

**Development of scientific research in the
social sciences: an approach from the
Latin American university**

Benzaquen-Hinope, Hugo Alberto
Miranda-Guerra, María del Pilar
López-Castro, Fernando Christian
Ramirez-Salazar, Daniel Javier
Yanice Ordóñez Parra
Edisson Maza Aucapiña
Geovanny Zamora Zamora
Rolando Andrade Amoroso
Carlos Ramírez Valarezo
John Edwin López Castillo
Mónica Briggith Rosales Namicela
Diego Vinicio Orellana Bueno
Marcos Eduardo Cantos Ochoa
Patricio Esteban Mendieta Andrade
José Alciviades Guzmán Ávila
Juan José Brito Corral
Kléber Antonio Luna Altamirano
Rosana Alejandra Melean Romero
Sebastián Antonio Luna Idrovo
Oscar Rene Calle Masache
Yonimiler Castillo Ortega
Jessica Marisol Delgado Marquez
Andrés Francisco Ugalde Vásquez
Gina Patricia Cuadrado Sánchez
Ana Alexandra López-Jara
Klever Alfonso Morales-Pazmiño
Sara Nathaly Ayala-Pasquel
Ernesto Bolívar Rizzo-Orellana
Marcos Eduardo Cantos Ochoa
Nube Estefanía Venegas Sánchez
María del Pilar Cabrera Hermida
Santiago Andrés Moreano Granizo
Jovina Alejandra Jaramillo Quezada
Judith Cristina Pesantez Rodríguez
Ramón-Poma, Glenda Maricela
Macias-Cabrera, Alba Guadalupe
Astudillo-Arias Pedro Yamil
Andrade-Pesantez Daniel Jacobo
José Luis Pita-Espinoza
Manuel Antonio Diaz-Paredes
Wilder Martín Vásquez-Murillo
Lily Fanny Zapata-Revoredo
Jorge García Regalado
Rina Bucaram Leverone
Víctor Quinde Rosales
Diego Marcelo Cordero Guzman
Deysi Catalina Urgilés Criollo

Ximena Abril Fajardo
Pablo Perez Jara
Diego Fernando Ortiz Lazo
Francisco Quinde Rosales
Renán Teodoro Rodríguez Pillaga
Daniela Dolores Jiménez Rodríguez
Priscila Isabel Ruiz Alvarado
Magdalena Emilia Ordóñez Gavilanes
Gilberto Carrion-Barco
Alejandro Chayan-Coloma
Rodolfo Pastor Tineo-Huancas
Dany Amparito Vega-Clavo
Carmen Yolanda Jaramillo Calle
Monica Alexandra Hermida Carpio
Christian Mauricio Banegas Campoverde
Pedro Yamil Astudillo Arias

Development of scientific research in the social sciences: an approach from the Latin American university

This book has been duly examined and assessed in the double-blind mode in order to guarantee its scientific quality.

Editors. Carlos Barros Bastidas
Sunny Bores Froment
Publicaciones Editorial Grupo Compás
Guayaquil.- Ecuador
compasacademico@icloud.com
<https://repositorio.grupocompas.com>



Barros, C., Bores, S. (Ed.) (2024) Development of scientific research in the social sciences: an approach from the Latin American university.
Editorial Grupo Compás

ISBN: 978-9942-33-811-2

Copyright encourages creativity, defends diversity in ideas and knowledge, promotes free expression and fosters a living culture. The production or storage of all or part of this publication, including the cover design, or the transmission of this publication by any means, electronic, chemical, mechanical, optical, recording or photocopying, without the permission of the copyright holders, is strictly prohibited and punishable by law.

Table of Contents

| | |
|---|-----------|
| Entrepreneurship and its relationship with the new global trends of complex thinking: A literature review | 8 |
| Introduction | 8 |
| State of the art of entrepreneurship and the new trends of complex thinking | 11 |
| Entrepreneurship | 11 |
| New global trends | 14 |
| Relationship between entrepreneurship and new global trends | 21 |
| Proposed solution to address the challenges of entrepreneurship through complex thinking | 28 |
| Conclusions | 32 |
| References | 34 |
| | |
| Impact of the banking credit system on the financial performance of micro, small and medium-sized enterprises | 46 |
| MSMEs and their participation in the labor market | 46 |
| The financial system and its importance in the business economy | 48 |
| Fuzzy logic as a tool for timely decision making | 56 |
| Conclusions | 89 |
| Reference | 89 |
| | |
| Administrative proposals to promote women's participation in small and medium-sized Latin American enterprises | 94 |
| Introduction | 94 |

| | |
|---|-----|
| Women's leadership and participation in SMEs..... | 99 |
| Correlation of internal and external factors..... | 111 |
| Conclusions | 129 |
| Reference | 131 |

| | |
|---|------------|
| Incidence of personal attitude on the entrepreneurial intention of university students | 136 |
| Introduction | 137 |
| Theoretical analysis | 139 |
| Self-efficacy | 143 |
| Internal locus of control..... | 146 |
| Methodological Process and Results..... | 147 |
| Data analysis..... | 151 |
| Structural equation modeling test..... | 157 |
| Conclusions | 162 |
| References..... | 163 |

| | |
|---|------------|
| Fuzzy logic as a new computational technique in financial indicators | 173 |
| Introduction | 174 |
| Financial Indicators: essential basics | 177 |
| Financial indicators under the fuzzy approach | 182 |
| Conclusions | 192 |
| References..... | 195 |

| | |
|--|------------|
| Influence of knowledge management on business effectiveness. An analysis with PLS | 202 |
| Introduction | 202 |
| Knowledge Management in SMEs | 205 |
| Relationship between knowledge management and business effectiveness | 209 |

| | |
|--|-----|
| Methodological process, study variables and research results | 214 |
| Independent variable: Knowledge management..... | 217 |
| Dependent variable: Business effectiveness | 218 |
| Conclusions | 226 |
| Reference | 228 |

| | |
|---|------------|
| Analysis of Governmental Accounting in Parochial Autonomous Governments: case study of the execution of public works in Tayuza | 237 |
| Quality assurance of financial information in the public sector and the regulations of parochial decentralized autonomous governments | 243 |
| The accounting-budgetary association and financial reporting in parochial decentralized self-governments. | 250 |
| Comprehensive implementation of accounting and budgeting principles in parochial decentralized autonomous parish governments..... | 259 |
| Preparatory Stage..... | 259 |
| Pre-contractual stage | 260 |
| Contract execution stage | 261 |
| Conclusions | 276 |
| References..... | 278 |

| | |
|---|------------|
| Influence of Marketing on the business growth of SanOdonto dental clinics..... | 284 |
| Introduction | 284 |
| Theoretical analysis | 289 |
| Conclusions | 304 |
| Reference | 306 |

| | |
|--|------------|
| Continuous Improvement through ISO 9001: | |
| Analysis in Modern Organizations..... | 312 |
| Introduction | 312 |
| The impact of ISO 9001 on continuous improvement and business competitiveness in various industries | 314 |
| Evolution and Implementation of ISO 9001 Standards in Quality Management and Auditing..... | 318 |
| Influence of Organizational Culture on the Perception and Management of Quality | 323 |
| Evaluation of the effectiveness of quality audits in the supply chain..... | 328 |
| Development of best practices to ensure the quality of suppliers' products or services | 334 |
| Conclusions | 350 |
| References..... | 352 |
| | |
| Impact of Artificial Intelligence on the | |
| Accounting Profession | 360 |
| Introduction | 360 |
| Key fundamentals of artificial intelligence..... | 362 |
| Artificial intelligence as an improvement in accounting and auditing processes | 365 |
| Practical implications..... | 379 |
| Conclusions | 381 |
| References..... | 382 |
| | |
| Impact and factors of emerging technologies on | |
| innovation management in SMEs..... | 387 |
| Introduction | 387 |
| Emerging technologies in the innovation management processes in SMEs..... | 396 |
| Factors influencing the impact of technology on innovation management in SMEs..... | 401 |

| | |
|-------------------|-----|
| Conclusions | 407 |
| References..... | 409 |

| | |
|---|------------|
| Study of the production, import and export of intermediate inputs of Ecuador's manufacturing sector and its effect on the Ecuadorian incorporated product (PEI)..... | 416 |
| Technique Panel data..... | 422 |
| Methodological process..... | 423 |
| Analysis of the Motorcycle manufacturing sector (ISIC 30) using the Arellano-Bond correction | 427 |
| Analysis of the Motorcycle Manufacturing Sector (ISIC 30) using Weighted Least Squares Regression | 429 |
| Analysis of the vehicle manufacturing sector (ISIC29) using 3 models..... | 431 |
| Analysis of the food manufacturing sector (ISIC 10) using two models..... | 432 |
| Conclusions | 436 |
| References..... | 439 |

| | |
|---|------------|
| Adoption of Industry 4.0 in the Organizational Management of the Commercial Sector in the City of Cuenca-Ecuador | 443 |
| Introduction | 443 |
| Definition of Industry 4.0..... | 447 |
| Methodological aspects | 457 |
| Population | 457 |
| Sample | 459 |
| Variables and Instrument..... | 460 |
| Analysis of the proposed model | 463 |
| Measurement Model | 463 |
| Structural model | 467 |
| Hypothesis testing..... | 470 |

| | |
|-------------------|-----|
| Conclusions | 472 |
| References..... | 473 |

| | |
|--|------------|
| Economic activity and its impact on the delinquency rate of private banks in Ecuador..... | 480 |
| Introduction | 480 |
| Empirical evidence of the relationship between macroeconomic variables and bank delinquencies..... | 482 |
| Establishment of the methodological proposal | 484 |
| Unit Root Test..... | 485 |
| Impact of economic activity on private bank delinquency rates in Ecuador..... | 488 |
| Conclusion..... | 492 |
| References..... | 494 |

| | |
|---|------------|
| Organizational Resilience and challenges of the cooperative sector in the city of Cañar..... | 496 |
| Introduction | 496 |
| Organizational Resilience in the face of the challenges of a changing and dynamic environment | 499 |
| Capabilities of Resilient Organizations..... | 501 |
| Organizational factors that drive Organizational Resilience | 506 |
| Discussing findings..... | 510 |
| Conclusions | 515 |
| References..... | 517 |

| | |
|---|------------|
| Analysis of corruption in public administration..... | 522 |
| Introduction | 522 |
| Effects of corruption on public trust and confidence | 525 |
| Mechanisms for preventing and combating corruption in public administration | 528 |

| | |
|---|-----|
| Impact of corruption on government efficiency | 532 |
| Conclusions | 536 |
| References..... | 537 |

| | |
|---|------------|
| Savings and investment strategies of private banks in the canton of Cuenca, province of Azuay..... | 546 |
| Introduction | 546 |
| Private banking..... | 547 |
| Savings and investment strategies | 549 |
| Increase in managed volume | 556 |
| Personalized treatment..... | 557 |
| Maintain a stable link and communication with the customer..... | 558 |
| Inferential analysis | 562 |
| Conclusions | 563 |
| Reference | 564 |

| | |
|--|------------|
| Importance of the agricultural sector in the Ecuadorian economy | 568 |
| Introduction | 568 |
| Problem, research question and hypothesis, | 569 |
| Discussion of results | 581 |
| Conclusions | 583 |
| References..... | 584 |

Entrepreneurship and its relationship with the new global trends of complex thinking: A literature review

Benzaquen-Hinope, Hugo Alberto

Full-time lecturer, Universidad Tecnológica del Perú
c14071@utp.edu.pe

Miranda-Guerra, María del Pilar

Director of the School of Business, Universidad Privada del Norte
maria.miranda@upn.edu.pe

López-Castro, Fernando Christian

San Ignacio de Loyola University
fernando.lopez@epg.usil.pe

Ramirez-Salazar, Daniel Javier

Part-time lecturer, Universidad Tecnológica del Perú
c24087@utp.edu.pe

Introduction

This study addresses the intricate relationship between entrepreneurship and new global trends, such as complex thinking and evidence analysis, which have generated significant transformations in organizations, affecting social, economic, cultural and environmental aspects, as pointed out by Solleiro & Castañón (2005); therefore, in this context, the central question arises: Is there a relationship between entrepreneurship and new global trends?

In this scenario, ventures are immersed in a highly competitive environment, where innovative capacity stands as a determining factor for their survival and success in the market, as highlighted by Schnarch (2004); thus, this

intrinsic connection between entrepreneurship and the dynamics of new trends highlights the urgent need to understand and embrace these transformative forces to thrive in the current business landscape, research on entrepreneurial activities enabled by digital technologies is fragmented, divergent and delayed (Zhai et al., 2023).

Ventures, with diverse goals ranging from social to economic or political objectives, seek to innovate in response to societal needs and profit; as well as a multidisciplinary academic field, from the perspective of complex thinking, the duality between social and economic objectives highlights the inherent versatility of ventures; where, the essential connection between entrepreneurship and the identification of profitable opportunities in the market, highlighted by Abd and Samad (2016), not only drives the growth and development of ventures, but also contributes to overall economic development by generating employment, stimulating competition and catalyzing innovation from a sustainable perspective.

Thus, the interaction between new global trends, the imperative need for innovation in entrepreneurship and its intrinsic connection with the identification of market opportunities highlights the complexity and relevance of these factors in the contemporary business framework, with impacts not only on the individual success of ventures, but also on the global economic and social landscape. From the perspective of complex thinking, it is essential to

consider the interconnection of various emerging technologies, such as artificial intelligence, Internet of Things (IoT) and blockchain, as discussed by Estrada et al. (2009). In this context, innovation in products, processes and technological management is presented as critical for the success of ventures. Despite this recognition, the effective implementation of innovation in Latin America faces significant obstacles, especially due to limited access to financing, according to the World Intellectual Property Organization (2019), which is a major barrier to the necessary investments.

Furthermore, from the perspective of analysis in strategic foresight, where data, trends and any other information that may provide clues about possible future developments are examined, Jaiswal and Zane (2022) highlight how culture and the innovation environment play a crucial role in venture initiation, underlining the importance of considering contextual and cultural factors in entrepreneurial development. Taken together, these aspects highlight the complexity and interconnectedness of various elements that need to be addressed in a holistic manner to foster a strong and sustainable entrepreneurial ecosystem.

Ultimately, the synergy between entrepreneurship and new global trends shapes today's business dynamics. The success of ventures lies in their ability not only to adapt, but also to anticipate and lead new trends. This proactive approach not only ensures survival in a constantly evolving

business environment, but also positions entrepreneurs as drivers of change on the global stage.

State of the art of entrepreneurship and the new trends of complex thinking.

At this point we present the variables entrepreneurship, new global trends and the relationship between entrepreneurship and new global trends.

Entrepreneurship

Today, entrepreneurship has been stimulated worldwide, from developed to emerging countries, economies, thanks to accelerated globalization, integration of people and cultures, and rapid technological innovation (Li, 2022). Undoubtedly, entrepreneurship, according to Acs and Amorós (2008), starts with the identification of beneficial opportunities. This view is supported by Orrego (2010) and Gutiérrez et al. (2014), who argue that entrepreneurship goes beyond mere creativity, implying the materialization of business ideas through the deployment of talent, intelligence and personal skills. In this context, it is evident that the perception and materialization of opportunities are essential elements for the entrepreneurial start-up. This connection between identification and action lays the foundation for effective entrepreneurship.

On the other hand, the in-depth understanding of Durán and Arias (2015) highlights that entrepreneurship seeks to establish small businesses, skillfully adapting to circumstances, as corroborated by Wach et al. (2016). This

pragmatic approach underlines the importance of flexibility in entrepreneurship, where the ability to adapt to changing market conditions becomes a key factor for success. In summary, adaptability is revealed as a fundamental skill for entrepreneurs on their way to establishing new businesses.

In contrast, according to Adomako et al. (2018) they add another layer to the argument by highlighting the importance of connecting to useful social networks for entrepreneurial success; similarly, Leyva et al. (2019) and López et al. (2021) propose that entrepreneurship manifests itself when there is confidence in a project and innovative opportunities are seized. These connections and confidence in the project are not only vital for the individual success of the entrepreneur, but also contribute to the social fabric and the generation of innovation in the business environment.

However, within the research developed by Jones et al. (2020) they emphasize the ability to create value as an essential component in most definitions of entrepreneurship, generating a positive impact on society. This ethical approach emphasizes that entrepreneurship is not only an individual pursuit of financial success, but also a meaningful contribution to social welfare. In short, effective entrepreneurship implies an orientation towards value creation not only for the entrepreneur, but also for society at large.

On the other hand, considering the contributions of Shane and Venkataraman (2000), they offer a conceptual perspective by considering entrepreneurship as the search for and creation of innovative opportunities. The importance of human knowledge and market environment in entrepreneurship; similarly, Meek et al. (2010) adds a crucial dimension to the process. This approach emphasizes the need for in-depth knowledge and a clear understanding of the market for the effective identification and exploitation of entrepreneurial opportunities.

