fulfillment of the indicated general functions of accounting in practice requires the implementation of specific components of detailed functions for the organization. They are presented in Table 1.

Table 1. Detailed functions of accounting

Division/criteria	Detailed function	Description
Course of data processing in the accounting system	Registration function	Regards accounting as an information system. Its function is manifested in the recording and disclosure of the effects of economic operations through their chronological recording in the books.
	Classification function	Accounting through accounting entries allows allocation of the effects of economic operations to the appropriate records.
	Reporting function	Enables the preparation of the individual components of financial statement reports of a statistical nature, or controlling reports.
Managing the organization – needs	Analytical function	Enables the analysis, examination, and assessment of the organization's property, economic, and financial situation, as well as interpretation of the results it achieves in the context of the level of efficiency.
	Optimization function	Enables decision-making regarding selection of the optimal courses of action for the organization by providing information in the appropriate format.
	Motivational function	Provides information on costs, revenues, or other categories that are used to formulate performance appraisal metrics or to determine the value of indicators in the field of financial analysis.
	Control function	Allows the control and qualitative evaluation of the level of revenues, costs, results, asset value, and its structure.
Stakeholders – information obligations	Billing function	Enables the level of receivables and liabilities to be determined in relation to various stakeholders.
	Evidence function	Allows credible evidence to be presented in the form of accounting records during tax or judicial inspections.

Source: Author's own study based on (Nowak, 2016; Karmańska, 2020; Gierusz, 2021)

The tool used within the accounting system to convey information is undoubtedly the financial statement. A financial statement is a systematic representation of the financial situation and performance results of an economic entity (Accounting Act, 2023, poz. 120). The financial situation of the organization is presented in the form of numerical statements: profit and loss account, balance sheet, cash flow statement, statement of changes in equity, and information in the form of an analytical text of a business nature, that is, the management report and additional information. They should be marked by (Gierusz, 2021):

1. credibility (reliability)
2. understandability for users
3. completeness
4. comparability
5. verifiability
6. timeliness
7. continuity

As previously indicated, according to Article 45, paragraph 2 of the Accounting Act, the complete financial statement of the entity includes:

1. The balance sheet (financial situation report). The purpose of its preparation is to present the status of assets (assets) and the sources of their financing (liabilities) as of the balance sheet date. It has the following structure:
 - 1.1. Assets – resources controlled by the entity:
 - fixed assets (long-term): e.g. tangible assets, intangible assets, long-term investments
 - current assets (short-term): inventories, receivables, cash.
 - 1.2. Liabilities – sources of financing assets:
 - equity: share capital, retained earnings, financial result
 - liabilities and provisions: loans, trade payables, provisions for benefits or risks.

The detailed structure of the balance sheet is presented in Table 2.

2. The profit and loss account. The purpose of its preparation is to show the efficiency of the entity's operations – the revenues gained and costs incurred in a given period. It has two possible forms:
 - calculative – the cost of goods sold
 - comparative – cost types (depreciation, salaries, energy, etc.).

Key positions from the perspective of evaluating the financial situation of the organization are:

- the net sales revenue
- operating costs
- profit/loss from operating activities
- financial income and expenses
- gross and net financial result.

The detailed structure of the income statement is presented in Table 3.

3. Additional information (including an introduction and explanations). The purpose is to provide the user with context and details that are not visible in the numbers. It includes:

- an introduction to the report (description of the adopted accounting principles)
- explanations for the items in the balance sheet and profit and loss account
- summary of changes in the value of assets and liabilities
- information about conditional obligations, guarantees, risks
- non-financial data, including environmental and social data (if relevant).

Additional information plays a key role in disclosing the impacts of investments in actions related to the implementation of sustainable development (ESG) principles and non-financial risks.

4. Statement of changes in equity (required in the full report, especially for capital companies). The purpose of its preparation is to present the changes that occurred in the individual components of equity during a given period. It includes among others:

- initial capital
- net profit/loss for the year
- dividends, issuances, share buybacks
- transfers between funds.

It shows how financial results and ownership decisions affect the capital structure that the organization has.

5. Cash flow statement (mandatory for entities subject to examination by a certified auditor). Its purpose is to present the actual cash inflows and outflows during a given period. It is constructed from three analytical areas:

- operating activity: revenue from sales, expenses to suppliers, taxes
- investment activity: purchase/sale of fixed assets, investments
- financial activities: loans, share issuance, dividend payouts.

It helps to assess an individual's ability to generate cash and maintain financial liquidity.

6. The report on the unit's activities is a non-financial document. Its purpose is to provide a broader description of the economic situation, various types of risks, plans, and factors determining actions and managerial decisions related to the implementation of sustainable development goals. This document includes, among others:

- the characteristics of the activity and the market environment
- risk and hazard factors
- non-financial information (including those related to ESG)
- information about the dividend policy in use
- financial analysis (indicators, the structure of assets and liabilities).

Therefore, it is this part of the reporting in the accounting system that allows broader disclosure of the activities undertaken by the organization that have an impact on its operations and management.

Table 2. Example of a simplified balance sheet

A. FIXED ASSETS	A. EQUITY
I. Intangible and legal assets	I. Basic capital
1. Costs of completed development work	II. Due payments for basic capital

2. Goodwill	III. Own shares
3. Other intangible and legal assets	IV. Reserve capital
4. Prepayments for intangible and legal assets	V. Capital from revaluation
II. Tangible fixed assets	VI. Other reserve funds
1. Fixed assets	VII. Profit/loss from previous years
a) Land	VIII. Net profit/loss
b) Buildings, premises and civil engineering and water engineering structures	IX. Deductions from net profit
c) Technical devices and machinery	B. LIABILITIES AND PROVISIONS FOR LIABILITIES
d) Means of transport	I. Provisions for liabilities
e) Other fixed assets	1. Provision for deferred income tax
2. Fixed assets under construction	2. Provision for pension and benefits
3. Prepayments for fixed assets under construction	- long-term
III. Long-term receivables	- short-term
1. From related entities	3. Other provisions
2. From other entities	- long-term
IV. Long-term investments	- short-term
1. Real estate	II. Long-term liabilities
2. Intangible and legal assets	1. Related entities
3. Long-term financial assets	2. Other entities
4. Other long-term investments	a) Loans
V. Long-term accruals	b) Debt securities liabilities
1. Deferred tax assets	c) Other financial liabilities
2. Other accrued expenses	d) others
B. CURRENT ASSETS	III. Short-term liabilities
I. Inventories	1. Related entities
1. Materials	a) supplies and services with a due period:
2. Work in progress and semi-finished goods	- up to 12 months
3. Finished products	- over 12 months
4. Goods	b) others
5. Prepayments for supplies	2. Other entities
II. Short-term receivables	a) Loans
1. Receivables from related entities	b) Debt securities liabilities
a) supplies and services with a due period:	c) Other financial liabilities
- up to 12 months	d) supplies and services with a due period:
- over 12 months	- up to 12 months

b) others	- over 12 months
2. Receivables from other entities	e) prepayments for deliveries
a) supplies and services with a due period:	f) bills liabilities
- up to 12 months	g) taxes, customs, social insurance and other benefits
- over 12 months	h) salaries
b) taxes, customs, social insurance and other benefits	i) others
c) others	3. Special funds
d) court claims	IV. Accruals
III. Short-term investments	1. Negative goodwill
1. Short-term financial assets	2. Other accruals
a) related entities	- long-term
b) other entities	- short-term
c) cash and cash equivalents	TOTAL LIABILITIES
2. Other short-term accrued expenses	
IV. Short-term accrued expenses	
TOTAL ASSETS	