However, contemplating what has been developed by Phan et al. (2009) and Nambisan (2017) add to the discussion a unique perspective by highlighting the importance of opportunity recognition as a crucial component of entrepreneurship. These authors stress the need for thorough exploration of new markets or discovery of innovative technologies to drive the entrepreneurial process. The combination of these perspectives reinforces the idea that opportunity identification and exploitation are critical to entrepreneurial success.

Furthermore, in the analysis of the study prepared by Elia et al. (2020) contribute to the discussion by defining entrepreneurship as the process of identifying and taking advantage of business opportunities; similarly, Ratten (2023) elaborates on the idea of entrepreneurship as the pursuit of business opportunities through the creative and innovative use of existing or new resources. Similarly, Zea-Fernandez et al. (2020) reinforce the notion by stressing

that new venture creation is a key driver of development and social welfare, thus providing a comprehensive and balanced perspective. Taken together, these studies reveal that entrepreneurship is not only about identifying opportunities, but also about the ability to materialize them in creative and innovative ways.

In short, the research reviewed collectively underscores the relevance of entrepreneurship as a catalyst for economic and social development. This process, which goes beyond mere creativity, involves the identification of opportunities, adaptability to circumstances and the generation of value through innovative ideas and sustainable practices. Connectivity to social networks, trust in projects and the ability to create value emerge as crucial elements in this dynamic business landscape. Ultimately, ventures are defined by the initiative to establish new enterprises based on reliable projects and the ability to face challenges, addressing not only economic benefits, but also social and environmental challenges to contribute to sustainable development.

New global trends

From a strategic perspective, current trends focus on adopting complex thinking and rigorous analysis of evidence in decision making. Strategic agility becomes essential in a dynamic business environment, where complex thinking enables rapid adaptation to unexpected changes. The integration of emerging technologies, supported by evidence-based analysis, guides decision

making on the adoption and effective integration of tools such as artificial intelligence and automation.

To begin with, the current landscape of evidence-based decision making highlights the need for complex thinking and rigorous analysis to adapt to unexpected changes. The integration of emerging technologies guides strategic decisions, especially in the adoption of artificial intelligence and automation. Current trends strengthen approaches focused on customer experience, sustainability and social responsibility. From Liedtka's (1998) perspective, there is a movement toward more inclusive and collaborative decision-making processes, leveraging creativity and collective knowledge. Multidisciplinary research, such as Pope et al. (2006) and Pintér et al. (2010), highlights the integration of analytical frameworks for sustainable development strategies. However, as investigated by Desclee et al. (2021), they highlight the importance of approaches focused on stakeholder participation and accurate representation of supply chains, demonstrating the evolution towards more holistic decision making.

On the other hand, considering the research developed by Lapaige (2009) highlights the integration of different types of knowledge as a significant trend in evidence-based decision making. Knowledge management, competency development and adaptation to the socio-historical context of the knowledge economy are key elements that define this trend. These aspects reveal the importance of

informed decision making in a globalized and dynamic environment, where adaptability and effective utilization of knowledge are essential for organizational success.

In contrast, the study by Champagne et al. (2014) points to the growing recognition of the importance of using evidence-based analysis to improve decisions and outcomes. The variability in the effectiveness of training initiatives, influenced by the strategic relevance of projects and organizational support, highlights the need for a comprehensive approach that includes team building and collaboration on common projects. This trend toward effective evidence-based decision making underscores the importance of addressing both individual and organizational aspects to achieve optimal results.

Also, according to Vecchiato's (2012) detailed research highlights the importance of addressing environmental uncertainty through strategic foresight. Strategic management focuses on using strategic foresight to address uncertainty and prepare organizations for emerging challenges. In contrast, Carnochan et al. (2017) reveal a growing focus on evidence-informed practice in human service organizations, integrating research, practical wisdom, and service user perspectives. These opposing perspectives illustrate the diversity of challenges and approaches within the field of evidence-based decision making.

On the other hand, according to researchers Robertson and Loreti (2018) indicate that current trends focus on data integration and analysis to inform strategic and operational decisions. Sophistication in data collection and analysis is geared toward more informed, evidence-based decision making. In contrast, Walsh et al. (2019) highlight that evidence is often not considered in decisional processes, primarily due to barriers such as resource and organizational capacity constraints. Sutherland et al. (2004) stress the importance of allocating efforts effectively, focusing on areas where the application of evidence is most effective. This dichotomy underscores the need to overcome organizational barriers to ensure the effectiveness of evidence-based decision making.

As for the specific contributions of Ausden et al. (2020), they propose a pragmatic approach, identifying priority decisions for the use of evidence and facilitating a more realistic and effective transition to evidence-based practices. However, according to Sutherland et al. (2021), the study highlights the growing recognition of the importance of integrating scientific evidence into conservation practices. However, it faces barriers such as resource constraints and organizational capacity. This additional perspective underscores the complexity and specific challenges in applying evidence-based practices in particular contexts, such as conservation.

In a different perspective, according to the analysis made by Nisar et al. (2021) they highlight a shift towards the use

of Big Data to improve the quality of decisions in organizations. Organizational culture and technology for Big Data are positively related to data-driven decision making capabilities. This focus on big data represents an evolution in organizational analytical capabilities, where decision making increasingly relies on the collection and analysis of large-scale data. Similarly, Lazarus et al. (2023) emphasize the integration of strategic practices and continuous improvement supported by evidence. This systematic and evidence-based approach highlights the importance of data collection and stakeholder feedback for efficient and effective organizational decisions. This focus on evidence-supported continuous improvement emphasizes the importance of informed, results-oriented decision making.

Finally, the study by Criado-Perez et al. (2023) highlights an increased appreciation for the collection and critical application of information from diverse sources. Despite technological advances, questions remain about the factors that facilitate or limit the accuracy and effectiveness of evidence-based decision making in management. This emphasis on the diversity of information sources underscores the need for constant critical evaluation of data for robust and accurate decision making.

In contrast to the evidence analysis, the research reviewed reveals diverse perspectives on trends in complex thinking-based decision making within ventures and organizations. Burnes' (2005) detailed research advocates a continuous

approach to change based on self-organization, where democratization of organizational power becomes a key objective. The proposal of decentralization and flexible adaptation in decision making reflects the essence of Complex Thinking, where the organization is recognized as a dynamic and interconnected system. Likewise, in the analysis carried out by Espinosa et al. (2007) they highlight the importance of inter-organizational collaboration and effective knowledge management. Their perspective, focused on more democratic forms of governance, is aligned with the philosophy of complex thinking, which seeks to understand the organization as a complex and interdependent system.

However, according to the research conducted by Richardson (2008, 2010), he considers that the perspective of dealing with uncertainty in organizational systems. His reflective and pluralistic approach, which accepts the possibility of errors and the need for continuous change, highlights the systemic nature of complex thinking, which challenges traditional practices by considering the organization as a complex and interrelated entity.

Conversely, according to the analyses detailed by Rivas (2013) and Bohórquez and Espinosa (2015) converge in highlighting the importance of understanding reality as multidimensional and recognizing the non-linear nature of complex systems. Their perspective addresses complexity and uncertainty, underpinning the need to make

organizations more resilient and able to adapt, in line with the principles of complex thinking.

Consequently, studies by Copelli et al. (2016) and Daryani and Amini (2016) agree on the adoption of a paradigm that values integrality and multidisciplinary in decision making. These approaches seek to improve the adaptability, flexibility and responsiveness of organizations, reflecting the essence of Complex Thinking by considering several variables and their interconnection.

Instead, according to the contributions of San Cristóbal et al. (2018) they highlight the management of complexity and uncertainty in modern projects as a key component in decision making. Their adaptation to structural and dynamic complexity reflects the essence of Complex Thinking, which recognizes the unpredictable nature of the business environment and promotes flexibility and adaptability.

Finally, according to the results of the research carried out by Ángeles-Tovar and Cadena-López (2021), they propose a transdisciplinary vision, contributing to the complete understanding of individuals in organizations. Their approach challenges conventional conceptions, proposing an alternative thinking aligned with strategic foresight and Complex Thinking, comprehensively addressing organizational reality in times of uncertainty. In summary, these approaches converge in the importance of adopting Complex Thinking in organizational decision making,

promoting adaptability, reflection and consideration of the complexity inherent to systems.

Overall, the current landscape of evidence-based decision making shows a diversity of approaches, from the integration of multidisciplinary analytical tools to the use of Big Data. Effective adoption of evidence-based practices requires consideration of diverse aspects, from training and collaboration to overcoming organizational barriers. The key lies in understanding and addressing the complexity inherent in decision making in contemporary organizational contexts; likewise, this reviewed research underscores the need to address complexity and uncertainty in organizations through approaches that promote adaptability, reflection, and consideration of interconnectedness. Adopting Complex Thinking emerges as a key response to face the dynamic and multifaceted challenges of today's business environment, promoting resilience and the ability to anticipate and adapt to changing situations.

Relationship between entrepreneurship and new global trends

In the field of entrepreneurship, global trends also point toward the use of complex thinking and evidence-based analysis to drive success; thus, complex thinking emerges as an invaluable tool for entrepreneurs, enabling them to understand and address the intricate challenges and opportunities that arise in the business environment. Adopting a complex thinking perspective allows

entrepreneurs to consider diverse variables, interactions and possible consequences when making strategic decisions. Likewise, with respect to evidence-based analysis, strategic foresight stands out as a crucial element in the context of entrepreneurship. This involves the collection and evaluation of relevant and reliable information to support informed and strategic decision making; that is, by merging complex thinking with evidence analysis, entrepreneurs can make more informed decisions by exploring various scenarios and possibilities.

In the field of business models, mainly in entrepreneurship, the importance of informal relationship networks highlights their transcendence for strategic decision making, strengthening adaptability and favoring decisions aligned with organizational complexity (Boland & Tenkasi, 1995). Although evidence-based management is recognized as promising, resistance rooted in beliefs persists, underscoring the need for continuing education and overcoming obstacles to closing the gap between research and practice (Pfeffer & Sutton, 2006). The integration of informal relationship networks and the perspective of Rivas (2013) highlights the importance of addressing resistances and promoting a transition to more informed practices in the entrepreneurial arena, directly influencing the ability of entrepreneurs to make effective strategic decisions. Ultimately, this approach not only impacts strategic decisions, but also shapes the ability of entrepreneurs to address business challenges within ventures. Overcoming obstacles and fostering a culture of informed decisions are

key to strengthening entrepreneurial adaptability and success; furthermore, the analysis highlights the need to integrate informal relationships with evidence-based management for more effective and resilient decisions in the entrepreneurial environment of ventures.

However, the duality of evidence-based management is revealed in its promising potential to improve decision making, countered by barriers such as time pressures and resistance to losing autonomy (Sohrabi & Zarghi, 2015). Overcoming these barriers becomes an essential element to fully reap the benefits of evidence-based management. Despite the recognition of the importance of academic research, many managers rely on their personal experience, formal knowledge and intuition, facing barriers such as lack of time and the perceived complexity of scientific research (Barends et al., 2017). To conclude, overcoming barriers to adopting evidence-based practices, supported by Sohrabi and Zarghi's perspective, highlights the need to foster a corporate culture that values informed decision making, directly influencing organizational performance and effectiveness in the entrepreneurial context.

In parallel, considering the position of Camuffo et al. (2019) highlight that entrepreneurs, by adopting a decision-making approach based on evidence analysis, employ tools such as computer-aided design (CAD) and parametric software in architectural design. This approach not only provides a solid foundation for adaptation in changing

business model environments, but also contributes to the formulation of effective strategies; thus, the systematic application of this evidence analysis enables entrepreneurs to successfully navigate a dynamic and challenging business world.

Improving the reliability and relevance of evidence in decision making becomes imperative, highlighting the need to address conflicts of interest and promote transparent reporting (Rousseau, 2018; Criado-Perez et al., 2020). Furthermore, the adoption of an evidence-based approach to organizational change management, supported by scientific practices and diverse data, is presented as crucial for business success (Rousseau and Ten Have, 2022). The trend towards Evidence-Based Management (EBM) and Evidence-Based Decision Making (EBDM) highlights the importance of reducing biases and irrational thinking in decisions, directly contributing to improved organizational performance (Ray, 2022). Ultimately, the integration of evidence-based practices, supported by the perspectives of Rousseau and Criado-Perez, directly strengthens the resilience and adaptability of ventures in dynamic environments, directly influencing the ability of entrepreneurs to make informed strategic decisions.

With respect to complex thinking, it emerges as a key tool to address the uncertainty and complexity inherent to the business environment (Rivas, 2013; Horkheimer, 2002). This approach allows entrepreneurs to consider multiple

dimensions and the interconnectedness of factors when making strategic decisions, enabling them to face changing challenges and build solid strategies (Cruz-Sandoval et al., 2023). In addition, it encourages the questioning of traditional assumptions, promoting innovation and the creation of sustainable business models (Daryani and Amini, 2016; Gambardella et al., 2017). Ultimately, by adopting Complex Thinking, entrepreneurs are better equipped to face changing challenges and build sound strategies that sustain business growth.

Likewise, to incorporate Complex Thinking into business models, entrepreneurs develop flexible strategies capable of adapting to rapid and often unexpected changes in the market. This involves a holistic approach that takes into account a wide range of factors, such as economic, social, technological and environmental variables, and how these interact with each other (Horkheimer, 2002; Mintrom, 2016). Consequently, the adoption of flexible strategies based on Complex Thinking not only enables adaptation to dynamic environments, but also promotes a holistic view that encompasses all relevant dimensions of the business. The open and flexible mindset promoted by complex thinking becomes a catalyst for creativity and adaptability, fundamental for continued success in a dynamic business world.

Moreover, complex thinking positively impacts entrepreneurship by providing a comprehensive framework to address the heterogeneity and uncertainty of

today's business environment (Parada-Camargo et al., 2022). It facilitates interdisciplinary knowledge creation, enhances understanding and solution of entrepreneurial challenges, and cultivates an entrepreneurial mindset from an early age. This multidisciplinary and interdisciplinary educational approach is essential to develop a strong entrepreneurial culture, capable of transforming economies and generating employment in innovative markets.

In contrast, complex thinking significantly impacts entrepreneurship by providing a framework for addressing uncertainty and interconnectedness in modern business environments (Baena-Rojas et al., 2022). It empowers entrepreneurs and organizations to recognize and manage the complexity of economic and social systems, contributing to prosperity, wealth and economic growth in societies. By adopting theoretical models with multiple variables and logical relationships, entrepreneurs can better represent the functioning of economic processes, considering the constant uncertainty in human behavior and the interrelation with scientific and technological progress.

Instead, complex thinking influences how entrepreneurs approach decision making, highlighting the need for a more complete integration of its subcompetencies in business management (Pacheco-Velázquez et al., 2023). It goes beyond the critical thinking commonly associated with business decision making, highlighting the

importance of incorporating all the subcompetencies of complex thinking into business practice.

In the field of social entrepreneurship, complex thinking supports the practical capacity to address new projects and discover market opportunities with a focus on sustainable social development (Ibarra-Vazquez et al., 2023). It facilitates creativity, problem identification and solution, as well as informed decision making. This approach crucially influences the ability of entrepreneurs to holistically, creatively and collaboratively address complex social problems, key aspects for the success and sustainability of social ventures.

Likewise, complex thinking has a significant impact on entrepreneurship, especially in the field of social entrepreneurship (Vázquez-Parra et al., 2023). The competence of complex thinking is defined as the ability to perform multidimensional analysis and reasoning, allowing the recognition of constantly changing contextual challenges. In the professional field, this competence enables the approach to problems in an interconnected and systemic manner. Results of educational interventions indicate a positive correlation between the perception of achievement in social entrepreneurship competence and complex thinking. Ultimately, complex thinking impacts entrepreneurship by enabling entrepreneurs to address problems in a systemic and multidimensional manner, crucial for success and sustainability in dynamic and challenging environments.

Proposed solution to address the challenges of entrepreneurship through complex thinking.

From the authors' perspective, the key to addressing the challenges in entrepreneurship is to adopt a holistic and multidimensional approach, highlighting the essential role of complex thinking and evidence-based decision making. This approach provides leaders and entrepreneurs with the necessary tools to deal with the uncertainty and complexity inherent in today's business environments. Complex thinking enables a comprehensive understanding by considering diverse perspectives and connections between elements, identifying crucial interdependencies. Simultaneously, evidence-based analysis involves the evaluation of relevant data, such as market trends and consumer behavior, supporting informed and informed decisions. By integrating these disciplines, entrepreneurs can strengthen their understanding of the business environment, anticipate obstacles and make strategic decisions based on solid data to ensure the long-term success of their projects.

To begin with, evidence-based analysis according to Pfeffer and Sutton (2006) is presented as a comprehensive solution to improve business decision making, advocating basing choices on recent and proven data, similar to the revolution in evidence-based medicine. This approach seeks to overcome organizational inertia and increase decisional effectiveness. Furthermore, considering the contributions of Sohrabi and Zarghi (2015), evidence analysis stands as a crucial tool to raise the quality of

managerial and organizational decisions, by providing reliable and valid information. Ultimately, its systematic application drives informed decision making and leads to more effective solutions at the local level.

On the other hand, reflecting on Barends et al. (2017), it is highlighted that evidence analysis is presented as an effective solution to overcome the challenge of making decisions based on unverified or subjective information in business management; therefore, it facilitates decision-making supported by data and scientific findings, counteracting the exclusive reliance on personal experience.

In contrast, as detailed by Rousseau (2018) points out that evidence analysis constitutes an effective solution to mitigate biased and subjective decision making in organizations. The incorporation of scientific evidence, organizational data and stakeholder perspectives confers a more objective character to decisions, reducing the influence of personal values and, therefore, increasing the chances of success and acceptance.

On the other hand, the research by Criado-Perez et al. (2020) states that evidence analysis addresses the challenge of navigating the overwhelming amount of available information by providing a structured approach to discern between weak and strong evidence. This structured approach empowers managers and ventures to

focus on leveraging the strongest evidence, gaining competitive advantages in the business environment.

Also, taking into account the findings of Rousseau and Ten Have (2022), they argue that evidence-based analysis supports more effective business decision making by effectively identifying and solving real problems. Their evidence-based approach, which includes evaluating various problem definitions, consulting with experts and gathering key inputs, increases the likelihood of success.

Similarly, according to the results of the research conducted by Ray, (2022), he mentions that evidence analysis is positioned as a key solution to counteract decision making influenced by bias, intuition or unreliable personal experiences. By supporting decisions with scientific data and evidence, this approach reduces errors in judgment, improves organizational effectiveness and performance.

Likewise, Baena-Rojas et al. (2022) propose strategies for the management of complex thinking, suggesting that entrepreneurs adopt a holistic and multidimensional approach when considering economic and social systems. One of the key strategies is the promotion of multidisciplinary knowledge generation and educational innovation as key means to foster entrepreneurial adaptability and sustainability, thus incorporating complex thinking in decision making.

On the other hand, Pacheco-Velázquez et al. (2023) emphasize that strategies linked to complex thinking in entrepreneurship encompass the development of skills to understand uncertain situations and recognize complex patterns. These researchers support the adoption of competencies such as complex, innovative, creative, systemic and scientific thinking, considered fundamental for problem solving in the dynamic business context. In this sense, complex thinking is integrated as an essential component to address the challenges inherent in venture management.

In turn, Vázquez-Parra et al. (2023) suggest strategies that enable entrepreneurs to address problems in an interconnected manner and consider the complexity of business environments. This implies the development of skills to contemplate and address problems in a systemic way, recognizing the dynamics between different aspects and actors, highlighting the importance of complex thinking in these practices.

In contrast, Ibarra-Vazquez et al. (2023) propose specific strategies for social entrepreneurship, focused on cultivating competencies associated with complex thinking. This includes fostering critical, systemic, scientific and innovative skills, essential to address challenging situations and contribute to sustainable social development, thus integrating complex thinking as a fundamental part of these skills.

Finally, Parada-Camargo et al. (2023) emphasize strategies to address heterogeneity and uncertainty in entrepreneurship, proposing the adoption of an interdisciplinary approach to provide solutions. In addition, they suggest that complex thinking contributes to the formation of an entrepreneurial and resilient mindset, essential to face the changing challenges of the business environment, highlighting the relevance of complex thinking in the development of these competencies.

Conclusions

The present research significantly highlights the growing importance of complex thinking and evidence-based decision making in the field of entrepreneurship. It highlights how these approaches not only enable entrepreneurs and organizations to successfully navigate the uncertainty and complexity of modern business environments, but also act as catalysts to drive progress and innovation.

In this context, it is confirmed that entrepreneurship plays a vital role in economic and social development. Over the last decades, significant growth has been observed, highlighting the capacity for innovation and the creation of new entrepreneurial initiatives as fundamental elements in the construction of prosperous societies.

Similarly, a crucial aspect that emerges from this research is the need to make strategic decisions supported by evidence-based analysis. Current trends emphasize the use

of multidisciplinary approaches and emerging technologies, where the integration of Big Data emerges as an essential component to raise the quality of organizational decisions, thus improving the effectiveness and efficiency of operations.

Moreover, the relationship between entrepreneurship and new global trends highlights the importance of complex thinking in strategic decision making. In a world characterized by uncertainty and high interconnectedness, the need to adopt transdisciplinary approaches, as well as to foster flexibility and adaptability, is underlined.

However, despite widespread recognition of the importance of making evidence-based decisions and applying complex thinking, entrepreneurs face significant challenges. These include resistance to change and lack of access to relevant information. Overcoming these obstacles proves to be a priority to ensure the sustainable success of ventures.

However, the analysis reveals that complex thinking is essential for understanding and managing uncertainty and complexity in modern business environments. Its adoption is positioned as a crucial factor in fostering creativity and adaptability, key elements for success and sustainability in dynamic and challenging environments.

Similarly, from the perspective of social entrepreneurship, it should be noted that complex thinking enables complex social problems to be addressed in a holistic and

collaborative manner. This capacity becomes a crucial element for the success of social enterprises, allowing for a positive and sustainable impact on society.

In turn, evidence-based analysis is identified as an effective tool to overcome organizational inertia and improve decision making in organizations. This approach not only enhances the effectiveness of decision making, but also boosts the adaptability and responsiveness of organizations to the changing challenges of the business environment.

References

- Abd, N., & Sarminash, S. (2016). Innovation and Competitive Advantage: Moderating Effects of Firm Age in Foods Manufacturing SMES in Malaysia. *Procedia Economics and Finance*, 35(1), 256-266. [https://doi.org/10.1016/s2212-5671\(16\)00032-0](https://doi.org/10.1016/s2212-5671(16)00032-0).
- Adomako, S., Danso, A., Boso, N., & Narteh, B. (2018). Entrepreneurial alertness and new venture performance: Facilitating roles of network capability. *International Small Business Journal*, 36(5), 453-472. <https://doi.org/10.1177/0266242617747667>
- Ángeles-Tovar, L., & Cadena-López, A. (2021). The importance of complex thinking and transdisciplinarity for the study of organizations. *Administracion Y Organizaciones*, 24(46), 10-29. <https://orcid.org/0000-0001-6387-5873>
- Ausden, M., & Walsh, J. C. (2020). The use of evidence in decision-making by practitioners. In W. J. Sutherland, P. N. M. Brotherton, Z. G. Davies, N. Ockendon, N. Pettorelli, & J. A. Vickery (Eds.), *Conservation Research, Policy and Practice* (pp. 145-

- 161). chapter, Cambridge: Cambridge University Press. <https://doi.org/10.1017/9781108638210.009>
- Baena-Rojas, J. J., Ramírez-Montoya, M. S., Mazo-Cuervo, D. M., & López-Caudana, E. O. (2022). Traits of Complex Thinking: A Bibliometric Review of a Disruptive Construct in Education. *Journal of Intelligence*, 10(3), 37. <https://doi.org/10.3390/jintelligence10030037>.
- Barends, E., Villanueva, J., Rousseau, D., Briner, R., Jepsen, D. M., Houghton, E., Ten Have, S. (2017). Managerial attitudes and perceived barriers regarding evidence-based practice: An international survey. *PLoS One*, 12(10), e0184594. <https://doi.org/10.1371/journal.pone.0184594>.
- Burnes, B. (2005). Complexity theories and organizational change. *International Journal of Management Reviews*, 7(2), 73-90. <https://doi.org/10.1111/j.1468-2370.2005.00107.x>
- Bohórquez, L. & Espinosa, A. (2015). Theoretical approaches to managing complexity in organizations: A comparative analysis. Theoretical approaches to managing complexity in organizations: a comparative analysis. Abordagens teóricas da gestão da complexidade nas organizações: uma análise comparativa. *Estudios Gerenciales*, 31(134), 20-29. <https://doi.org/10.1016/j.estger.2014.10.001>
- Boland, R., & Tenkasi, R. V. (1995). Perspective Making and Perspective Taking in Communities of Knowing. *Organization Science*, 6(4), 350-372. <http://www.jstor.org/stable/2634993>
- Camuffo, A., Cordova, A., Gambardella, A. & Spina, C. (2019). A Scientific Approach to Entrepreneurial Decision Making: Evidence from a Randomized

- Control Trial. *Management Science*. 66(2).
<https://doi.org/10.1287/mnsc.2018.3249>
- Carnochan, S., McBeath, B., & Austin, M. (2017). Managerial and Frontline Perspectives on the Process of Evidence-Informed Practice Within Human Service Organizations. *Human Services Organizations Management Leadership & Governance*, 41(4).
<https://doi.org/10.1080/23303131.2017.1279095>.
- Champagne, F., Lemieux-Charles, L., Duranceau, M., MacKean, G. & Reay, T. (2014). Organizational impact of evidence-informed decision making training initiatives: a case study comparison of two approaches. *Implementation Science*, 9, 53.
<https://doi.org/10.1186/1748-5908-9-53>
- Copelli, F., Oliveira, R., Oliveira, C., Meirelles, B., Mello, A., & Magalhães, A. (2016). O pensamento complexo e suas repercussões na gestão em enfermagem e saúde. *Aquichan*, 16(4), 501-512.
<https://doi.org/10.5294/aqui.2016.16.4.8>.
- Criado-Perez, C., Collins, C., & Jackson, C. (2020). Enablers of evidence-based management: Clues from the absorptive capacity literature. *Australian Journal of Management*, 45(3), 468-487.
<https://doi.org/10.1177/0312896220919784>
- Criado-Perez, C., Jackson, C., Minbashian, A. & Collins, C. (2023). Cognitive Reflection and Decision-Making Accuracy: Examining Their Relation and Boundary Conditions in the Context of Evidence-based Management. *Journal of Business and Psychology*.
<https://doi.org/10.1007/s10869-023-09883-x>
- Cross, R., Borgatti, S. P., & Parker, A. (2002). Making invisible work visible: Using social network analysis to support strategic collaboration. *California*

- Management Review*, 44(2), 25-46.
<https://doi.org/10.2307/41166121>.
- Cruz-Sandoval, M., Vázquez-Parra, J., Salinas-Navarro, D., & Carlos-Arroyo, M. (2023). Business decision-making and complex thinking: A bibliometric study. *Administrative Sciences*, 13(3), 1-17.
<https://doi.org/10.3390/admsci13030080>
- Daryani, S. & Amini, A. (2016). Management and Organizational Complexity. *Procedia - Social and Behavioral Sciences*, 230, 359-366.
<https://doi.org/10.1016/j.sbspro.2016.09.045>
- Desclee, D., Sohinto, D. & Padonou, F. (2021). Sustainability Assessment and Agricultural Supply Chains Evidence-Based Multidimensional Analyses as Tools for Strategic Decision - Making - The Case of the Pineapple Supply Chain in Benin. *Sustainability*, 13(4), 2060.
<https://doi.org/10.3390/su13042060>.
- Duarte, T., & Ruiz, M. (2009). Entrepreneurship an option for development. *Scientia Et Technica*, 15 (43), 326-331. <https://bit.ly/37MFtJD>
- Durán, E. & Arias, D. (2015). Entrepreneurial intention in university students: integration of cognitive and socio-personal factors. *Revista Colombiana de Ciencias Sociales*, 6(2), 320-340.
<https://doi.org/10.21501/22161201.1528>
- Drucker, P. (1985). Innovation and Entrepreneurship Practice and Principals. *The Practice of Innovation*. New York: Harper & Row. <https://bit.ly/2KMuLcQ>.
- Elia, G., Margherita, A. & Passiante, G. (2020). Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process. *Technology*

- Foresight and Social Change*, 150, 119791.
<https://doi.org/10.1016/j.techfore.2019.119791>
- Espinosa, A., Harnden, R. and Walker, J. (2007), Beyond hierarchy: a complexity management perspective, *Kybernetes*, 36 (3/4), 333-347.
<https://doi.org/10.1108/03684920710746995>
- Estrada, R., García, D., & Sánchez, V. (2009). Determinants of Competitive Success in SMEs: An Empirical Study in Mexico. *Revista Venezolana De Gerencia*, 14(46), 169-182.
<https://doi.org/10.37960/revista.v14i46.10528>
- Gambardella, A., Camuffo, A., & Cordova, A. (2017). *A Scientific Approach to Entrepreneurial Decision-Making: Evidence from a Randomized Control Trial* (CEPR Discussion Paper No. 12421). CEPR Press.
<https://cepr.org/publications/dp12421>
- Gutiérrez, J., Asprilla, E., & Gutiérrez, J. (2014). Entrepreneurship and research on the scale of professional training and business innovation in Colombia. *Revista Escuela de Administración de Negocios*, (76), 144-157.
<https://doi.org/10.21158/01208160.n76.2014.802>
- Horkheimer, M. (2002). *Critical Theory: Selected Essays*. New York: Continuum.
<https://blogs.law.columbia.edu/critique1313/files/2019/09/Horkheimer-Traditional-and-Critical-Theory-2.pdf>
- Ibarra-Vazquez, G., Ramírez-Montoya, M., & Miranda, J. (2023). Data Analysis in Factors of Social Entrepreneurship Tools in Complex Thinking: An exploratory study. *Thinking Skills and Creativity*, 49, 101381. <https://doi.org/10.1016/j.tsc.2023.101381>.
- Jaiswal, M. & Zane, L. (2022). National Culture and Attitudes' Impact on Diffusion of Sustainable New

- Technology-based Products, *New England Journal of Entrepreneurship*, 25(1). DOI: 10.1108/NEJE-09-2021-0059.
- Jones, P., Ratten, V. & Hayduk, T. (2020). Sport, fitness, and lifestyle entrepreneurship. *International Entrepreneurship and Management Journal*, 16, 783-793. <https://doi.org/10.1007/s11365-020-00666-x>
- Jones, R. & Salimath, M. (2022). Architectural Dimensions of Socially Driven Venture Capital Firms: Social Innovation in the Capital Markets, *New England Journal of Entrepreneurship*: 25(1). DOI: 10.1108/NEJE-07-2020-0027.
- Lapaige V. (2009). Evidence-based decision-making within the context of globalization: A "Why-What-How" for leaders and managers of health care organizations. *Risk management and healthcare policy*, 2, 35-46. <https://doi.org/10.2147/RMHP.S4845>
- Lazarus, M., Bush, R. & McNeil, S. (2023). Examining the Intersection of Strategic Thinking and Continuous Process Improvement Through the Lens of Military Medical Education to Build a Novel Model. *United States Air Force School of Aerospace Medicine*. <http://dx.doi.org/10.2139/ssrn.4561072>
- Leyva, A., Alcántara, J., Espejel, J. & Coronado, M. (2019). Formation of the entrepreneurial profile in higher education at the University of Sonora, Mexico. *Revista Escuela de Administración de Negocios*, 86, 115-132. <https://doi.org/10.21158/01208160.n86.2019.2293>
- Li, J., Demirkan, I., Lee, Y. and Cortes, A.F. (2022), "Guest editorial New trends in entrepreneurship: a global context", *New England Journal of Entrepreneurship*,

- Vol. 25 No. 1, pp. 2-4.
<https://doi.org/10.1108/NEJE-07-2022-064>
- Liedtka, J. (1998). Strategic thinking: Can it be taught? *Long Range Planning*, 31(1), 120-129.
[https://doi.org/10.1016/S0024-6301\(97\)00098-8](https://doi.org/10.1016/S0024-6301(97)00098-8).
- Meek, W., Pacheco, D. & York, J. (2010). The impact of social norms on entrepreneurial action: Evidence from the context of environmental entrepreneurship. *Journal of Business Venturing*, 25(5), 493-509.
<https://doi.org/10.1016/j.jbusvent.2009.09.007>
- Meelen, T., & Schwanen, T. (2013). Organizations as users in sustainability transitions: Embedding Vehicle-to-Grid technology in the United Kingdom. *Energy Research & Social Science*, 106, 103303.
<https://doi.org/10.1016/j.erss.2023.103303>.
- Mintrom, M. (2016). Herbert A. Simon, Administrative Behavior: A Study of Decision-Making Processes in Administrative Organization. In M. Lodge, E. C. Page, & S. J. Balla (Eds.), *The Oxford Handbook of Classics in Public Policy and Administration*. Oxford Handbooks.
<https://doi.org/10.1093/oxfordhb/9780199646135.013.22>
- Nambisan, S. (2017). Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship. *Entrepreneurship Theory and Practice*, 41(6), 1029-1055. <https://doi.org/10.1111/etap.12254>
- Nisar, Q., Nasir, N., Jamshed, S., Naz, S., Ali, M. & Ali, S. (2021). Big data management and environmental performance: role of big data decision-making capabilities and decision-making quality. *Journal of Enterprise Information Management*, 34(4), 1061-1096. <https://doi.org/10.1108/JEIM-04-2020-0137>