Source: Author's own study based on (Nowak, 2016; Karmańska, 2020; Gierusz, 2021)

Table 3. Example structure of profit and loss account in a calculation format

	SPECIFICATION
A	Net sales revenues from products, goods, and materials including from related entities
I	Sales revenues from products
II	Sales revenues from goods and materials
B	Costs of sold products, goods, and materials, including from related entities
I	Cost of goods sold
II	Value of sold goods and materials
C	Gross profit (loss) from sales (A-B)
D	Selling costs
E	General administrative expenses
F	Profit (loss) from sales (C-D-E)
G	Other operating income
I	Profit from the sale of non-financial fixed assets
II	Grants
III	Other operating income
H	Other operating costs
I	Loss from the sale of non-financial fixed assets

II	Impairment of non-financial assets
III	Other operating costs
I	Profit (loss) from operating activities (F+G-H)
J	Financial income
I	Dividends and shares in profits including
II	Interest including from related entities
III	Profit from the sale of shares and stakes
IV	Impairment of investments
V	Other
K	Financial costs
I	Interest including from related entities
II	Loss from the sale of shares
III	Update of investment value
IV	Other
L	Profit (loss) from business activity (I+J-K)
M	Result of extraordinary events
I	Extraordinary profits
II	Extraordinary losses
N	Gross profit (loss) (L+M)
O	Income tax
P	Other mandatory profit reductions (loss increases)
R	Net profit (loss) (N-O-P)

Source: Author's own study based on (Nowak, 2016; Karmańska, 2020; Gierusz, 2021)

The financial statement and the method of presenting the organization's performance results during the reporting period is the result of the accounting information system applied in it. The traditional, historically established reporting formula still applies despite the dynamic changes in the organization's operations and the potential effects of implementing sustainable development reporting (ESG) (Komisja Parlamentu Europejskiego i Rady UE, 2022).

Investments in sustainable development – a brief specification, characteristics, and classification

In 2020, the European Parliament and the Council of the EU adopted Regulation 2020/852 of June 18, 2020, commonly referred to as the EU Taxonomy (Rozporządzenie Parlamentu Europejskiego i Rady UE 2020/852, 2020). This legal act was created to establish a framework to facilitate sustainable investments (Directive 2021/1056, L 231, 30.06.2021). These provisions aim to create incentives

for organizations to intensify specific investment-related actions with environmental impacts. They define detailed goals for organizations to achieve. They are:

- mitigate climate change
- adapt to climate change
- sustainable use and protection of water and marine resources
- transition to a circular economy
- prevent pollution and its control
- protect and restore biodiversity and ecosystems (Directive 2021/1056, L 231, 30.6.2021).

Due to their nature and based on the mapping principles resulting from the accounting system and the assumptions regarding the preparation of financial information, which is the financial statement, they can be presented within the accounting information system as:

- fixed assets
- intangible and legal assets
- operating expenses (in the case of educational campaigns or training).

Therefore, any such economic and business activity undertaken by the organization will have a significant impact on the individual components of the organization's financial and non-financial reporting, as well as on the evaluation of the achieved results (Kotsantonis et al., 2016). Furthermore, it should also be noted that the reflection in the accounting system of the actions taken by the organization will affect the value of the indicators of economic and financial assessment of the organization and may distort or disrupt their comparability in different years or periods.

Research methodology

The research methodology of desk research was used in the work. Owing to the fact that the obligation to report the achievement of sustainable development goals begins in 2026, and has been postponed for small and medium-sized enterprises operating in the European Union (the so-called 'Omnibus amendment'), this approach is justified. The article is based on a review of literature. The criteria for selecting the literature were: publications concerning investments in sustainable development and their economic as well as accounting consequences, also texts analyzing the application of the National Accounting Standards. Priority was given to publications from the last 5 years due to dynamic changes. Older sources were considered only if they were fundamental in nature. In addition to scientific literature, normative acts such as the National Accounting Standards, ministerial documents, or the Accounting Act, as well as reports from international and national institutions (e.g., IFAC, IASB, GUS, Ministry of Finance), were analyzed, if they were related to reporting practices in Poland. The criteria for selecting the sources take into account the need to ensure content coherence and relevance of the analyzed materials in relation to the research issue, which is the impact of investments in sustainable development on the financial reporting of enterprises in accordance with the requirements of the National Accounting Standards. This approach allowed theoretical discussions to be linked

with practical applications in the reporting process. The combination of scientific literature, normative sources, and reports from regulatory institutions ensured a multifaceted perspective on the issue. On one hand, it enabled in-depth theoretical reflection, and on the other hand, it was related to practice and the legal requirements in force in Poland. The main aim of this study is to provide a concise characterization of the specifics of investment in sustainable development within the framework of the organization's accounting system, as well as an overview of the main components of the financial statement. The result is the proposal of a model mapping of the connections between the statement and the accounted economic events that reflect the investments in achieving the organization's sustainable development goals.

Sustainable development and components of the financial statement according to KSR.

Map of relations – results of analysis and literature review

Investment activities undertaken based on decisions optimizing the management of the organization can take various forms. They range from modernization of the specifics or components of the individual costs incurred by the organization, to strategic investment actions (WEF, 2023). The nature of economic operations reflected through the tools of the accounting system in financial statements in accordance with the National Accounting Standards can lead to the following implications for the value and completeness of information provided using financial statements (Christensen et al., 2021):

1. Balance sheet. National Accounting Standard 11 (Komitet Standardów Rachunkowości, KSR nr 11, 2015) – Fixed assets and National Accounting Standard 13 regarding the recognition and determination of production costs is applied. Investments in new environmental technologies (e.g. emission filters, production lines with closed water loops) should be recognized as fixed assets. According to National Accounting Standard 11, an entity is required to recognize a fixed asset if it meets the criteria of controllability and brings measurable economic benefits. Modernizations that increase energy efficiency can lead to a reduction in the future production costs of finished goods. Modernizing the supply structure of raw materials or packaging will – depending on the applied income strategy – also significantly influence the modification of the value of this cost. This impact can either increase this cost or decrease it if the organization applies global orders correlated with the revenue portfolio.
2. Profit and loss account. National Accounting Standard 4 (Komitet Standardów Rachunkowości, KSR nr 4, 2017) applies – Establishing the financial result. Costs related to education, ESG training, or social campaigns can be included in categorical or functional costs as general administrative expenses. On the other hand, subsidies received for tasks related to adapting the organization to the principles of sustainable development should be recorded as other operating income, in accordance with the principle of matching revenues and costs (KSR 4).

3. Additional information. National Accounting Standard 9 (Komitet Standardów Rachunkowości, KSR nr 9, 2016) – Additional information. In light of the principle of the completeness of information, the entity should disclose the nature and scope of implemented projects in the field of sustainable development if they have a significant impact on the financial result or financial position. For example, obligations associated with future environmental remediation resulting from legal regulations or voluntary commitments should be recognized as provisions. National Accounting Standard 6 applies (Karmańska, 2021) – Provisions, deferred expenses, and conditional liabilities.
4. Cash flow statement. Expenditures on sustainable development investments will be visible in the investment activities section (for example, the purchase of new infrastructure), while expenditures on training or promotional activities will be in the operational section. It is important to emphasize that investments in sustainable development can impact the improvement of cash flows in the long term, even though they cause cash outflows in the short term.

The table below presents a synthetic overview of the impact of investments in activities related to sustainable development on the individual components of financial statements.

Table 4. Implications of sustainable development actions on financial statement components

Financial statement component	Function	Importance in context of ESG
Balance sheet	The state of assets and the sources of their financing	ESG influences the structure of assets (e.g. green investments)
Profit and loss statement	Financial result for the period	ESG investments affect costs and revenues
Additional information	Context and details of the figures	Key place for the disclosure of ESG projects and risks
Summary of changes in equity	Analysis of the impact of owners' decisions	Possible transformations of capital under the influence of ESG policies
Cash flow	Liquidity analysis	ESG can affect investment and operational cash flow
Report on the activities of the organization	Narrative and strategic report	The main source of sustainability reporting

Source: Author's own study based on (EFRAG, 2023)

Based on the analysis of the specifics of sustainable development activities and the aforementioned specificity of the implications of these activities on the components of financial statements (IFAC & AICPA, 2022), it is possible to construct

a map of connections between the financial statement and its elements, in addition to the areas of activities within the framework of achieving the principles of sustainable development. It is presented in the Table 5 below.

Table 5. Map of ESG connections and elements of financial statement

Financial report component	Related ESG areas	Description of the relationship (impact mechanism)	Examples
Balance sheet	E, G	Investments in ecological assets, reserve capture, leasing, ESG subsidies	- purchase of PV panels → fixed assets – green bonds → liabilities – reserves for environmental rehabilitation
Profit and loss statement	E, S	Change in operating costs, revenues from 'green' sales, employment costs	- reduction in energy costs - revenue from 'eco' products - higher costs of wages (labour standards)
Cash flow	E, G	Investment flows (renewable energy), financial (green bonds), grants	- expenditures on machine modernization - impact from the climate loan - refunds from NFOŚiGW
Summary of changes in equity	G, E	Capital from sustainable emissions, decisions on profit retention for ESG purposes	- issuance of ESG shares - transfers to targeted funds
Additional information	E, S, G	Detailed ESG disclosures, description of policies, risks, and climate commitments	- principles of ESG investment classification - non-financial disclosures - CO ₂ emission costs, certificates
Report on the activities of the organization	E, S, G	ESG strategy reporting, non-financial indicators, CSRD, risks	- decarbonization strategy – carbon footprint - DEI indicators (diversity, equity, inclusion)

E – Environmental: energy efficiency, waste management, CO₂ emissions, sustainable resource consumption

S – Social: labor rights, health and safety, impact on the local community, gender equality

G – Governance: transparency, management structure, ethics, anti-corruption

Source: Author's own study based on (Micherda 2002; EFRAG, 2023)

A visualization of the impact of the changes in the values from the financial statement on the indicators used for the economic and financial evaluation of the organization's activities is shown in Table 6.

Table 6. Evaluation indicators of organizational activities

Indicator	Before investment	After investment	Comment
Operating profit (EBIT/revenue))	$\frac{8\,000\,000,00\text{ zł}}{50\,000\,000,00\text{ zł}}=16\%$	$\frac{10\,000\,000,00\text{ zł}}{50\,000\,000,00\text{ zł}}=20\%$	Improvement in operational efficiency
ROA – return on assets (net profit/total assets)	$\frac{6\,400\,000,00\text{ zł}}{40\,000\,000,00\text{ zł}}=16\%$	$\frac{8\,000\,000,00\text{ zł}}{50\,000\,000,00\text{ zł}}=16\%$	Neutral impact on ROA – despite the increase in profit, the asset base increased.
ROE – return on equity (net profit/equity)	$\frac{6\,400\,000,00\text{ zł}}{25\,000\,000,00\text{ zł}}=25,6\%$	$\frac{8\,000\,000,00\text{ zł}}{25\,000\,000,00\text{ zł}}=32\%$	Increase in the efficiency of using own capital.
Debt ratio (liabilities/total assets)	$\frac{15\,000\,000,00\text{ zł}}{40\,000\,000,00\text{ zł}}=37,5\%$	$\frac{20\,000\,000,00\text{ zł}}{50\,000\,000,00\text{ zł}}=40\%$	Increase in debt –, it is worth monitoring liquidity.
EBITDA (Operating profit + depreciation)	8 000 000+ 2 000 000= 10 000 000 zł	10 000 000+ 3 000 000= 13 000 000 zł	Improvement in EBITDA – the investment increased both the operating profit and depreciation (larger fixed assets).

Source: Author's own study

It can be concluded that:

- short- and medium-term investments in activities related to achieving sustainable development goals can positively impact operational results and profitability indicators, provided they generate real savings (e.g. in energy or logistics)
- the increase in fixed assets and debt requires careful monitoring of solvency indicators

- it is worth considering the long-term impact: maintaining profitability while improving the image, the possibility of obtaining preferential financing (for example, green bonds), as well as avoiding regulatory risks (e.g. environmental penalties).

Discussion of the results

As presented in this study, the financial report is the main information carrier for stakeholders and decision-makers managing the organization. This relationship, or rather interdependence, creates practical challenges in the context of the accounting system and financial information system used in the organization. It is possible that as a result, there will be improvement in the principles of the accounting system, its modification, and evolution.

Due to the postponement of the obligation to report indicators related to the achievement of sustainable development goals, there is a lack of empirical material in the form of financial statements containing specific data in the non-financial part. This does not exempt organizations from accurately reflecting in their accounting system the actions taken to achieve the goals set forth by the ESG strategy adopted by the organization. It has been shown that these actions will significantly impact the assessment of the organization's financial condition through various financial analysis indicators that are calculated based on the data contained in financial statements. In summary, in the current reality, financial departments in organizations should work on building individualized accounting maps for sustainability activities, but in strict compliance with accounting standards so that in the future they can report in accordance with the fundamental, overarching principles of accounting.