- World Intellectual Property Organization (2019). *Global Innovation Index: Creating Healthy Lives-The Future*. <https://bit.ly/3mJnCaH>.
- Orrego, C. (2010). Phenomenology and entrepreneurship. *Revista Científica Pensamiento Y Gestión*, 83,27. <http://www.redalyc.org/articulo.oa?id=64612782008>
- Pacheco-Velázquez, E., Vázquez-Parra, J., Cruz-Sandoval, M., Salinas-Navarro, D., & Carlos-Arroyo, M. (2023). Business Decision-Making and Complex Thinking: A Bibliometric Study. *Administrative Sciences*, 13(3), 80. <https://doi.org/10.3390/admsci13030080>.
- Parada-Camargo, J., Aguillón-Nocua, M., & Zambrano-Vargas, S. (2023). Entrepreneurship and education: an approach from complex thinking. *Revista Venezolana De Gerencia*, 28(9), 757-776. <https://doi.org/10.52080/rvgluz.28.e9.47>
- Phan, P., Wright, M., Ucbasaran, D. & Tan, W. (2009). Corporate entrepreneurship: Current research and future directions. *Journal of Business Venturing*, 24(3), 197-205. <https://doi.org/10.1016/j.jbusvent.2009.01.007>
- Pfeffer, J., & Sutton, R. (2006). Evidence-based management. *Harvard Business Review*, 84(1), 62-74, 133. PMID: 16447370.
- Pintér, L., Hardi, P. Martinuzzi, A & Hall, J. (2012). Bellagio STAMP: Principles for sustainability assessment and measurement. *Ecological Indicators*, 17, 20-28. <https://doi.org/10.1016/j.ecolind.2011.07.001>.
- Pope, J. & Grace, W. (2006) Sustainability assessment in context: Issues of process, policy and governance. *Journal of Environmental Assessment Policy and Management*. 8(3), 373-398. <https://doi.org/10.1142/S1464333206002566>

- Ratten, V. (2023). Entrepreneurship: Definitions, opportunities, challenges, and future directions. *Global Business and Organizational Excellence*, 42(5), 79-90. <https://doi.org/10.1002/joe.22217>.
- Ray, P. (2022). The Importance of Evidence-Based Decision Making in a Business Organization: A Study Based on Evidence-Based Management. *Brainwave: A Multidisciplinary Journal*, 3(2), 159-162. Brainware University. <https://www.brainwareuniversity.ac.in/brainwave/archive/pdf/Vol-3-Issue-2-June-2022/TheImportanceOfEvidenceBasedDecisionMakingInBusinessOrganization.pdf>
- Richardson, K. (2008). Managing Complex Organizations: Complexity Thinking and the Science and Art of Management. *Emergence: Complexity and Organization*, 10, 13. <https://doi.org/10.emerg/10.17357.c27fa1fd443ab603eea744131b6b79f6>
- Richardson, K. (2010). Exploring the Implications of Complexity Thinking for the Management of Complex Organizations. In S. Wallis (Ed.), *Cybernetics and Systems Theory in Management: Tools, Views, and Advancements* (pp. 36-51). IGI Global. <https://doi.org/10.4018/978-1-61520-668-1.ch003>
- Rivas, L. (2013). Exploration on strategic decisions from complex thinking. *Universidad & Empresa*, 15 (25), 107-129. <http://www.redalyc.org/articulo.oa?id=187229746007>
- Robertson, N. & Loreti, M. (2018). From the back room to the front room: Combining clinical and financial information to support evidence-based decision

- making, *International Journal of Population Data Science*, 3(4).
<https://doi.org/10.23889/ijpds.v3i4.973>
- Rousseau, E. & Ten Have, S. (2022). Evidence-based change management. *Organizational Dynamics*, 51(3), 100899.
<https://doi.org/10.1016/j.orgdyn.2022.100899>
- San Cristóbal, J., Carral, L., Diaz, E., Fraguela, J. & Iglesias, G. (2018). Complexity and Project Management: A General Overview, *Complexity*, 10, 4891286.
<https://doi.org/10.1155/2018/4891286>
- Schnarch, A. (2004). Creativity, innovation and entrepreneurship. *Recreate Magazine*, 2(7), 121-134. <http://sedici.unlp.edu.ar/handle/10915/11310>
- Shane, S. & Venkataraman, S. (2000). The promise of Entrepreneurship ofresearch. *Academy of Management Review*, 25(1), 217-226.
<https://doi.org/10.5465/amr.2000.2791611>
- Solleiro, J., & Castañón, R. (2005). Competitiveness and innovation systems: the challenges for Mexico's insertion in the global context. *Technovation*, 25(9), 1059-1070.
<https://doi.org/10.1016/j.technovation.2004.02.005>
- Sohrabi, Z., & Zarghi, N. (2015). Evidence-Based Management: An Overview. *Creative Education*, 6, 1776-1781.
<https://doi.org/10.4236/ce.2015.616180>
- Stenholm, P. & Renko, M. (2016). Passionate bricoleurs and new venture survival, *Journal of Business Venturing*, 31, 5, 9.
<https://doi.org/10.1016/j.jbusvent.2016.05.004>
- Sutherland, W., Downey, H., Frick, W., Tinsley-Marshall, P. & McPherson, T. (2021). Planning practical evidence-based decision making in conservation

- within time constraints: the Strategic Evidence Assessment Framework. *Journal for Nature Conservation*, 60, 125975. <https://doi.org/10.1016/j.jnc.2021.125975>
- Sutherland, W., Pullin, A., Dolman, P. & Knight, T. (2004). The need for evidence-based conservation. *CellPress*, 19(6), 305-308. <https://doi.org/10.1016/j.tree.2004.03.018>
- Vázquez-Parra, J. C., Carlos-Arroyo, M., & Cruz-Sandoval, M. (2023). Social Entrepreneurship and Complex Thinking: Validation of SEL4C Methodology for Scaling the Perception of Achieved Competency. *Education Sciences*, 13(2), 186. <https://doi.org/10.3390/educsci13020186>.
- Vecchiato, R. (2012). Strategic foresight: matching environmental uncertainty. *Technology analysis & strategic management*, 24(8), 783-796. <https://doi.org/10.1080/09537325.2012.715487>
- Wach, D., Stephan, U. & Gorgievski, M. (2016). More than money: Developing an integrative multi-factor integrative measure of entrepreneurial success. *International Small Business Journal*, 34(8), 1098-1121. <https://doi.org/10.1177/0266242615608469>
- Walsh, J., Dicks, L., Raymond, C. & Sutherland, W. (2019). A typology of barriers and enablers of scientific evidence use in conservation practice, *Journal of Environmental Management*, 250, 109481. <https://doi.org/10.1016/j.jenvman.2019.109481>
- Zea-Fernández, R., Benjumea-Arias, M. & Valencia-Arias, A. (2020). Methodology for the identification of dynamic capabilities for entrepreneurship in higher education institutions. *Ingeniare Journal*, 28(1), 106-119. <http://dx.doi.org/10.4067/S0718-33052020000100106>.

Zhai, Y., Yang, K., Chen, L., Lin, H., Yu, M. and Jin, R. (2023), "Digital entrepreneurship: global maps and trends of research", *Journal of Business & Industrial Marketing*, Vol. 38 No. 3, pp. 637-655. <https://doi.org/10.1108/JBIM-05-2021-0244>

Impact of the banking credit system on the financial performance of micro, small and medium-sized enterprises

Yanice Ordóñez Parra

Catholic University of Cuenca, jordonezp@ucacue.edu.ec
<https://orcid.org/0000-0002-5002-2203>

Edisson Maza Aucapiña

Catholic University of Cuenca , edisson.maza.93@est.ucacue.edu.ec
<https://orcid.org/0009-0004-8524-5417>

Geovanny Zamora Zamora

Catholic University of Cuenca , ezamoraz@ucacue.edu.ec
<https://orcid.org/0000-0003-3265-8846>

Rolando Andrade Amoroso

Catholic University of Cuenca , randradea@ucacue.edu.ec
<https://orcid.org/0000-0002-6078-3487>

Carlos Ramírez Valarezo

Catholic University of Cuenca, framirezva@ucacue.edu.ec
<https://orcid.org/0000-0002-3437-2705>

MSMEs and their participation in the labor market

Micro, small and medium-sized enterprises (MSMEs) are solidarity associations that guarantee the labor market by decentralizing labor, concentrating income and productive capacity in a larger number of companies (Saavedra and Saavedra, 2016). They are also characterized by their greater technological adaptability and lower infrastructure costs, and are usually family units that foster a closer relationship between employer and employee (Cedeño, et al., 2017). The problem addressed

by this research is related to the difficulties they face in obtaining credit, which are focused on the lack of advice or knowledge of the procedures and processes for obtaining credit; another cause is the lack of a credit history on the part of the natural person representing the business unit.

In addition, Cisneros (2023) points out that financial institutions maintain stringent qualification requirements that include substantial collateral and a solid credit history, which restricts their ability to support their operations and expansion projects. Recent studies such as González-Martín et al., (2023); Ruis et al., (2019); Cusquillo (2021) mention that the management of credit granting procedures plays a crucial role in the success of a financial institution's operations, face challenges associated with the identification, measurement and mitigation of errors in the granting of credit constitutes an essential part of this management process.

Ordóñez et al. (2020) also state that the proper functioning of the financial system is essential for the proper development of the economy, since it covers all financial activities, therefore, the effective participation of the various financial institutions is crucial to promote economic growth and improve the quality of life of society, i.e. the amount of credit offered by the Ecuadorian banking system facilitates the capitalization of small entrepreneurs allowing the opportunity to grow in the business environment of the popular and solidarity economy.

The objective of this study is to evaluate the impact of the banking credit system on the financial performance of the above mentioned sector in Cuenca and to suggest improvement strategies to support the lending process in a faster and more efficient way . A thorough review of the financial statements presented by banking institutions will be carried out, focusing on the asset element, group 14 and sub-account 1404 "Microcredit Portfolio" according to the single catalog of accounts (CUC) established by the Superintendency of Banks and based on official data provided by the Central Bank of Ecuador.

In the first instance, the structure of this research begins with the collection of information from notable authors who have researched in the proposed line, followed by a methodological process whose approach is quantitative and a descriptive statistical analysis, which seeks to examine a social reality from an external and objective perspective, for this purpose, methods and techniques that facilitate the review of general principles, laws, or widely accepted and proven theorems are used, in order to apply them to specific facts, and strengthening it through the fuzzy logic model to determine the hidden effect and improvement strategy for the benefit of those involved in the research.

The financial system and its importance in the business economy

The financial system is a set of institutions, regulations and markets that facilitate the flow of money and financial

resources within an economy. Cusquillo (2021) mentions that the financial system encompasses a set of state-authorized entities responsible for collecting, managing and investing funds from individuals and companies both locally and abroad, these entities are part of a system that offers services and facilitates a wide range of financial and commercial transactions to boost economic development.

Under homogeneous premises to those indicated Dwivedi & Tripathi, (2019); assert that, within the context of the financial system, there is a link that represents a particular facet of financial connections, the financial system as a whole is composed of various facets of these connections, here monetary funds are generated and used, which encompasses different approaches and techniques to generate, distribute and use funds from the State as well as from companies. Another contribution, indicated by Flew & Kirkwood (2021), mentions that the financial system channels savings towards financial needs, that is to say that institutions such as public and private banks maintain certain projects towards sectors of the popular and solidarity economy, granting them credits that contribute to the growth and economic dynamism of those entrepreneurs who are just starting out in the business sphere.

The solid financial performance of MSMEs not only drives economic growth, but also creates jobs, stimulates innovation and strengthens the corporate structure. As key drivers of the economy, maintaining strong financial

participation is essential to ensure their long-term sustainability (Abad and Morocho, 2023). This factor not only benefits the companies themselves, but also positively impacts society by fostering economic inclusion and improving living standards through job opportunities and local development. In this context, attention and support for the financial health of MSMEs become indispensable elements to boost Ecuador's social and economic progress (Cedeño et al., 2017; Palacios and Macias., 2020).

The evaluation of the financial performance of MSMEs is of paramount importance for banking institutions; this fundamental analysis helps determine credit risk, framing financing conditions and taking into account historical credit records (Ordóñez et al., 2022). During this process certain key indicators are evaluated; profitability measures the company's capacity to generate income through its operations, liquidity evaluates its willingness to meet short or long-term financial obligations, and indebtedness establishes the relationship between a company's debt and its equity holdings (Peñaloza et al., 2022).

It is essential that these determinants be evaluated as a whole, considering both the sector and the size of the company, which can vary significantly depending on the context, further underscoring their importance for collective evaluation. The analysis of the financial performance of MSMEs is fundamental not only to understand their role within the economy but also to

discover optimization opportunities and design support strategies that allow them to overcome obstacles to magnify their contribution to the country's economic development (Abad and Morocho., 2023; Cisneros, 2022; Ordóñez et al., 2020).

Cusquillo (2021) clarifies that bank loans are usually subject to specific conditions, such as interest rates, repayment terms, and approval requirements. Banks meticulously evaluate the creditworthiness of applicants to determine the viability of the loan and establish predetermined stipulations under which credit is granted; loans may be short, medium or long term, depending on the purpose of the loan and repayment capacity.

Abad and Morocho, (2023) argue that the process by which banks generate credit and deposits has implications for social cooperation. The most important outcome of this process is the creation by banks of unsupported credit when these lack support for voluntary savings, an action that precipitates inescapable distortionary effects on real productive structures that usually result in crises and recessions. Garcia (2018) posits that a key function of banking activity lies in acting as a financial intermediary that accumulates financial resources from individuals to provide interest-bearing loans to those who require access to credit lines.

Bank loans are loans that banks grant to individuals or companies, which allow borrowers to access money for

different purposes, such as buying a house, a car, financing studies, expanding a business or covering unexpected expenses. For Peñaloza et al., (2022) the need for credit by large companies increased, some borrowers sought to increase their cash reserves in the face of possible income reductions while others reorganized their debts from foreign to local currency debts to decrease their exposure to exchange rate risk.

Cusquillo (2021) defines bank loans as a fundamental tool in the economy as it allows individuals and companies to obtain financing to achieve goals or meet specific financial needs. The credit portfolio is the most significant item in the balance sheet of banks reflects the principal balance not yet collected, this amount is crucial as it constitutes the largest source of financial income for them, banks have the ability to support a wide range of economic activities through this portfolio (Diaz and Del Valle-Guerra, 2017).

The credit portfolio refers to loans granted by banks or financial institutions to companies, businesses or enterprises with the purpose of promoting productive activities, these credits are intended to finance the acquisition of assets, working capital, investment in machinery, infrastructure or other resources necessary to generate goods or services. Chagerben et al. (2019) state that credit provided by public entities has a limited influence on production levels, while credit from the private sector and other financial institutions has a negative relationship with production levels.

These loans are intended to cover financing needs for working capital, including the acquisition of raw materials, labor supplies and other essential resources for operational functioning, as well as investment for the purchase of machinery (Abad and Morocho, 2023; González et al., 2021).

Tacuri and Suarez (2017) argue that microcredits play a fundamental role in carrying out these tasks with the objective of streamlining the flow of money, attracting the surplus generated and promoting its rotation to expand its financing capacity, this action allows reaching the most vulnerable sectors and multiplying the impact of financing towards them. This type of credit portfolio is focused on stimulating economic activity and business growth, loans can be used to expand operations, improve productive capacity, finance investment projects or cover working capital needs (García, 2018).

Abad and Morocho (2023) state that microcredit, compared to other forms of credit in the public, private and popular and solidarity economy sectors, also examines the evolution of credit over time, followed by a detailed analysis of the Gross Domestic Product and GDP per capita, is fundamental for the development and dynamism of sectors such as industry, agriculture, commerce, services and other areas that generate goods and employment within an economy. Cisneros, (2022) mentions that bank loans become an instrument to boost the growth of productive sectors, representing a way to

finance investment in capital and expansion into new markets.

The Microcredit portfolio consists of small-scale financial loans, granted specifically to low-income individuals, entrepreneurs or microenterprises. Since these entities often have difficulty accessing traditional financial services, these loans cover modest amounts and are designed to support minor business initiatives or projects. These projects play a key role in improving the economic conditions of those living in communities with restricted access to financial resources (Ordoñez et al., 2020). Furthermore, Prados-Peña et al., (2024) rightly assert that microfinance serves as an integral component in strengthening the socioeconomic position of underserved communities. Its main objective lies in progressively rectifying the household welfare standards of those struggling with poverty.

In Ecuador in 1986, they promoted microcredit activities through a system supported by the national government, this approach had as its main objective to offer credit to individuals with lower incomes who were involved in small and microenterprises, and who did not have access to conventional loans, the main banks that facilitated these loans were the Banco Nacional de Fomento, la Previsora and Banco de Loja , which mobilized about one million dollars in the following ten years (Cedeño et al., 2017).

Microcredits are characterized by flexible repayment terms and can be used to start or strengthen small businesses, acquire tools, raw materials or machinery, or to cover basic needs that boost income generation; these loans are usually accompanied by counseling or business training to maximize their impact and ensure their proper use. For Vallejo and Ochoa, (2019) at present, microcredits have provided low-income individuals with the opportunity to improve their quality of life by accessing loans that allow them to start or improve their businesses, making it possible to provide their families with adequate education and contribute to combating poverty.

The microcredit portfolio represents a key tool for promoting entrepreneurship and economic development in areas where access to conventional credit is limited for people with more modest financial resources. The microcredit system has proven to be one of the most effective tools for eliminating extreme poverty in developing nations, by providing accessible, fast and consistent credit to sectors affected by lack of resources, allowing them to break the cycle of poverty, facilitating the creation of microenterprises that generate wealth (Inglada et al., 2015).

One of the main trends in Ecuador's financial market has been the constant attraction of deposits within the country's financial system, this practice has become a significant source of funds used to support the activities of the microfinance sector (Tacuri and Suarez, 2017). In such

virtue microcredit is defined as a loan directed to a natural or legal person with annual income not exceeding USD 100,000 or to a group of borrowers backed by a collective guarantee, this type of financing is intended to support small-scale production or marketing activities, loan repayment is mainly based on the income obtained from sales or supported activities, which are rigorously evaluated by the corresponding financial institution (Cedeño et al., 2017).

For the process of granting credit in a more agile and effective way it is crucial to propose improvement strategies as it is important and necessary because they contribute to efficiency, competitiveness, customer satisfaction and risk reduction, crucial elements for the success and sustainability of a financial institution, that is why, the authors Sinthupundaja and Chiadamrong (2015) propose to perform related improvement strategies in the financial performance of companies have been the subject of considerable interest in the financial literature, by which explores the characteristics of these companies, focusing especially on factors such as growth, size and age, in relation to the financial strategies employed to support.

Fuzzy logic as a tool for timely decision making

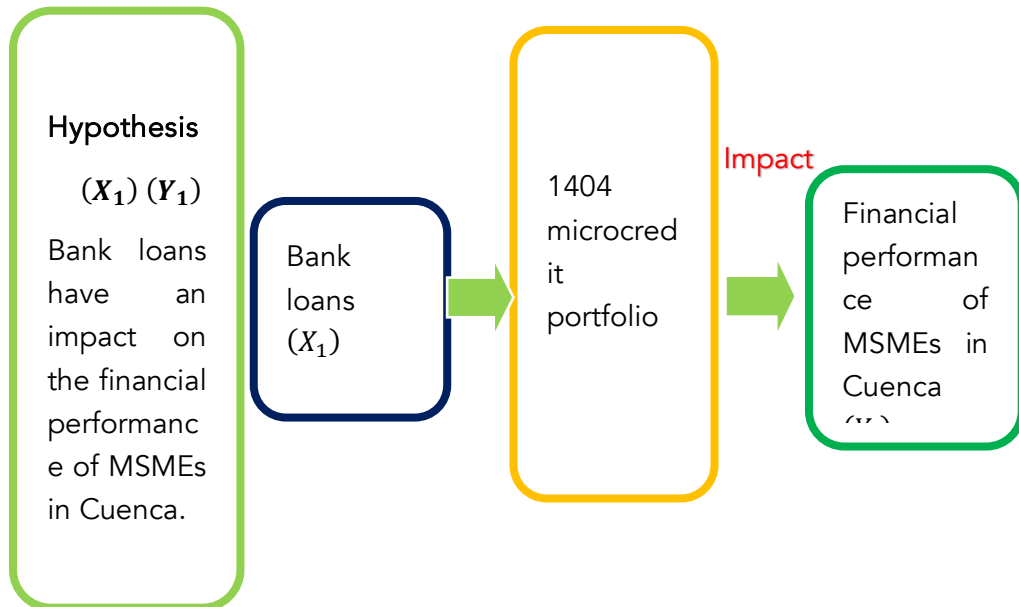
The present research facilitates the realization of a detailed critical analysis of a research stream, in order to examine the conditions that initiated it and to highlight the most significant achievements reached by the different studies carried out in this area (Tinto, 2013). Aligning to the

quantitative approach with longitudinal cut studies corresponding to the periods 2018 to 2022, on the impact of the banking credit system on the financial performance of the Mypimes, using the deductive method (Tadesse & Eesee, 2020). On the other hand, Hernandez et al., (2014) consider examining general principles, laws or theorems widely accepted and proven, for their application in the resolution of specific situations or facts, and verifying the variables through numerical measurements and statistical analysis. The technique applied is the survey, structuring and applying a questionnaire through the fuzzy logic expert model. It is a technique that starts from uncertain premises or data in order to obtain precise answers that facilitate decision making (Rodríguez-García, et al.,2022).

On the other hand, the authors Prados-Peña et al., (2024) state, that the research technique is a conventional method, supported by practice, aimed mainly, but not exclusively, at collecting and modifying valuable information to solve problems in scientific disciplines, each method involves the use of a specific device, the questionnaire is used in the survey technique.

Figure 1 below shows the hypothesis and the variables that will be analyzed in this research, in order to determine whether or not there is an impact on financial performance.

Figure 1. Hypothesis - Variables



Control variables: Loans falling due, Past-due loans, Amounts granted Terms

Prepared by: the authors

The hypothesis suggests that bank loans may or may not have a significant impact on the financial performance of MSEs, since access to these loans allows them to finance their operations, expansion plans and face adverse financial situations. It is expected that by obtaining bank loans, MSEs will be able to invest in productive assets, improve their operational capacity and take advantage of business opportunities, which in turn should be reflected in higher growth and profitability. To test this hypothesis, a detailed analysis of MSEs' financial and credit data will

be carried out, considering indicators such as revenue growth, profitability and solvency, in addition to other factors such as the economic environment and business management.

The analysis of variables was carried out using the SPSS 20 statistical program, by means of Pearson's correlation coefficient. Shubita, (2018) asserts, SPSS is a fundamental tool in the field of scientific research, supported by various specialized computer applications, it is important to note that this software stands out for its outstanding ability to manage large volumes of data and for its user interface of easy access consolidating itself, thus becoming a preferred option in statistical processing.

Once the statistical process was analyzed, the expertise of six officials of the National Bank was sought, who with their knowledge through the matrix of actions of effects gave their criteria, a questionnaire was designed using the fuzzy logic expert model, which integrates the criteria of experts within the bank.

The financial institutions subject to analysis are composed of a total of 24 entities currently in operation, which are subject to regulation by the Superintendency of Banks, as shown in Table 1.

Table 1. Private financial institutions

| Private financial institutions | Rating as of March 2023 | State |
|---------------------------------------|--------------------------------|--------------|
| Amibank | BB | Activate |
| Banco Amazonas S.A. | AA+ | Activate |
| Citibank N.A | AAA | Activate |
| Banco Bolivariano C.A. | AAA / AAA- | Activate |
| Banco Coopnacional S.A. | AA+ | Activate |
| Banco Comercial de Manabí S.A. | A | Activate |
| Banco Capital S.A. | C- | Activate |
| VisionFund Ecuador Bank | AA- | Activate |
| Bank D-Miro S.A. | A- | Activate |
| Banco Guayaquil S.A. | AAA- / AAA | Activate |
| Banco de Loja S.A. | AAA | Activate |
| Banco de Machala S.A. | AAA- / AAA- | Activate |
| Banco Produbanco S.A. | AAA / AA+ | Activate |
| Banco Diners Club del Ecuador S.A. | AAA- / AAA | Activate |
| Banco Procredit S.A. | AAA- / AAA- | Activate |
| Banco Pichincha S.A. | AAA / AAA- | Activate |
| Banco Internacional S.A. | AAA- / AAA | Activate |
| Banco General Rumiñahui S.A. | AAA- | Activate |
| Banco Desarrollo de los Pueblos S.A. | A- | Activate |
| Banco del Bank S.A. | A | Activate |
| Banco del Pacifico S.A. | AAA- | Activate |
| Banco Solidario S.A. | AAA- | Activate |
| Banco del Litoral S.A. | A | Activate |
| Banco del Austro S.A. | AA+ / AAA- | Activate |
| Total private financial institutions | | 24 |

Note: Data acquired from the Superintendency of Banks (2023).

The data collection was carried out through the official website of the Superintendency of Banks, where active financial institutions and their respective ratings are reported.

Table 2 below presents a summary of the data corresponding to the variables identified in this study, such as: 1404 microcredit portfolio and its control variables microcredits granted, due and overdue with terms of more than 360 days taken from the Superintendency of Banks, since MSMEs choose to apply credit for more than one year because their growth projects are long-term. In a transversal manner, the dynamics of sales by company size and economic sector, obtained from the platform of the National Institute of Statistics and Census for the periods 2018-2022, was considered as an economic axis in order to measure the financial performance of MSMEs for the respective correlation analysis.

Table 2. *Economic axes*

| Year | Total amount of commercial and microcredit granted | Total amount of commercial and micro loans maturing | Total amount of past due commercial and microloans | Terms granted more than 360 days | Sales dynamics of MSMEs |
|------|--|---|--|----------------------------------|-------------------------|
| 2018 | 164622368,07 | 163707054,66 | 915313,41 | 50635728,31 | 47.381 |
| 2019 | 174312381,90 | 173449871,65 | 862510,25 | 52217018,01 | 46.922 |
| 2020 | 165340701,30 | 164400086,83 | 940614,48 | 45913180,29 | 40.263 |
| 2021 | 180467944,39 | 179759244,35 | 708700,04 | 77430228,72 | 47.474 |
| 2022 | 223084016,19 | 222203969,96 | 880046,23 | 109912404,25 | 38.566 |

Note: Data taken from Superintendencia de Bancos (2023) and Instituto Nacional de Estadísticas y Censos (2023).

To evaluate the correlation, the application was carried out through SPSS software using Pearson's correlation method. This procedure exhibits the variables in a bidirectional manner, thus evidencing the relationship with the dependent variable (microcredit portfolio) and its control variables (past-due loans, past-due loans and terms granted more than 360 days).

Table 3. Pearson correlation

| | | Total amount of commercial loans and microloans granted | Total amount of commercial and microloans due for repayment | Total amount of past due commercial loans and microloans | Terms granted more than 360 days | Sales dynamics of MSMEs |
|---|---------------------|---|---|--|----------------------------------|-------------------------|
| Total amount of commercial loans and microloans granted | Pearson correlation | 1 | 1,000** | -,145 | ,964** | -,590 |
| | Sig. (bilateral) | | ,000 | ,816 | ,008 | ,295 |
| | N | 5 | 5 | 5 | 5 | 5 |
| Total amount of commercial and microloans due for repayment | Pearson correlation | 1,000** | 1 | -,148 | ,965** | -,588 |
| | Sig. (bilateral) | ,000 | | ,812 | ,008 | ,297 |
| | N | 5 | 5 | 5 | 5 | 5 |
| Total amount of past due commercial loans and microloans | Pearson correlation | -,145 | -,148 | 1 | -,346 | -,472 |
| | Sig. (bilateral) | ,816 | ,812 | | ,569 | ,423 |
| | N | 5 | 5 | 5 | 5 | 5 |
| terms granted more than 360 days | Pearson correlation | ,964** | ,965** | -,346 | 1 | -,465 |
| | Sig. (bilateral) | ,008 | ,008 | ,569 | | ,430 |
| | N | 5 | 5 | 5 | 5 | 5 |

| | | | | | | |
|--------------------------------|---------------------|-------|-------|-------|-------|---|
| Sales dynamics of MSMEs | Pearson correlation | -,590 | -,588 | -,472 | -,465 | 1 |
| | Sig. (bilateral) | ,295 | ,297 | ,423 | ,430 | |
| | N | 5 | 5 | 5 | 5 | 5 |

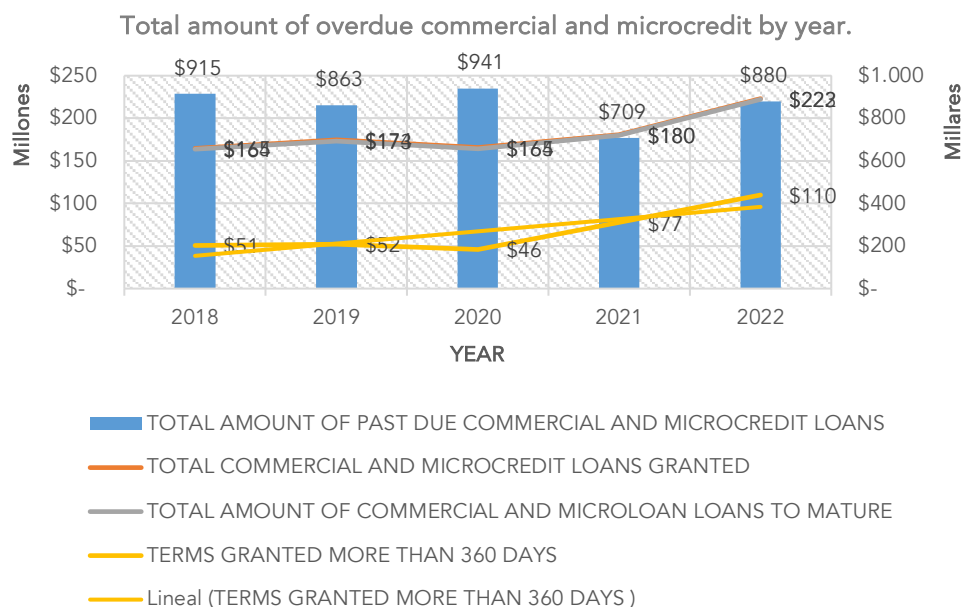
** . Correlation is significant at the 0.01 level (bilateral).

Prepared by: the authors

As shown in Table 3, Pearson's correlation analysis establishes that there is no statistically significant correlation between the sales dynamics of MSMEs and the total amount of commercial loans and microcredits granted due and overdue, as well as the terms granted over 360 days; therefore, the hypothesis put forward in the research is not accepted. However, it can be observed that the total amount of commercial and microcredit loans granted correlates positively and significantly (0.965) with the total amount of commercial and microcredit loans due and with terms granted over 360 days with a very strong positive correlation of (0.964),964) which denotes the importance of following up to have a credit portfolio that allows them to comply fully and without inconveniences with their payments and another aspect to consider is the term granted to MSMEs so that they can facilitate compliance with the payment of their installments on time and above all does not affect their cash flow with exorbitant values in their monthly payments.

Based on the results extracted using SPSS software, the following results were verified concerning the control variables and the impact on financial performance.

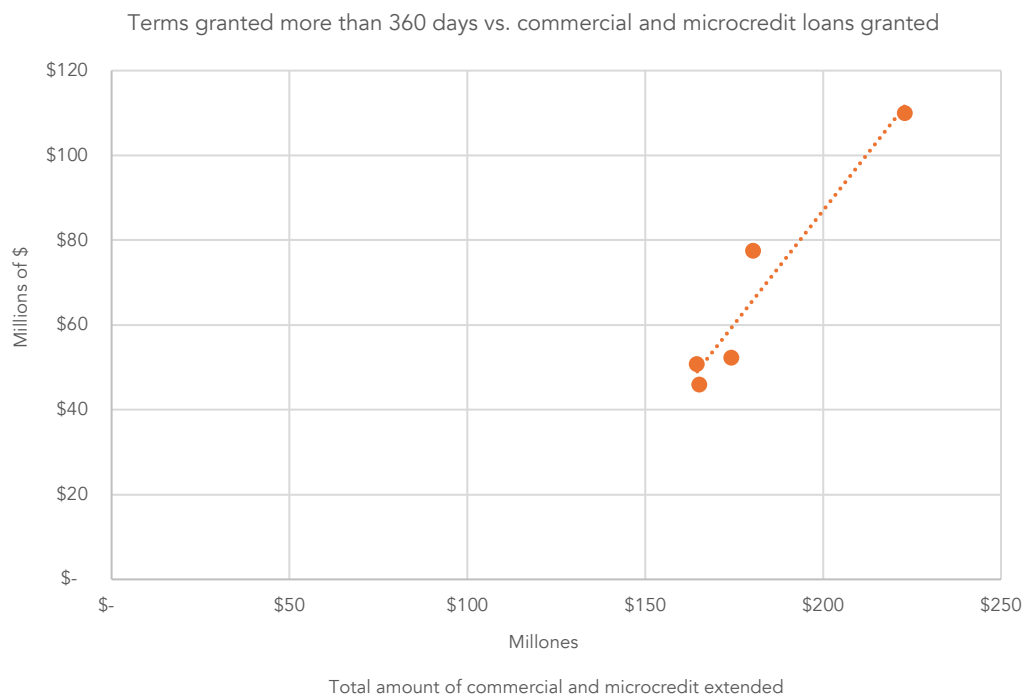
Figure 2. Variable and terms granted for more than 360 days



Note: Prepared by the authors using SPSS software.