An open issue for further research remains the question of whether and how to modify accounting standards to facilitate a methodological approach for organizations to this type of bookkeeping. It should also be pointed out that a unified approach would enhance the quality and comparability of the data reported by organizations. The approach of individual interpretation, which will undoubtedly be applied in the first stage by organizations, may lead to a disruption of comparability and assessment of the data reported in financial statements.

The conglomerate of specific actions in the environment of the 5.0 economy and business requirements resulting from sustainable development can therefore be a determinant of emergence:

- Difficulties in valuing intangible assets: investments in human capital or reputation are difficult to account for in the balance sheet.
- A lack of clear accounting guidelines: the National Accounting Standards do not yet contain a dedicated standard for reflecting sustainable development in the accounting system, which necessitates the application of general accounting principles. There are only separate guidelines and recommendations related to the reporting of indicators measuring the effects of ESG actions.
- Risks of misclassifying expenditures: incorrectly classifying investments related to the implementation of sustainable development goals as current costs instead of assets, which may distort the financial result.

Overall, there is a lack of a revised, clear approach within the Polish accounting system in the form of a separate standard dedicated primarily to investments aimed at achieving sustainable development goals. From the perspective of organizations, this may affect non-financial assessment and, in the long term, the management of the organization in the following aspects:

- regulatory risk – for example, emissions – decreases as investments are made in activities related to achieving the goals stemming from sustainable development
- the impact on image among stakeholders is stronger as the goals arising from sustainable development are achieved
- access to financing – with the passage of time and improvements in financial results in terms of levels, values, and profitability of EBITDA as a result of the use of sustainable development-related activities; barriers to accessing external financing will decrease
- the potential for collaboration with large clients (balanced bilateral supply chain) will increase
- the ability to obtain grants from the European Union will be very high.

Establishing a uniform standard for accounting for investments related to sustainable development activities will undoubtedly become easier as organizations gradually publish their strategies and report on their actions. It will then undoubtedly become possible to develop general sectoral guidelines.

Conclusion

In light of the above, the following final conclusions and recommendations arising from the analysis of the undertaken issues can be formulated:

1. Due to the lack of framework rules for these specific bookings, entities should apply the National Accounting Standards in an interpretive manner, taking into account the economic purpose of a given expense and keeping in mind preservation of the highest standard of reliability in reflecting economic events in the absence of specific guidelines resulting from accounting standards.
2. There is a need to strive for the development of a separate accounting standard related to ESG in financial statements.
3. The completeness of ESG disclosures may affect the assessment of an entity's risk by stakeholders.

Application of the above recommendations will undoubtedly enable a better reflection of the economic and financial situation of the organization. Ultimately, in the future, it will also be possible to develop and formulate accounting recommendations specific to the various sectors in which organizations operate.

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**IMPLIKACJE INWESTYCJI W ZRÓWNOWAŻONY ROZWÓJ.
ZARYS WPŁYWU NA SKŁADOWE
SPRAWOZDANIA FINANSOWEGO ORGANIZACJI
ZGODNIE Z WYMOGAMI KRAJOWYCH STANDARDÓW RACHUNKOWOŚCI**

Streszczenie: Zmiany, które wprowadzają firmy inwestujące w sposób zrównoważony, mają niewątpliwie charakter zarządczy, ale również znacząco wpływają na rachunkowość. Wymagają odpowiedniej reprezentacji w systemie sprawozdawczości finansowej. Krajowe Standardy Rachunkowości jeszcze nie odnoszą się bezpośrednio do ESG, a konieczne jest odpowiednie uwzględnienie takich zdarzeń w sprawozdaniach finansowych. Na podstawie ogólnych wytycznych standardów rachunkowości oraz analizy możliwych specyfik wspomnianych inwestycji autor publikacji proponuje ramowe schematy prezentacji i księgowania oraz wskazuje konsekwencje prezentacji i księgowania tych działań dla poszczególnych komponentów sprawozdania finansowego. Celem badania jest dostarczenie związanej charakterystyki specyfiki inwestowania w zrównoważony rozwój w ramach systemu księgowego organizacji oraz scharakteryzowanie głównych komponentów sprawozdań finansowych. Na podstawie ogólnych wytycznych standardów rachunkowości oraz analizy możliwych specyfik wspomnianych inwestycji autor publikacji proponuje ramowe schematy prezentacji i księgowania oraz wskazuje konsekwencje prezentacji i księgowania tych działań dla poszczególnych komponentów sprawozdania finansowego.

Słowa kluczowe: standardy rachunkowości, sprawozdanie finansowe, inwestycje w ESG, zrównoważony rozwój

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MULTIPLIERS OF VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENTS ON THE EXAMPLE OF POLISH IPO

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Abstract: The aim of the article is to analyze the investment multipliers achieved by funds in companies that successfully completed an initial public offering (IPO) on the Warsaw Stock Exchange in the years 2000-2023. Venture capital funds and private equity currently constitute an important asset class in the financial market. The goal of investors is to achieve superior returns, which inevitably translate into adequate economic performance of portfolio companies fueled by venture capital funds and private equity. This results in very dynamic growth in their value, in some cases reaching multipliers at ten times the invested funds over a period of 5-7 years. The level of the multiplier depends on the ability of the funds to complete the investment and sell their shares. One method of disinvestment commonly used by VC and PE funds is an initial public offering.

Keywords: private equity, value creation, venture capital

JEL Classification: O43, O16, E44

Introduction

Venture capital and private equity funds have become an important segment of the financial market on a global scale. Many institutional investors, such as banks, pension funds, and insurance companies, have taken an interest in these rapidly developing funds and have become involved in their operations. The dynamic growth of these funds and the scale of capital they have raised have resulted in their investments reaching a global scope and experiencing a rapid increase in assets under management. In recent years, this has been the fastest-growing asset class in the global

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financial market. According to Ocorian's Global Asset Monitor (Ocorian, 2025) private equity grew from 1.4 trillion of USD in 2009 to 10.7 trillion USD in 2024. The rapid development of the real global economy is now driven by innovation, and financing innovation is a highly risky endeavor (Gompers & Lerner, 2001). Nevertheless, this asset class generates above-average returns for investors (Levis, 2011), especially over the long term, which encourages further capital allocation and fuels its continued growth. As a result, the impact of these funds on the rate of return of investment portfolios is mostly positive, which necessitates a deeper understanding of how they operate. A report from MSCI (2025) shows a downward trend in exit multiples: for the past three years, subsequent exits have been realized at lower multiples than those still in the funds' portfolios.