As can be seen in Figure 2 during the period between 2018 and 2020, a stable trend is evident in overdue commercial loans and microcredits. However, for the year 2021, a notable decrease is observed, possibly influenced by the effects of the pandemic worldwide, with respect to overdue loans, in the loan portfolio, until 2020, remained within a normal range. Therefore, in 2021 there was a decrease due to the pandemic, it is important to note that by the year 2022, all past due loans, both granted and due, will again experience a significant increase.

Figure 3. Control variables: terms granted over 360 days and total amount of commercial loans and microloans granted.



Note: Prepared by the authors based on SPSS software.

Figure 3 shows that the total amount of commercial credit and microcredit granted is highly correlated in terms of terms, which means that MSMEs have no problem in covering their installments according to the terms for which their credit has been granted.

The first step for the execution of this tool was to establish the actions and effects with the purpose of evidencing the impact of the financial performance of the MSMEs,

supported by the extensive knowledge of six officials responsible for the credit area who undoubtedly provided their contingent to determine what will be the appropriate improvement strategies for future implementation. As shown in Table 4, the square matrix structure process is used to determine the forgotten effect. In the first instance, the actions and effects that are directly related to the process of credit operations in financial institutions are determined.

Table 4. *Actions and effects*

| ACTIONS | EFFECTS |
|--|---|
| Conduct a comprehensive creditworthiness assessment of MSME applicants. | Minimize the risk of non-payment and ensure that they have the financial capacity to meet their credit obligations |
| Review the credit history of MSME applicants. | Help determine past financial responsibility and forecast future credit behavior priority credit proposals. |
| Maintaining a diversified MSME loan portfolio | Promote customer confidence and ensure that they are fully informed about the terms and conditions of the MSME loan |

| | |
|---|--|
| Preferential loans for MSMEs according to term and amount. | Reducing the risk of over-reliance on a single type of loan in the economic sector |
|---|--|

| | |
|---|---|
| Establish monitoring and follow-up systems to continuously evaluate the financial health of MSMEs. | Strengthen customer loyalty and encourage new customers to come to us |
|---|---|

| | |
|--|--|
| Providing personalized service between consultant / MSMEs | Identify potential financial problems early and take corrective action to mitigate the risk of noncompliance |
|--|--|



Prepared by: the authors

The fuzzy logic approach contains a highly efficient tool. The authors Rodriguez-Garcia et al., (2022) state: It is a methodology that offers a simple and refined way to obtain a conclusion (...) an additional advantage lies in the ability to implement fuzzy logic both hardware and software or in a combination of both, according to its definition, each index is placed within an interval ranging from 0 to 1.

The endecadary scale is shown in Table 5 below.

Table 5. *Endecadary scale*

| Degree of assumption α | Incidence |
|-------------------------------|---------------------------------------|
| 0 | No impact |
| 0,1 | Minimal impact |
| 0,2 | It has little impact |
| 0,3 | It has some impact |
| 0,4 | It has an influential impact |
| 0,5 | It has an impact as well as no impact |
| 0,6 | It has a significant impact on |
| 0,7 | It has a significant impact on |
| 0,8 | It has a major impact on |
| 0,9 | It has a very high incidence |
| 1 | Maximum incidence |

Prepared by: the authors

With the information obtained, the frequency is structured, the repetitions of the degree of presumption are determined in relation to the number of experts consulted, then the frequency is normalized, this is the distribution between the data obtained in the frequency and the number of experts consulted.

Then, the accumulation of frequencies is established, starting with the last value in ascending order until the unit is obtained, from there on all values are considered as one, then the sum of this process is performed only from 0.1, which is detailed in table 6.

Table 6. *Normalization and frequency accumulation*

| Level of presumption | Frequencies | Normalized frequencies | Expert character |
|----------------------|-------------|------------------------|------------------|
| 0 | 0 | 0 | 1 |
| 0,1 | 0 | 0 | 1 |
| 0,2 | 0 | 0 | 1 |
| 0,3 | 0 | 0 | 1 |
| 0,4 | 0 | 0 | 1 |
| 0,5 | 0 | 0,000 | 1 |
| 0,6 | 1 | 0,167 | 1,000 |
| 0,7 | 2 | 0,333 | 1,00 |
| 0,8 | 2 | 0,333 | 0,833 |
| 0,9 | 1 | 0,167 | 0,500 |
| 1 | 0 | 0,000 | 0,16 |
| | 6 | 1 | 7,500 |
| Total | | | 0,750 |

Prepared by: the authors

After careful consultation with six experts from banking institutions who provided valuable insights into the correlation between the actions and effects that are connected to the microcredit portfolio, which are not obvious to the naked eye, a better understanding of the financial situation within this sector has been achieved. This also helped to identify opportunities for performance improvement. The full results are illustrated comprehensively in Table 7, where these expert opinions are shown by applying a square matrix before transferring the data into the base matrix. It is worth mentioning that such an analysis contributes significantly to reducing information-related uncertainty and facilitating better decision making.

The application of the theory of forgotten effects through fuzzy logic is beneficial to evaluate the impact that the banking system has on the financial performance of the mentioned sector located specifically in the city of Cuenca. This allows to have a superior understanding of the financial situations while identifying new ways that will lead towards a progressive gain for its better performance.

Table 7. Base matrix

| | | | | | | | |
|-------------|---------|---|---|---|--|---|--|
| Base matrix | EFFECTS | Minimize the risk of non-payment and ensure they have the financial capacity to meet their credit obligations | Help determine past financial responsibility and forecast future credit behavior priority credit proposals. | Promote customer confidence and ensure that they are fully informed about the terms and conditions of the MSME loan | Reducing the risk of over-reliance on a single type of loan in the economic sector | Strengthen customer loyalty and encourage the arrival of new ones | Identify potential financial problems early and take corrective action to mitigate the risk of noncompliance |
| ACTIONS | | A | B | C | D | E | F |

| | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|
| Conduct a comprehensive creditworthiness assessment of MSME applicants. | 1 | 0,750 | 0,783 | 0,717 | 0,733 | 0,783 | 0,800 |
|---|---|-------|-------|-------|-------|-------|-------|

| | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|
| Review the credit history of MSME applicants. | 2 | 0,767 | 0,717 | 0,800 | 0,733 | 0,733 | 0,800 |
|---|---|-------|-------|-------|-------|-------|-------|

| | | | | | | | |
|-------------------------|---|-------|-------|-------|-------|-------|-------|
| Maintaining diversified | 3 | 0,733 | 0,733 | 0,733 | 0,750 | 0,833 | 0,833 |
|-------------------------|---|-------|-------|-------|-------|-------|-------|

MSME loan portfolio

| | | | | | | | |
|--|---|-------|-------|-------|-------|-------|-------|
| <p>Preferential loans for MSMEs according to term and amount.</p> | 4 | 0,733 | 0,750 | 0,800 | 0,733 | 0,867 | 0,800 |
| <p>Establish monitoring and follow-up systems to continuously evaluate the</p> | 5 | 0,767 | 0,717 | 0,800 | 0,750 | 0,767 | 0,850 |

financial health
of MSMEs.

| | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|
| Providing personalized service between consultant / MSMEs | 6 | 0,850 | 0,867 | 0,817 | 0,800 | 0,900 | 0,833 |
|---|---|-------|-------|-------|-------|-------|-------|

Prepared by: the author

In this study, as indicated, a square matrix was constructed, where the number of rows concerning the actions is the same as the number of columns concerning the effects, for which the so-called max-min convolution process is applied, consisting of finding the largest number in a succession of smaller numbers, these are the product of comparing the rows with columns of the base matrix incidence matrix, for this reason it must be convolved between itself, in the same way, when performing this operation the "transposed" matrix is obtained, the convolution procedure between row 1 with column A, is explained below:

For 1-A:

$$(K7 \wedge K7) \vee (K8 \wedge L7) \vee (K9 \wedge M7) \vee (K10 \wedge N7) \vee (K11 \wedge O7) \vee (K12 \wedge P7)$$

$$(0,750 \wedge 0,750) \vee (0,767 \wedge 0,783) \vee (0,733 \wedge 0,717) \vee (0,733 \wedge 0,733) \vee (0,767 \wedge 0,783) \vee (0,850 \wedge 0,800)$$

From each interval, the smaller value is chosen: 0.750 \vee 0.767 \vee 0.717 \vee 0.733 \vee 0.767 \vee 0.800 \vee 0.800 \vee 0.717 \vee 0.733 \vee 0.767 \vee 0.800

Of all the smaller values chosen, the largest value is chosen, in this case (0.800), this value must be positioned at the intersection of 1 with A in matrix "I" corresponding to table 8, and so on, the same procedure is performed for the rest of the coordinates, the following table shows the results of this process.

Table 8. Matrix I

| | | | | | | | |
|----------|---------|--|---|---|--|---|--|
| Matrix I | EFFECTS | Minimize the risk of non-payment and ensure that they have the financial capacity to meet their credit obligations | Help determine past financial responsibility and forecast future credit behavior priority credit proposals. | Build customer confidence and ensure that they are fully informed about the terms and conditions of the MSME loan | Reducing the risk of over-reliance on a single type of loan in the economic sector | Strengthen customer loyalty and encourage the arrival of new ones | Identify potential financial problems early and take corrective action to mitigate the risk of noncompliance |
|----------|---------|--|---|---|--|---|--|

| | | | | | | |
|---------|---|---|---|---|---|---|
| ACTIONS | A | B | C | D | E | F |
|---------|---|---|---|---|---|---|

| | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|
| Conduct a comprehensive creditworthiness assessment of MSME applicants. | 1 | 0,750 | 0,767 | 0,733 | 0,733 | 0,767 | 0,850 |
|---|---|-------|-------|-------|-------|-------|-------|

| | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|
| Review the credit history of MSME Applicants. | 2 | 0,783 | 0,717 | 0,733 | 0,750 | 0,717 | 0,867 |
|---|---|-------|-------|-------|-------|-------|-------|

| | | | | | | | |
|-------------------------|---|-------|-------|-------|-------|-------|-------|
| Maintaining diversified | 3 | 0,717 | 0,800 | 0,733 | 0,800 | 0,800 | 0,817 |
|-------------------------|---|-------|-------|-------|-------|-------|-------|

MSME loan portfolio

| | | | | | | | |
|--|---|-------|-------|-------|-------|-------|-------|
| <p>Preferential loans for MSMEs according to term and amount.</p> | 4 | 0,733 | 0,733 | 0,750 | 0,733 | 0,750 | 0,800 |
| <p>Establish monitoring and follow-up systems to continuously evaluate the</p> | 5 | 0,783 | 0,733 | 0,833 | 0,867 | 0,767 | 0,900 |

financial health
of MSMEs.

| | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|
| Providing personalized service between consultant / MSMEs | 6 | 0,800 | 0,800 | 0,833 | 0,800 | 0,850 | 0,833 |
|---|---|-------|-------|-------|-------|-------|-------|

Prepared by: the authors

The values obtained from this arithmetic operation are expressed in absolute value, for example, Base (1A) - I (1A); Base (1B) - I (1B); Base (1C) - I (1C); Base (1C) - I (1C); this process is continued until the matrix containing the forgotten effect is obtained.

To determine the hidden variables or forgotten effects, we start from the values obtained in the matrix in Table 9 (Matrix containing forgotten effects), we select the values closest to unity, in the case of this study the values considered "**a**" **0.117** located at coordinates **(5, D)** and **(4, E)** to see how the action affects the effect, finding the forgotten effect of causality incidence between these two variables.

Table 9. *Base Matrix - Matrix I*

| | | | | | | | |
|---------------|---------|--|---|---|--|---|--|
| M. Base -M. I | EFFECTS | Minimize the risk of non-payment and ensure that they have the financial capacity to meet their credit obligations | Help determine past financial responsibility and forecast future credit behavior priority credit proposals. | Build customer confidence and ensure that they are fully informed about the terms and conditions of the MSME loan | Reducing the risk of over-reliance on a single type of loan in the economic sector | Strengthen customer loyalty and encourage the arrival of new ones | Identify potential financial problems early and take corrective action to mitigate the risk of noncompliance |
| ACTIONS | A | B | C | D | E | F | |

| | | | | | | | | |
|---|---|---|-------|-------|-------|-------|-------|-------|
| Conduct comprehensive creditworthiness assessment of MSME applicants. | a | 1 | 0,000 | 0,017 | 0,017 | 0,000 | 0,017 | 0,050 |
| Review the credit history of MSME applicants. | | 2 | 0,017 | 0,000 | 0,067 | 0,017 | 0,017 | 0,067 |
| Maintaining a diversified MSME loan portfolio | | 3 | 0,017 | 0,067 | 0,000 | 0,050 | 0,033 | 0,017 |
| Preferential loans for MSMEs according to term and amount. | | 4 | 0,000 | 0,017 | 0,050 | 0,000 | 0,117 | 0,000 |

| | | | | | | | |
|--|---|-------|-------|-------|--------------|-------|-------|
| Establish monitoring and follow-up systems to continuously evaluate the financial health of MSMEs. | 5 | 0,017 | 0,017 | 0,033 | 0,117 | 0,000 | 0,050 |
|--|---|-------|-------|-------|--------------|-------|-------|

| | | | | | | | |
|---|---|-------|-------|-------|-------|-------|-------|
| Providing personalized service between consultant / MSMEs | 6 | 0,050 | 0,067 | 0,017 | 0,000 | 0,050 | 0,000 |
|---|---|-------|-------|-------|-------|-------|-------|

Prepared by: the authors

For the case of the present study, the found value of " α " equal to 0.0117 of the matrix ", M-I - M. BASE", in the intersections (5, D) AND (4, E), are analyzed in order to find the forgotten effect, again the max-min convolution process is performed, comparing the row with the column of the intersection (5, D).

For 5, D:

$(K59 \wedge N55) \vee (L59 \wedge N56) \vee (M59 \wedge N57) \vee (N59 \wedge N58) \vee (O59 \wedge N59) \vee (P59 \wedge N60)$

$0,017 \wedge 0,000 \vee 0,017 \wedge 0,017 \vee 0,033 \wedge 0,050 \vee 0,117 \wedge 0,000 \vee 0,000 \wedge 0,117 \vee 0,050 \wedge 0,000$

From each interval, the smallest value is chosen: $0.000 \vee 0.017 \vee 0.033 \vee 0.000 \vee 0.000 \vee 0.000 \vee 0.000$

For 4, E:

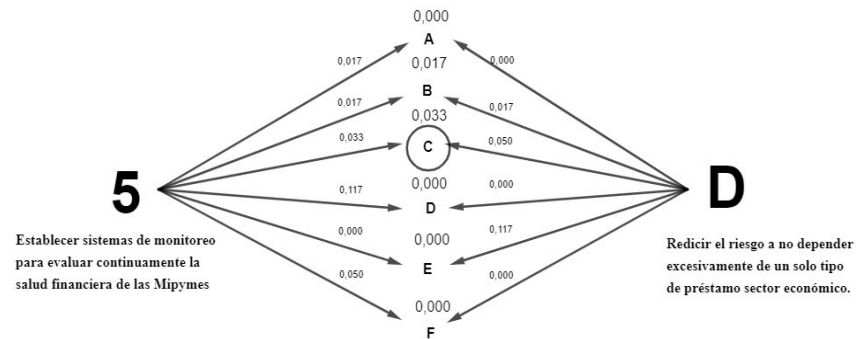
$(K58 \wedge O55) \vee (L58 \wedge O56) \vee (M58 \wedge O57) \vee (N58 \wedge O58) \vee (O58 \wedge O59) \vee (P58 \wedge O60)$

$0,000 \wedge 0,017 \vee 0,017 \wedge 0,017 \vee 0,050 \wedge 0,033 \vee 0,000 \wedge 0,117 \vee 0,117 \wedge 0,000 \vee 0,000 \wedge 0,050$

From each interval, the smallest value is chosen: $0.000 \vee 0.017 \vee 0.033 \vee 0.000 \vee 0.000 \vee 0.000 \vee 0.000$. Finally, the largest value is chosen: 0.033 in this case.

Once the process was carried out, two scenarios were determined in which Action No. 5 affects the effect established in Letter D through its hidden variable C. And Action No. 4 affects the effect established in Letter E through its hidden variable C, which can be better appreciated in Figures 4 and 5, where the variables were determined with their scenario that becomes the improvement strategy to be applied by the sector under study:

Figure 4. Incidence of 5D causality

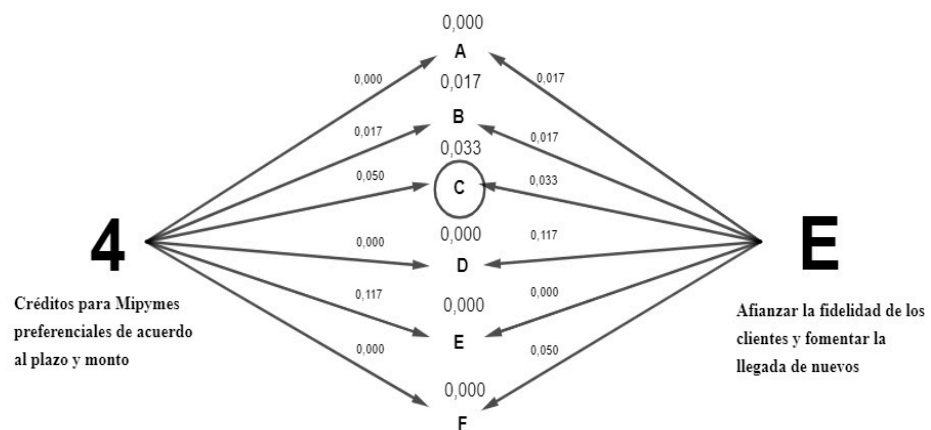


Prepared by: the authors

Finally, two proposed scenarios were presented, where in the first one, according to Figure 4, it was determined according to the 5-D coordinates. Establishing monitoring and follow-up systems to continuously evaluate the financial health of MSMEs has an impact on Reducing the risk of not depending

excessively on a single type of economic sector loan. Through the hidden variable Fostering the trust of and ensure that they are fully informed about the terms and conditions of the new priority credit for MSMEs.

Figure 5. Incidence of causality 4E



Prepared by: the authors

The second scenario is shown in Figure 5 according to the 4-E coordinates. Preferential loans for MSMEs according to term and amount. To strengthen customer loyalty and encourage the arrival of new clients. Through the **hidden variable** To foster customer confidence and ensure that they are fully informed about the conditions of the new priority credit for MSMEs.

Conclusions

The banking credit system plays a fundamental role in the development and growth of MSMEs in Cuenca by providing them with financial access for investments, working capital and other business requirements; however, despite the fact that there is no correlation between sales dynamics and credit portfolio, there is no doubt that most of them were able to access adequate and timely credit that allows them to have a better performance in terms of growth, profitability and investment capacity.

It should be emphasized that by 2020 the economic crisis derived from the COVID-19 pandemic significantly affected access to credit for MSMEs, many companies faced difficulties in obtaining financing due to the reduction of economic activity and the financial restrictions of banking institutions. That is why in this study fuzzy logic was used as a tool to identify the hidden variable with the purpose of developing strategies for improvement in the area of preferential credit for customer loyalty of MSMEs.

Reference

- Abad, J. D., & Morocho, D. P. (2023). Variation in the volume of productive credit in Ecuador and its impact on GDP (2016-2021). *INNOVA Research Journal*, 8(3), 152-172. <https://doi.org/10.33890/innova.v8.n3.2023.2287>.
- Cedeño, M., Rodríguez, S., and Marín, L. (2017). Microcredit as an alternative source of financing for MSMEs in

- Ecuador. *Universidad técnica de Machala*, 1(1), 1-11.
<https://n9.cl/xnlo6>
- Chagerben, L., Moreno, N., & Chagerben, W. (2020). Productive credit and its impact on agricultural production in Ecuador. *Estudios De La Gestión: Revista Internacional De Administración*, (6), 11-36.
<https://doi.org/10.32719/25506641.2019.6.1>
- Cisneros, D. (2022). The effects of bank credit granted to industry and consumption on economic growth: evidence from Mexico, 1994-2017. *Mexican journal of economics and finance, Nueva Epoca*, 17(2), 1-25. DOI:
<https://doi.org/10.21919/remef.v17i2.560>
- Cisneros, D. (2023). Determinants of bank credit granted to the Mexican industrial sector, 2008-2018. *Economic Analysis*, 38(98), 113-127.
<https://doi.org/10.24275/uam/azc/dcsh/ae/2023v38n98/Cisneros>
- Cusquillo, S. (2021). *Analysis of the credit portfolio of public and private banks to the productive sector in Ecuador. Period 2015-2019* (Bachelor's thesis, Universidad de Guayaquil. Faculty of Economic Sciences).
- Diaz, C., and Del Valle Guerra, Y. (2017). Financial risk in consumer loans in the Venezuelan banking system 2008-2015. *Orbis. Revista Científica Ciencias Humanas*, 13(37), 20-40.
[http://www.redalyc.org/articulo.oa?id=70952383002`](http://www.redalyc.org/articulo.oa?id=70952383002).
- Dwivedi, P., & Tripathi, S. (2019) . A simplified interval type-2 fuzzy implementation for financial credit decision}, *International Journal of Innovative Technology and Exploring Engineering*, 8 (10), p. 3036 - 3044,
<https://doi.org/10.35940/ijitee.J9478.0881019>

- Flew, T., & Kirkwood, K. (2021) The impact of COVID-19 on cultural tourism: art, culture and communication in four regional sites of Queensland, Australia, *Media International Australia*, 178 (1), p. 16-20. <https://doi.org/10.1177/1329878X20952529>
- García Lomas, V. A. (2018). Analysis of the credit portfolio of Ecuadorian public banks (2008-2017). *Revista científica UISRAEL*, 5(3), 37-50. <https://doi.org/10.35290/rcui.v5n3.2018.76>.
- González-Martín, C., García-López, A., Romero-Frías, E. & Cano-Martínez, M. (2023) Gender-based stereotyping in the Spanish artisan sector, *Craft Research*, 14(1), p. 117-138 https://doi.org/10.1386/crre_00097_1
- González, J., Valdés F., & Saavedra M., (2021). Success factors in SME financing through crowdfunding in Mexico. *Mexican journal of economics and finance*, 16(2), p. 1-23, e471, <https://doi.org/10.21919/remef.v16i2.471>.
- Hernández, R., Fernández, C., Baptista, P. (2014). *Metodología de la investigación*. Mexico: McGraw-Hill.
- Ordóñez-Granda, E., Narváez-Zurita, C., Erazo-Álvarez, J. (2020). The financial system in Ecuador. Innovative tools and new business models. *Revista Arbitrada Interdisciplinaria Koinonía*, 5(10), 195-225. <http://dx.doi.org/10.35381/r.k.v5i10.693>
- Palacios, C. A. C., & Macías, G. R. P. (2020). Credit risk management to improve the quality of the microcredit portfolio in the cooperative comercio Ltda. *Polo del Conocimiento: Revista científico-profesional*, 5(3), 225-254.

<https://dialnet.unirioja.es/servlet/articulo?codigo=7398427>

- Prados-Peña, M., Gálvez-Sánchez, F., Núñez-Cacho, P. & Molina-Moreno, V. (2024) Intention to purchase sustainable craft products: a moderated mediation analysis of the adoption of sustainability in the craft sector, *Environment, Development and Sustainability*, 26(1) p. 775-797, <https://doi.org/10.1007/s10668-022-02732-6>.
- Peñaloza, E., Chávez, C., and Arámbulo, M. (2022). Credit placements of the Banca Múltiple, Tacna region, before and after the measures for the sanitary emergency. *Revista de la Universidad Nacional Jorge Basadre Grohmann*, 4(2), 19-35. <https://revistas.unjbg.edu.pe/index.php/eyn>
- Rodríguez-García, M., Galindo-Manrique A, Cortez-Alejandro, K and Méndez-Sáenz, A. (2022) Eco-efficiency and financial performance in Latin American countries: An environmental intensity approach, *Research in International Business and Finance*, 59, p. 101547, <https://doi.org/10.1016/j.ribaf.2021.101547>.
- Ruís, S., Gomes, P., Rodriguez, L. & Gama, J. (2019). Credit scoring for microfinance using behavioral in emerging markets. *Intelligent Data Analysis*, 23(6), 1355-1378. <https://doi.org/10.3233/IDA-184239>.
- Saavedra, M., and Saavedra, M. (2016). The problem of SME financing and the guarantee system in Mexico. *Teuken Bidikay - Revista Latinoamericana De Investigación En Organizaciones, Ambiente Y Sociedad*, 7(8), p. 147-170. <https://revistas.elpoli.edu.co/index.php/teu/article/view/1040>

- Sampieri, R., Fernández, C., & Baptista, L. (2014). Definitions of quantitative and qualitative approaches, their similarities and differences. *RH Sampieri, Research Methodology*, 22.
- Sinthupundaja, J. and Chiadamrong, N. (2015). Investigating the financial characteristics and strategies of Thai manufacturing SOEs to improve financial performance. *Journal of Economics, Business and Management*, 3 (3), 331-337.
- Shubita, D.(2018). The Impact of Bank Performance and Credit Risk on Capital Structure: An Empirical Evidence of Jordanian Bank Sector. *Journal of Social Sciences*, 7(4), p. 350-357. <https://doi.org/10.25255/jss.2018.7.4.350.357>
- Tacuri, L., and Suarez, E. (2017). Impact of microcredit on vulnerability reduction in the city of Loja. *INNOVA Research Journal*, 2(9), 44-54. <https://doi.org/10.33890/innova.v2.n9.1.2017.502>.
- Tinto, J. (2013). Content analysis as a useful tool for conducting descriptive research. An example of practical application used to learn about research conducted on the brand image of Spain and the country of origin effect. *Provincia*, (29), 135-173. <https://www.redalyc.org/pdf/555/55530465007.pdf>.
- Vallejo, J., and Ochoa, J. (2019). Evolution of microcredit in the popular and solidarity sector versus public-private banking in Ecuador. *Revista ECA Sinergia*, 10(2), 138-148. https://doi.org/10.33936/eca_sinergia.v10i2.1550.

Administrative proposals to promote women's participation in small and medium-sized Latin American enterprises

John Edwin López Castillo

Catholic University of Cuenca , jlopezc@ucacue.edu.ec
<https://orcid.org/0009-0009-1210-6885>

Mónica Briggith Rosales Namicela

Catholic University of Cuenca, mrosalesn@ucacue.edu.ec
<https://orcid.org/0000-0002-3240-1146>

Yanice Licenia Ordóñez Parra

Catholic University of Cuenca, jordonezp@ucacue.edu.ec
<https://orcid.org/0000-0002-5002-2203>

Diego Vinicio Orellana Bueno

Catholic University of Cuenca , dorellana@ucacue.edu.ec
<https://orcid.org/0000-0002-7320-8684>

Introduction

Women's active participation is seen as an action to stimulate, change and influence the cultural dynamics of societies. Continued intervention within the business arena demonstrates the potential to change the stigma associated with gender roles that have defined their work in public life for generations, the challenges faced by women entrepreneurs and leaders are enormous and require answers (Sanchez et al., 2023). Only by adopting a positive attitude to achieve excellence can the leadership that is in the hands of women be achieved (Camarena, 2019; Vázquez-Parra et al.

2020).

From the outset, a way is sought to close the gender gap through female entrepreneurship. The space gained by women contributes to economic growth, employment generation and consequently to increased productivity, poverty reduction, personal and family development (Chong and Vélez, 2020). A woman who decides to undertake, despite the various obstacles such as precarious circumstances, the obvious disadvantages imposed by society either labor, business or family see it as a way to achieve economic independence (Enderica et al., 2018).

To reduce the bias of statistics, in early 2021 the Gender Atlas platform emerged as a result of collaboration between the United Nations National Women's Institute, Mujeres Mexico and the Economic Commission for Latin America and the Caribbean, the platform provides data on the participation of Latin American women in various socioeconomic spheres of public life (Hidalgo, 2022). However, while the data on the role of women entrepreneurs focus on the relative proportions of men and women according to the ownership of economic units and according to the number of employees employed, they do not take into account this information and do not include data that facilitate understanding their role in SMEs (Saavedra and Camarena, 2020).

Similarly, a study by Acevedo et al. (2021) shows that only

29% of senior management positions are held by women, despite a 5% increase in the last year. The data for Latin America are striking, with only 25% of women holding leadership positions in the region (Acevedo et al. 2021; Huamán et al. 2022). In fact, it is pertinent to mention that women are heavily involved in informal work, a situation that makes them extremely vulnerable. In developing countries, the informal employment rate of women, even in the agricultural sector, is 4.6% higher than that of men. Excluding this sector, it is 7.8% higher (International Labor Organization [ILO], 2018).

In particular, entrepreneurship has traditionally been the domain of men, obtaining a low female participation, generating a low level of growth of companies led by women. These genes appear when understood as a set of personal traits, tastes, preferences, attitudes, roles against women (Garcia et al., 2018). Adopting these characteristics in a business context by women entrepreneurs will be seen as a starting point to recognize the needs of this type of women (Saavedra et al., 2020).

Framing SMEs at the Ecuadorian level, they are considered the most productive sector of the country's economy, as they have a positive impact on both developed and developing countries. SMEs in Ecuador represent 25.4% of the business structure, accounting for more than 7% of Ecuador's gross domestic product (GDP) (Horta et al., 2020; Ordóñez et al.,

2023). Similarly, SMEs in Mexico, Peru and Colombia represent more than 95.5% of the companies that provide formal productive employment in Latin America, being strong engines for inclusion and growth throughout the region, despite the difficulties they have for their growth, driven by women they achieve great relevance (Hidalgo, 2022; Salas-Arbeláez et al., 2020).

On the other hand, the lack of women's participation in the labor market, especially in managerial positions, has long been a well-known international problem. Since the creation of groups, they have needed someone to represent them and stand out in difficult times, usually led by men. The Human Resources area needs to deepen and encourage women to work in teams, being able to reach leadership positions managing not to be discriminated in positions they commonly do not lead (Le & Stefańczyk, 2018; García-Contreras et al.2021).

Highlighting the role of women in organizational leadership in general, especially in SMEs, which has intensified in Latin America, makes this issue very important (Arun et al., 2020). In addition, the gap in the representation of women in organizational leadership positions is unequal, while the representation of men is higher. At the same time, it is worth mentioning the wage gap that women receive compared to men in equal jobs (Kuschel et al., 2018).

It should be noted that there is no extensive literature on the study of women's leadership and participation in SMEs. Several studies highlight these as scenarios for the development of women's work and life projects (Madison et al., 2022). It is important to highlight that men and women develop different leadership styles due to the stereotypes that subordinates have about women in leadership positions, for example, that women are less capable than men. Likewise, taking into account that Ecuador, Mexico, Colombia and Peru are countries with diverse interculturality, their role is equally important, especially because of their desire to move forward (Hidalgo, 2022; Franco-Ángel and Awad, 2022).

Despite the potential benefits of international trade, women's participation as business leaders in the export process is very limited. According to the World Trade Organization, the percentage of women-led businesses delivering and receiving goods is much lower than that of men. Moreover, 90 % of manufacturing, and 88 % of service industries are owned by men (Adapa and Sheridan, 2021).

It is important to highlight the imperative need for women's participation in the workplace, since their role, as seen above, has not played a leading role, despite the fact that their leadership and participation are optimal (Saavedra et al., 2020). Therefore, it is essential to define the following hypothesis: the role of women in terms of their leadership and participation may allow the improvement of SMEs,

highlighting interculturality and diversity. For which the following objective was proposed: to suggest administrative strategies to promote leadership and encourage the participation of women in SMEs, highlighting interculturality and diversity in Ecuador, Mexico, Colombia and Peru.

Women's leadership and participation in SMEs

The importance of promoting leadership and encouraging the participation of women in SMEs, highlighting interculturality and diversity in Ecuador, Mexico, Colombia and Peru, is the precision of this research. Women who develop leaderships within any type of organization whether as micro, small or medium enterprises, demonstrate a declining performance since they do not impose leadership due to the gender discrimination that is still breathed despite the present feminist revolution (Saavedra, 2019).