This asset class is characterized by a long investment horizon, complex investment goals that require in-depth analysis, intricate cash flow structures, and the use of many hybrid financial instruments. Managing such high-risk funds requires fairly advanced fund management techniques. To manage such institutions effectively, one must fully understand the specific risks involved in investing in this type of undertaking. Venture capital and private equity funds constitute a complex asset class that involves multiple layers of risk across various aspects of their operations. These risks must be properly identified, described, and managed. To adequately assess the risks associated with these investments, it is also necessary to identify the stakeholders who influence fund investments. It is worth noting that between 2000-2007 and 2011-2012, the median return rates of venture capital and private equity funds hovered around 0% or were negative, highlighting the critical importance of conducting thorough analyses and selecting the right fund that will generate an appropriate risk-adjusted return. This, in turn, contributes to building the value of portfolio companies. The primary strategy of the fund is to deliver a return on the invested capital to its investors. This profit depends on the efficiency of managing the portfolio of enterprises supported by the fund – that is, on building lasting value in its portfolio companies. In the literature, one can find data on the length of a fund's involvement in an enterprise, indicating a period of 3-7 years as the time devoted to investing and increasing the portfolio company's value (Sobańska & Sieradzan, 2013). During the 2008-2010 crisis, the period of VC fund involvement in an enterprise extended to about 8-10 years, and in some cases even reached 12 years (Basnet et al., 2025). There are several reasons for this. First, VC investments are illiquid and cannot be easily or quickly sold. Second, investors by principle commit to an enterprise for a long term; unlike hedge funds or mutual funds, they are not entitled to sell their shares before a specific event occurs within the company. Divestment – i.e. the exit and sale of shares in the portfolio company – and its conditions are often strictly defined and included in the investment agreement (Cumming, 2008). Before making an investment, funds conduct in-depth financial, legal, and due diligence of the potential investment target. A very important factor for fund investors is that they are called upon to contribute their capital to the fund only at the time investments are actually made. Unlike other types of funds, VC funds do not hold excess idle capital unnecessarily and do not collect the full amount of committed capital at the fund's

inception. The primary objective of a VC fund is to build value in its portfolio companies. Creating value within a VC portfolio company is a complex process influenced by many factors. The aggregated components and their mutual interactions contribute to the creation of added value. The fund's activity as an investor in a portfolio company is most evident in its involvement in shaping the company's medium- and long-term development strategy. Active participation in this area allows the precise definition of strategic objectives, the measurement and evaluation of progress, and adjustments in response to changing market conditions. Fund personnel typically have extensive contacts in financial institutions, are familiar with consulting firms and lawyers, and – most importantly – know potential future investors. Moreover, they monitor the company's operations, particularly its financial performance, which helps identify potential problems early and enables joint problem-solving. It is this combination of capital, experience, and long-term commitment that makes VC attractive.

The primary objective of this study is to analyze the investment performance of venture capital and private equity funds in Poland by examining cash-on-cash multiples realized through initial public offerings (IPOs) on the Warsaw Stock Exchange (WSE) during the period 2000-2023. The study further aims to benchmark these outcomes against international markets (US and EU) in order to evaluate the relative attractiveness of Polish exits and to identify factors influencing multiple variability across different market cycles. The study addresses the following research questions: (1) To what extent do venture capital and private equity funds generate attractive multiples at the time of exit by means of IPOs? (2) How do these outcomes compare with benchmark performance on international markets? (3) What factors influence the variability of multiples across different periods? To compare it with global performance, multiples for US and EU markets are presented. There are no extended studies on this issue on the global or Polish market. The lack of in-depth analyses of cash-on-cash multiples in the context of IPOs on the Warsaw Stock Exchange, compared to global trends, constitutes a scientific and practical gap. The aim of this paper is to fill this gap.

Literature review

Academic literature reveals that venture capital funded companies show superior and much more advanced performance to regular companies that do not have venture capital support (Sobańska & Sieradzian, 2013). Those firms contribute in many ways to the development of economies by boosting turnover, innovation, creating jobs as well as enhancing growth. Their high levels of investment and returns also influence many different areas of the economy. However in general, in the macroeconomy the proportion of companies that receive venture capital funding is limited and very small. Despite that, there has been rapid growth in the availability of VC/PE funds over the years in different branches and economies. One can observe that there is still a lack of this kind of investors in many sectors. Researchers' conclusions have indicated that significant variance in performance between companies that are supported by VC/PE and regular firms can be attributed to the VC/PE investors (Fitza

et al., 2009). This outcome should then lead us to the important question – which capabilities of VC/PEs contribute to the performance variation of the supported companies. There is an abundance of research evidence indicating that the managerial and value addition capabilities of venture capital dominate the selection capabilities in explaining the performance variation (Chemmanur et al., 2009; Bayar & Chemmanur, 2011). The relationship between entrepreneur and investor is a broad area for VC/PE value added research. One of the most important things is the acceptance of the entrepreneur by the venture capital fund managers. Cable and Shane conclude that a cooperative relationship between entrepreneur and investor is even more important for the positive development of a company than the provision of money itself. They argue that the relationship between the two parties increases in its social complexity, and therefore becomes increasingly more difficult to imitate (Cable & Shane, 1997). This in turn leads to improvement in the company's performance.

At a certain period in the investment time span, venture capital funds should implement an effective divestment process. IPO as desirable exit for the funds is the outcome of that process. When a venture capital or private equity sponsor conducts an IPO of a portfolio firm, it does not often sell a significant stake of its investment, usually remaining a large block holder in the newly listed firm for a longer and much more extended period. This practice is consistent with the recognition that the retention of shares in an IPO is a signaling device that mitigates adverse selection intrinsic to equity issuance (Bayar & Chemmanur, 2011). There are clear benefits of a healthy IPO market. Research suggests that IPOs finance growth and stimulate innovation, productivity and job creation. After an IPO, venture capital funds generally block and hold their governance rights, maintain board representation, monitor managers, influence corporate decisions and sometimes are bound by regulations that restrict share trading. Because a sponsor influences a firm's operations until its ownership is sold (typically some years after an IPO), a venture capitalist is the type of block holder that researchers view as an effective corporate monitor. At the same time, the limited horizon intrinsic to the VC/PE business model creates pressure for sponsor divestment after an IPO, including the fact that a sponsor's limited partners pay high fees for managing the firm. Venture capital and private equity contracts govern long-term relations between entrepreneurs and their investors in a way that establishes a path for capital gain growth, cash flow, control rights and an exit horizon. The long-term nature of VC/PE-entrepreneur relationships leave entrepreneurs open to exploitation by VC/PE funds (Fried & Ganor, 2006) and VC/PE funds open to expropriation by entrepreneurs. It is natural to rely on the strength of a venture capital fund, which an entrepreneur accepts. Furthermore, as high-tech start-up entrepreneurial firms do not have sufficient cash flows to pay interest on debt or dividends on equity, contracts are established in a way that control rights are allocated over divestment decisions (Gilson & Black, 1998).

A successful divestment may involve an IPO, or a merger or acquisition (often referred to as a "trade sale"). There is a limited amount of research that covers ROE analysis for VC backed IPOs. Nonetheless, there are some studies showing that PE/VC backed IPOs companies have a lower leverage ratio in the first 5 years after

the IPO in comparison with those not financed by PE/VC. These companies, in addition to having more capital options, must return to the PE/VC funds the investments made by them. Carvalho et al. (2013) show that 25% of the exit from the investment of PE/VC funds between 2004 and 2009 were by means of IPO. In this sense, companies invested in by PE/VC are more likely to issue shares instead of debt. Further studies also found evidence that companies financed by PE/VC have a higher level of profitability – as measured by ROE – in the short term, i.e. in the first three years after the IPO. In the same direction, companies financed by PE/VC show a higher level of sales growth in the first 3 years after the IPO. With regard to the ROE variable, Tan and Morsfield (2006) argue that companies invested in by PE/VC funds tend to have on average, better performance in their investments when compared to those not invested in by PE/VC. Caselli et al. (2009) analyzed 804 investments made by 87 channels of investments of 58 PE/VC management organizations in Italy in the period of 1999-2005 and not divested before 2007. The authors also concluded that the high IRR is driven by sales growth, return on assets (ROA) and return on equity (ROE). In terms of profitability, the results indicate that these companies perform better, as measured by ROA, in the first 3 years after the IPO. These companies also presented superior results when considering sales growth as a variable of operational performance. In recent years, research on venture capital and private equity performance has expanded considerably. Studies from 2020 to 2025 emphasize the impact of market cycles, technological innovation, and macro-economic shocks on exit outcomes (Li et al., 2024). More recent empirical studies confirm that exit multiples are sensitive to monetary policy and geopolitical uncertainty (Korsah et al., 2024).

Research methodology

In order to assess the sustainability of a company's value growth, venture capital funds and investors use a variety of specific methods. Return multiples are the most popular and simplest methods for evaluating the financial performance of venture capital and private equity funds. The aim of the paper is to estimate investment multiples that private equity funds achieved from their investments in Poland. We examine IPO transactions conducted on the Warsaw Stock Exchange in the period 2000-2023. Cash-on-cash multiples were used for that purpose. This paper contributes to the understanding of how financial sponsorship impacts IPO valuation and performance, providing crucial insights for investors and issuing companies aiming to navigate the IPO landscape effectively. The results highlight the nuanced role of PE in enhancing company value post-IPO, which challenges the conventional wisdom of market efficiency and suggests a strategic advantage in PE involvement.

Generally, the formula for calculating these multiples is the ratio of realized profits, the value of the fund's portfolio, or distributions to investors in relation to the original investment amount. These indicators are relatively easy to interpret but do not account for the time value of money. Some critics argue that their application is limited as the formulas are mathematically too simplistic.

The multiples used by National Venture Capital Association (NVCA, 2024) and Invest Europe (European Private Equity and Venture Capital Association) include:

- DPI (distributions to paid-in capital)
- RVPI (residual value to paid-in capital)
- TVPI (total value to paid-in capital).

The DPI multiple represents the ratio of profits distributed by the fund to its participants (the net of all settled fees) over a specific period relative to the paid-in capital. It can be expressed mathematically as:

$$DPI_n = \frac{\sum_{i=0}^n CIF_i}{\sum_{i=0}^n COF_i} \quad (1)$$

where:

- CIF_i – positive cash flows from the fund to the investor in period i
- COF_i – negative cash flows from the investor to the fund in period i
- n – the number of periods.

The RVPI multiple is the ratio of the fund's residual value (the net asset value minus fees and interest) to the total capital paid in. Its mathematical formula is:

$$RVPI_n = \frac{NAV_n}{\sum_{i=0}^n COF_i} \quad (2)$$

The residual value (NAV_n) represents the net asset value of the fund, reduced by fees and interest that the fund is obligated to pay to the managing entity or third parties not participating in the fund.

The TVPI multiple combines both DPI and RVPI (after adjusting for costs and interest) and measures the total value relative to the committed capital. It is calculated as:

$$Multiple = TVPI_n = \frac{\sum_{i=0}^n CIF_i + NAV_n}{\sum_{i=0}^n COF_i} \quad (3)$$

Additionally, the PICC (paid-in capital to committed capital) ratio is used to show what proportion of the committed capital has actually been contributed by investors to the fund. These indicators measure the net returns on invested capital but do not account for the time value of money. It is important to note that venture capital funds attempt to estimate NAV at the end of each quarter. The interim values for IRR, TVPI, and RVPI are based on these estimates. This estimation is one of the most problematic components of evaluating venture capital performance and highlights the need to supplement quantitative analysis with a qualitative assessment of fund operations. A more conventional approach to company valuation and investment profitability involves using the internal rate of return (IRR) as the primary performance metric. IRR takes into account both the timing and magnitude of cash inflows and outflows for a given investment, making it particularly well suited for VC investments, which are typically structured across multiple funding rounds. Another

approach to evaluating funds and comparing them with the returns of public market companies is the public market equivalent (PME or index method). This is a return metric based on a market index, adjusted to reflect the irregular cash flows typical of VC funds. It is related to a money-weighted return (similar to IRR) in such a way that the PME rate is the return an investor would achieve by investing in a public index during the periods when the VC fund calls capital, and selling the index when the fund distributes proceeds. This strategy is designed to replicate the irregular investment and divestment patterns of a venture capital fund as closely as possible in order to compare the achieved returns more accurately. The indicator answers a simple question: how much (in net present value terms) would an investor need to invest in a public market index to generate one monetary unit of return equivalent to that received from a VC or PE fund investment. This measure allows a direct comparison of returns from public market investments and those from VC or PE funds. In this way, we can obtain a comprehensive comparison of investment performance against an appropriate benchmark.

Mathematically, the model is represented as follows:

$$PME = \frac{\sum_{t=1}^T cf_t \prod_{i=t+1}^T (1+R_{fi})}{\prod_{t=1}^T (1+R_{ft})} \quad (4)$$

where:

- R_{ft} – net return from the public market index over period t
- cf_t – normalized positive cash flow of the VC fund over period t

As can be observed, public index return rates are gross returns that include management fees. An alternative definition of the PME indicator model presented by Kaplan and Strömberg (2003) states that the PME ratio is the quotient of the discounted fund distributions from realized investments to the discounted fund inflows (investor contributions), where discounting is based on the return rate of the chosen benchmark investment. Mathematically, the formula is as follows:

$$PME_i = \frac{\sum_{t=1}^T (CFO_{ti} \prod_{n=0}^t (1+r_{Bn})^{-1})}{\sum_{t=1}^T (CFI_{ti} \prod_{n=0}^t (1+r_{Bn})^{-1})} \quad (5)$$

where:

- CFO_{ti} – fund distributions from investment i in period t
- CFI_{ti} – fund inflows for investment i in period t
- r_{Bn} – total return rate of benchmark index B in period t

If the PME ratio exceeds 1, it indicates that investments in VC or PE funds outperform the benchmark and provide higher returns than the public market. Conversely, if PME is below 1, then public market investments are more effective than VC and PE investments. From the investor's perspective, it is important to determine whether investing in venture capital funds offers higher efficiency compared to public market investments.

Another commonly used and simple metric for evaluating investment effectiveness is the cash-on-cash multiple. This is simply the ratio of the disinvestment

amount to the invested capital by the VC fund. Like the other multiples, it also ignores the time value of money. While the aforementioned indicators reflect the total value of the entire investment portfolio – including the current value of ongoing investments – the cash-on-cash multiple focuses solely on the effectiveness of a single investment. IRR and cash-on-cash multiples are related, but often move in opposite directions when the time period changes. Different firms target different rates, and metrics are met by different stages of an investment. VC funds expect multipliers of 3-5 for early-stage investments, and for the best investments, the multiplier should be ten times the amount invested. PE or late stage investments may use IRR, which ideally should be at the level of around 20% and over. The multiple metric simply divides the total distribution to investors by the amount of paid-in capital. Like DPI, RVPI or TVPI, it is a cash-on-cash measure but does not account for the time value of money. The advantages are easy to understand and calculate, and are good for assessing the total amount of money made. The disadvantages of this method are: it does not account for the time value of money and offers no insight into the rate of return.

The mathematical formula for the multiple of money or cash-on-cash multiple is:

$$\text{Cash-on-cash (multiple of money)} = \frac{\text{total cash inflows}}{\text{total cash outflows}} = \frac{\sum_{t=1}^T CFO_t}{\sum_{t=1}^T CFI_t} \quad (6)$$

where:

- CFO_{it} – total fund investment t
- CFI_{it} – total fund outflows in period t

Choosing the right metric depends on what an investor wants to know. IRR is useful for rate-based comparisons, DPI for assessing cash returns, TVPI for understanding total value, and the cash-on-cash multiple for gauging absolute profitability. Wise investors will look at all these metrics in conjunction to get a full understanding of a venture capital fund's performance.

This paper will examine the cash-on-cash multiple that was observed for VC and PE backed IPOs and reported by the funds at the time of the divestment process in the period 2000-2023. The results of the analysis show that IPOs conducted on WSE by PE and VC funds exhibit relatively high performance and create the value for portfolio companies and the funds' investors.

There are some study limitations which are explained here. The analysis relies on cash-on-cash multiples as the primary performance measure. While this indicator is widely used, it does not fully capture the risk profile, time value of money, or interim cash flows, unlike the internal rate of return (IRR) or the public market equivalent (PME). The study focuses exclusively on IPO exits. Other exit channels (trade sales, secondary buyouts, write-offs) are excluded, which may bias the conclusions since IPOs often represent higher-quality or more successful exits compared to the overall population of investments. Publicly available data on Polish VC/PE exits is limited. The disclosure requirements of the Warsaw Stock Exchange are not as extensive as in the US or Western European markets, which may affect the completeness and

accuracy of the dataset. The period 2000-2023 includes several distinct market cycles (the dot-com aftermath, 2008-2010 financial crisis, COVID-19, recent geopolitical disruptions). The variability across these sub-periods may influence averages in ways that are difficult to fully isolate. When benchmarking against US and EU multiples, differences in market maturity, fund structures, and regulatory environments must be acknowledged. Cross-country comparisons may therefore have inherent limitations.

Results

The performance of American (Table 1) and European (Table 2) funds differs only slightly, but the factors influencing their effectiveness are largely similar. When analyzing investment values and the volume of exit transactions, it becomes evident that this is a cyclical market segment influenced by stock market trends. The valuations of private assets held in fund portfolios are highly dependent on the valuations of publicly traded companies. As a result, funds established during bull markets tend to deliver relatively low returns, while those investments during bear markets often achieve above-average financial performance. This provides further evidence that venture capital and private equity market segments are subject to the phases of stock market cycles.

Table 1. Performance of VC funds on US market 1998-2023

Year	Median IRR	DPI	RVPI	TVPI
1998	-3.8%	1.45	0.05	1.5
1999	-2.29%	0.87	0.10	0.96
2000	-1.33%	0.82	0.23	1.05
2001	-1.650%	0.87	0.32	1.19
2002	-0.500%	0.72	0.30	1.02
2003	1.800%	1.07	0.59	1.66
2004	1.830%	0.89	0.69	1.58
2005	4.760%	0.51	0.89	1.40
2006	7.310%	0.52	1.01	1.53
2007	13.88%	0.62	1.17	1.79
2008	13.89%	0.32	1.27	1.59
2009	15.79%	0.23	1.41	1.64
2010	20.34%	0.22	1.55	1.77
2011	12.20%	0.04	1.40	1.44
2012	3.68%	0.01	1.24	1.25
2013	20.11%	0.22	1.34	1.55
2014	18.80%	0.10	1.24	1.34
2015	15.64%	0.04	1.22	1.26

Year	Median IRR	DPI	RVPI	TVPI
2016	15.85%	0.01	1.04	1.05
2017	16.27%	0.02	1.18	1.21
2018	16.58%	n/a	n/a	n/a
2019	10.44%	n/a	n/a	n/a
2020	9.11%	n/a	n/a	n/a
2021	4.520%	n/a	n/a	n/a
2022	-3.69%	n/a	n/a	n/a
2023	-12.00%	n/a	n/a	n/a

Source: Cambridge Associates Benchmark (2024), Bain and Company (2023)

What we could assess from data on the US market is that funds from the late 1990s and early 2000s experienced negative median IRRs, likely due to the dot-com bubble burst. Continued underperformance, with median IRRs remaining negative, possibly reflect the lingering effects of the early 2000s downturn. Starting with the 2009 vintage, median IRRs turned positive, peaking around 2014 with a median IRR of 20.11%. The 2021 vintage shows a median IRR of 4.52%, while the 2022 and 2023 vintages have negative median IRRs, indicating recent market challenges. When analyzing the performance of venture capital funds in the US, it should be noted that the median IRR during the 1998-2023 period was at a very low level. It is clearly visible that investments made during the dot-com downturn negatively affected fund performance. In contrast, funds that invested during the 2007-2009 financial crisis achieved higher return levels and recorded the highest average TVPI ratios. These results confirm the cyclical nature of venture capital investments and the impact that public company valuations have on the valuation of private companies held in fund portfolios.

Table 2. Performance of European VC/PE funds

Year	IRR	DPI	RVPI	TVPI
1980-1984	6.21	1.4	0.1	1.5
1985-1989	6.97	1.5	0.1	1.6
1990-1994	12.87	1.71	0.99	2.7
1995-1999	0.52	0.53	0.97	1.5
2000-2004	-2.21	0.35	1.25	1.6
2005-2009	2.75	0.15	1.45	1.6
2010-2013	-8.53	0.01	1.00	1.01
2014-2018	22.50	0.01	1.01	1.02
2018-2023	20.77	0.01	1.01	1.02

Source: Calculations based on EVCA (2025); NVCA (2024)

Analyzing the performance of European funds (Table 2), it can be stated that the level of achieved results is slightly lower than that of funds operating on the American market. The performance of European funds is also significantly influenced by the valuation levels of public companies (Diaconu, 2017). Starting with the Polish market between the years 2000 and 2023, 70 entities backed by VC and PE funds debuted on the Warsaw Stock Exchange (WSE). This accounts for 13.72% of all IPOs, which totaled 510 since 2000. Building company value by funds in the Polish market is quite complex but, on the other hand, is influenced by many positive factors. VC and PE funds are entities that attract stock market investors, which translates into the performance of companies listed on the WSE. The Polish market was not a mature market, so funds had to carefully choose the right moment for divestment to carry out an IPO. The Polish market confirms the rule that divestment transactions largely depend on stock market conditions. Over 37% of the IPOs of companies supported by VC funds took place during the bull market period of 2004-2007. We could observe only 37 IPOs in the period of 2020-2023 and only 9 of them were backed by VC and PE funds. The efficiency of funds that sold their shares to strategic investors – both domestic and foreign – was not as high but still provided good levels of returns. The average cash-on-cash multiple was lower for transactions selling to strategic investors compared to IPOs conducted by funds. Among the best transactions of share sales to strategic investors were the sales of Polcard (cash-on-cash multiple of 3.1), Lukas Bank (cash-on-cash multiple of 5.6), and Town&City (cash-on-cash multiple of 2.6). For comparison, the highest cash-on-cash multiples among IPO transactions were recorded by the following companies: One 2 One (10.2) – despite the highest costs of raising capital through the IPO, Comp Rzeszów (7.9), and Zetkama (6.9). For recent IPOs conducted by VC and PE funds, one could add to this list LPP, Dino and Żabka as most effective investments for VC and PE funds in Poland. For the period 1993-2011, the average multiple for IPOs was 3.5. For 1993-2004 it was 3.15, and for 2005-2011 it was 3.8. For the period of 2013-2023 the average multiple was also quite high and amounted to 3.12. This means that the funds tripled their investments in IPO transactions, taking advantage of favorable stock market conditions and carrying out IPOs during periods of increased activity on the WSE. This behaviour indicates that VC funds dynamically reduce both the value and number of divestments during market downturns.

Table 3. Statistics of multiples achieved by VC/PE funds in IPO process on WSE

Statistics	Mean	Median	Upper quartile	Lower quartile	Max.	Min.
Cash-on cash	3.2	2.7	5.6	1.3	12.2	0.3

Source: Author's own calculations

To sum up the research (Table 3) we could observe that the average for the period 2000-2023 was 3.2, and the median was 2.7. This indicates slightly better results for Polish funds compared to US and European funds; however, the scale of transactions

in the Polish market is entirely different compared to the previously discussed markets. Since 2014, bonds have become a very important financing instrument for large enterprises. The Catalyst bond market has provided Polish companies with an easy and transparent path to raise capital for growth, while also ensuring liquidity for trading these instruments on the Warsaw Stock Exchange. In 2025, approximately 600 different bonds were listed on the Warsaw Stock Exchange, and since 2017, their market capitalization has significantly exceeded the capitalization of the main stock market. This is one of the reasons why the number of IPO transactions is declining. This poses a challenge for venture capital and private equity investors, whose main objective is to increase the value of portfolio companies. One of the primary exit strategies is the stock exchange, which in the case of the Polish market is no longer functioning effectively, as since 2016, more delistings have been observed than IPO transactions.

Conclusion

Value creation by venture capital and private equity funds is one of the key drivers of growth in major global economies. High-tech companies such as Apple or Google, which today are among the highest valued on stock markets, were once financed by venture capital funds. The Polish market is less developed than other markets; nevertheless, fund activity in terms of investments remains relatively high. VC/PE funds are also quite active in taking companies public on the Warsaw Stock Exchange. Hence, the main aim of the article was to analyze the performance of Polish private equity and venture capital funds in terms of the investment multipliers they achieved. Private equity backed IPOs were examined to present the cash-on-cash multiple.

The performance of venture capital and private equity funds across the US, Europe, and Poland demonstrates the cyclical nature of these investments, heavily influenced by public market trends. While US and European funds exhibit similar patterns (higher returns during bear markets and weaker results during bull markets), the Polish market, although smaller in scale, has achieved comparable or even slightly better average cash-on-cash returns through IPOs. Nonetheless, the growing importance of bond markets and the declining number of IPOs, especially in Poland, pose challenges to traditional VC/PE exit strategies. These trends emphasize the need for funds to adapt to shifting capital markets and to strategically time their investment and divestment decisions in alignment with broader economic cycles.

The results achieved by the funds in the IPO process should be considered positive. The average cash-on-cash multiple of 3.2 indicates that funds achieve their investment goals related to value creation in enterprises. This is possible thanks to a well-functioning stock market and its adequate liquidity. A further stage of analysis and research could be the assessment of company value sometime after the IPO, once the fund has already exited its stake in the business.

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MNOŻNIKI WZROSTU WARTOŚCI PRZEDSIĘBIORSTWA FUNDUSZY VENTURE CAPITAL ORAZ PRIVATE EQUITY NA PRZYKŁADZIE POLSKIEGO RYNKU PIERWOTNEJ OFERTY PUBLICZNEJ

Streszczenie: Celem artykułu jest analiza mnożników wartości zainwestowanych kapitałów przez fundusze w spółki, które zdołały przeprowadzić pierwotną ofertę publiczną na Giełdzie Papierów Wartościowych w Warszawie w latach 2000-2023. Wyniki mnożników osiągnięte przez fundusze wskazują na ponadprzeciętne mnożniki wartości inwestycji. Fundusze venture capital oraz private equity to obecnie ważna klasa aktywów na rynku finansowym. Celem inwestorów jest osiągnięcie ponadprzeciętnych stóp zwrotu, co musi przełożyć się na odpowiednie wyniki ekonomiczne spółek portfelowych zasilanych funduszami venture capital oraz private equity. Wiąże się to z bardzo dynamicznym przyrostem ich wartości sięgającym w niektórych przypadkach mnożników na poziomie dziesięciokrotności zainwestowanych środków w okresie 5-7 lat. Poziom mnożnika zależy również od możliwości zakończenia inwestycji przez fundusz i sprzedaży posiadanych udziałów lub akcji. Jednym ze sposobów dezinwestycji chętnie stosowanym przez fundusze jest transakcja pierwotnej oferty publicznej.

Słowa kluczowe: venture capital, mnożniki inwestycyjne, kreowanie wartości

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