The relevance of applying administrative techniques in small and medium-sized enterprises (SMEs) that promote leadership and stimulate women's collaboration, paying special attention to cultural diversity, is highlighted. In countries such as Ecuador, Mexico, Colombia and Peru, cultural diversity is a reality that should be valued and exploited in business (Aguirre et al., 2022). Companies must recognize and respect cultural differences and use them as a competitive advantage; however, new challenges may arise in this area.

A considerable number of women have begun to take a more active role in the field of entrepreneurship, often facing a number of challenges, including lack of access to resources and financing, as well as lack of previous experience in the business sector. Female leadership is characterized by initiative, effectiveness in team building and the ability to make decisions in times of crisis. In addition, it acts with resilience, is characterized by self-development and results orientation, and shows high integrity and honesty. Duque et al. (2021) state that female empowerment develops, inspires and motivates others; builds leadership and relationships; sets ambitious goals, collaboration and teamwork; connects with the outside world; communicates powerfully and prolifically; analyzes and solves problems.

According to García et. al. (2018) argue that Ecuadorian women enter entrepreneurship despite coercion, having little experience in the field and without previous research, the apogee of female entrepreneurship shows equal opportunities to start a business for both women and men in various fields. Similarly, Paredes et al. (2019), indicate that the driving factors of female entrepreneurship in this country are associated with personal factors, as well as those related to obtaining resources, capabilities, motivation and independence, however, it highlights that personal factors are also mostly considered as a major obstacle as they can slow down the growth and success of women entrepreneurs.

In addition, it is important that SMEs establish an inclusive and respectful work environment with diversity, where non-discrimination is promoted and respect for the rights of all people, regardless of their gender, is encouraged (Molina et al., 2021). According to Solarte et al. (2020) state that, SMEs can implement practices such as labor flexibility and teleworking, which allow women to reconcile their personal and work life. A recurring problem for companies is access to capital. This stems from failures in the capital market, such as the low level of capital for financing, excessive bureaucracy, high rates and short repayment schedules.

In Ecuador, for example, microcredit programs that support women's entrepreneurship in national areas have been promoted for the past decade, such as *Mujer emprendedora*, *Women for women Ecuador* and *Corporación Financiera Nacional (CFN)*, among others. Thanks to these programs, women have had greater access to microcredit than men. The Ecuadorian government has worked to encourage many women to materialize their projects. However, it has not been possible to achieve the objectives proposed in the implementation of these programs (Alarcón, 2021).

Regarding democratic and autocratic leadership in the administrative management of SMEs, he points out that nowadays, in our country, usually all those who are at the head of an organization are called leaders, however, the term carries with it a background based on the attitude that this

individual adopts when interacting with the other participants of the company, since it is through the way he interacts with others that he acquires the expected results (Bamonde & Sardi, 2021; Pacheco & Pedrinho, 2022).

Leadership can also be understood as the continuation of activities that are of great importance to lead a group of individuals in a better direction (Espinoza & Elgoibar, 2019). A leader is needed, because there must be someone who makes decisions according to the needs of each situation that arises; he/she has the right to command a group of subjects, naturally exercising power without using tyranny. (Enderica et al., 2018)

Women entrepreneurs combine activities, establish links and recreate modes of action that escape the modernizing logic, in which employment is invariably established as the only horizon for those in the labor market (Vega & Bermúdez, 2019). It is common to find women entrepreneurs who have direct consumers as clients, and these are more often women compared to male-led businesses. In this regard, some researchers such as Alvarado (2022) asserts that organizations can improve the quality of their customer relationships by transforming environmental agents into new suppliers.

Gender-based occupational segregation is a widespread problem in all regions because substantial gender wage gaps are a feature of virtually all labor markets. Access to financial

information and training is essential for closing entrepreneurial gender gaps. In fact, Villaseca et al. (2020) state that in 40% of economies, women's initial entrepreneurial activity is half or less than half that of men, making it urgent to change the perspective from the financial sphere.

Thus, by identifying possible gender biases, both from women entrepreneurs and from investors or funders, it is possible to design tools that are flexible and adaptable to the organizational guidelines required by the environment, as well as to continue encouraging female entrepreneurship, which, in most opportunities, are limited by the scarcity of resources. Women's empowerment refers to the creation of opportunities for women to reach their full potential and participate fully in society, including the workplace.

In the research conducted in Latin America by Flores et al. (2021), they confirm that the vast majority of women entrepreneurs seek businesses that allow them to have time flexibility in order to cope with their responsibilities at home, and also indicate that the enterprises created by women in these countries generally remain at a low level; that is, they are micro-enterprises, which makes it difficult to some extent to access financing; despite this, female entrepreneurship has become a mechanism that promotes the empowerment of Latin American women.

Empowerment is a key factor that develops women's ability to make strategic decisions in situations where they had previously been denied that right. The Economic Commission for Latin America and the Caribbean (ECLAC), considers female entrepreneurship as an issue linked to the concept of women's empowerment, through the process in which women achieve control over their own lives (Orlandini et al., 2018).

In the context of small and medium-sized enterprises, empowering women can be especially important. A study by M'zungu et al. (2019) found that women-owned SMEs in Denmark were more likely to grow and succeed if they had access to networks and resources, including mentoring and training. Another study by Pichler & Wallace (2009) found that women entrepreneurs in Austria faced specific challenges, such as lack of access to finance and lack of confidence in their abilities, but that empowerment programs could help overcome these barriers.

A disadvantage of using national household surveys is that they capture few large business owners. The largest category (medium-sized firms) is defined as well as firms that have more than 11 employees. For Bolivia and Peru, there are only a handful of firms in this category, leading to inaccurate estimates of the percentage of female ownership. Apart from these two countries, the data consistently show that female ownership decreases as the firm size category increases.

Entrepreneurial activity has traditionally belonged to the male sphere, with various consequences, among which the minimal female participation stands out, however, it should be emphasized that women entrepreneurs actively participate in the production and marketing of goods and services for society, contributing in such a way in the psychosocial impact of their environment (Camarena, 2018).

The majority of women entrepreneurs gradually become involved in small, medium and large-scale business activities. It is essential to maintain a stable business to perform or implement various improvement strategies, clear example are the training systems conceived that should influence the work environment of the collaborators, so that they favor social support within the organization, and guarantee resources, in addition to generating an organizational culture that favors the transfer to the position and its maintenance (Camarena, 2018).

Financing is a very important issue for all human beings, because it is necessary to be efficient in the administration of resources, a primary source for obtaining income, through products and services that satisfy the needs of the market; this is also applicable to the various companies that are in the environment, since they need a way to finance themselves and make decisions on the use of money.

The surveys conducted with the people involved in this

research also noted a more careful attitude towards competition and more open to the possibility of establishing alliances to be more competitive. Although initially the micro-enterprises and SMEs declared to know and apply in depth the topics of logistics planning, when going deeper into its content and scope, it was possible to identify that they still present important gaps and inconsistencies. What is clear in this aspect is that they are aware of the need for logistics, but have a vague and very general idea of its techniques and procedures.

Although they are clear about the concepts of purpose: mission, vision, objectives and goals, values and strategies, they do not know the technical requirements to formulate them in their companies and the tools and the specific or specialized language of the world of strategies. Additionally, there is no culture of knowledge and use of indicators or plans for each area of the company.

Güell, A. and Solé (2020) state that empowerment is based on the ability to make decisions and control resources. In this sense, female empowerment focuses on women's personal and individual capacity and flexibility in order to achieve their own economic independence.

Implementing successful strategies is essential to achieving an organization's objectives and goals. A systematic and well-planned approach is required to ensure effective

implementation and achieve the desired results. In general, the role that women occupy in society should not be determined by their gender, but by their skills, talents and contributions. It is important to work towards a more equitable and just society, where men and women have the same opportunities to develop their potential and contribute to the common good and society (Medina-Vicent, 2019). Spaces should be created for the exchange of experiences and for mutual support among women leaders, one of these can be generated through entrepreneurship networks.

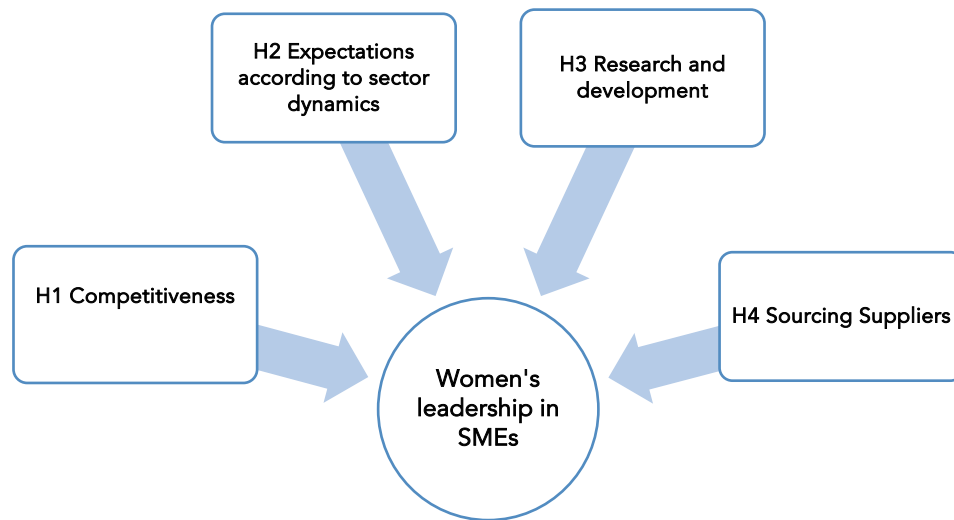
Entrepreneurship Networks are organizations that have structures defined according to the nature of their objectives, which, in the first place, have a direct impact on the business processes and results of their associates. Some authors, such as Zou & Storz (2023), state that the structure of the network, such as size or openness, influences business performance, in such a way that companies will be able to access to a greater or lesser extent to specialized information, resources and contacts that increase their performance, being this differential in the market. In other words, there is a positive relationship between the structure and content of the networks, opening up decisive social opportunities. However, enterprises that arise out of necessity, as a first step, have access to small networks with few variations made up of family or friends.

In addition, there is a need to promote gender equality in

political and economic decision-making, to ensure that women are represented at all levels of government and in key businesses and organizations. This will not only enable women to make strategic decisions in their own lives, but will also help address gender inequalities more broadly. In short, expanding women's capacity to make strategic decisions is essential to achieving a more just and equal society.

Therefore, the general objective of this research is to identify the factors of entrepreneurial management in the participation of women in SMEs in Colombia, Peru, Mexico and Ecuador. The general research hypothesis : the factors of entrepreneurial management that influence the participation of women in SMEs in Colombia, Peru, Mexico and Ecuador according to the variables: expectations, research and development, innovation, supplier supply and competitiveness of women entrepreneurs, as shown in Figure 1.

Figure 1. Graphical Variables Model



Note: The figure shows the predictor variables that contribute to this research.

It is important to make an analogy analysis between innovation and entrepreneurship, according to research, the main conclusions refer to the fact that more women than men start a business out of necessity. However, in recent years there have been more and more cases of new companies led by women, where the motivation to create a business does not come from necessity, inequality or lack of opportunities. On the contrary, it comes from the idea of growing,

innovating and being able to expand locally and internationally; that is, from the motivation to seek opportunities for innovative and successful business models (Huamán et al., 2022).

Under this parameter, according to research, there are three concepts that infer about women's participation in SMEs. Female empowerment based on power, which is used to delimit, so the power relationship means acting on others, but those others oppose. In this context, the concept is related to theoretical foundations such as the behavior of individuals in different strata of power and authority and how power is controlled with self-control and motivation. A second concept was female entrepreneurship framed in gender equity, which is finally perceived as a tool with which to obtain recognition of effort at the same level as the male gender (Ordoñez, Castillo and Rodríguez, 2021).

A third concept addresses female innovation, considered as the reinvention of her ideas and creativity, a woman also has the capabilities, knowledge and competencies that allow her to identify opportunities for improvement and positive changes that generate added value to her undertakings, which combined with empowerment emerge as a necessary engine for a society (Ordoñez, Castillo and Rodríguez, 2021). These attributes in the female gender in the productive, economic and financial processes contribute to an increase in the level of competitiveness of companies. Along the same

lines, the level of education and research also contribute to women's decision to become entrepreneurs and thus efficiently manage their companies.

Correlation of internal and external factors

The study design is non-experimental, the method applied is deductive, Castellanos (2017) states that it allows him to determine the characteristics of the specific reality from generally accepted conclusions. Hernández-Sampieri et al (2014) argue that the mixed survey method seeks to exploit the strengths of qualitative and quantitative methods, allowing the information to be analyzed systematically. The unit of analysis for the proposed study defined: the artisans macaneros of Gualaceo and the Asociación indígena artesanal de Ecuador, the artisans' guild of Ibagué- Colombia, the Cantagallo guild of Peru and the intercultural network of support and inclusion of indigenous people of Nuevo León in Mexico, making up the universe of 400 entrepreneurs receiving support from 198 of them. To calculate the sample size, the formula $n = \frac{Npqz^2}{e^2(N-1) + (z^2 pq)}$ was applied to the population of the participating countries.

The authors Schenkel and Pérez (2019) argue that through these investigations, data are collected and analyzed in order to present real situations, cases and phenomena that arise as a result of daily problems of organizations or communities to draw conclusions that are extracted from the environment.

The data processing was carried out in the SPSS statistical program, the results were presented through the indicators of absolute and percentage frequency, as well as the indicators of central tendency and multivariate correlation, which allowed detecting relevant aspects between variables, the same that influence the analysis of women's entrepreneurship in the countries under study.

In order to present the results of the research, it was previously mentioned that 198 entrepreneurs from Colombia, Ecuador, Mexico and Peru participated, as shown in Table 1 and Table 2, some variables have an impact on empowerment and leadership in women entrepreneurs, so it was proposed using the survey technique, the questionnaire as the instrument for the collection of information that covers the respective criteria and which are detailed below.

Table 1. *Demographic aspect: gender*

| Genre | Frequency | Percentage | Valid percentage | Cumulative percentage |
|--------|-----------|------------|------------------|-----------------------|
| MALE | 27 | 7,70 | 13,60 | 13,60 |
| FEMALE | 171 | 48,90 | 86,40 | 100,00 |
| Total | 198 | 56,60 | 100,00 | |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

The female gender predominates with 86.40%, as shown in Table 1, obtaining a percentage of 13.60% as a result and belonging to the male gender.

Table 2. Demographic aspect: marital status

| | | Frequency | Percentage | Valid percentage | Cumulative percentage |
|----------------|-------------|-----------|------------|------------------|-----------------------|
| Marital Status | MARRIED | 107 | 30,60 | 54,00 | 54,00 |
| | SOLTERA | 50 | 14,30 | 25,30 | 79,30 |
| | DIVORCED | 13 | 3,70 | 6,60 | 85,90 |
| | FREE UNION | 15 | 4,30 | 7,60 | 93,40 |
| | WIDOW | 8 | 2,30 | 4,00 | 97,50 |
| | FAMILY HEAD | 5 | 1,40 | 2,50 | 100,00 |
| Total | | 198 | 56,60 | 100,00 | |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

In Table 2, the most relevant results indicate that 54.00% are married, being the highest percentage, 25.30% are single and 1.40% identify themselves as heads of household.

Table 3. Demographic aspect: level of education

| | | Frequency | Percentage | Valid percentage | Cumulative percentage |
|--------------------|--------------|-----------|------------|------------------|-----------------------|
| Level of education | BASIC | 65 | 18,60 | 32,80 | 32,80 |
| | HIGH SCHOOL | 79 | 22,60 | 39,90 | 72,70 |
| | SUPERIOR | 39 | 11,10 | 19,70 | 92,40 |
| | NONE | 14 | 4,00 | 7,10 | 99,50 |
| | POSTGRADUATE | 1 | 0,30 | 0,50 | 100,0 |
| | Total | | 198 | 56,60 | 100,00 |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

In relation to the average level of education between basic and high school, it ranges between 72.70%, a large percentage of entrepreneurs and micro-entrepreneurs do not have fourth level or postgraduate degrees, this is represented in 0.50% of the results, as shown in Table 3.

Table 4. Demographic aspect: type of disability

| | | Frequency | Percentage | Valid percentage | Cumulative percentage |
|--------------------|---------|-----------|------------|------------------|-----------------------|
| Type of disability | NONE | 187 | 53,40 | 94,40 | 94,40 |
| | PHYSICS | 11 | 3,10 | 5,60 | 100,00 |
| | Total | 198 | 56,60 | 100,00 | |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

Referring to Table 4, related to the level of disability, 94.40% state that they have no impairment or disability, compared to 5.60% who do have some type of physical disability.

Table 5. Demographic aspect: ethnicity

| | | Frequency | Percentage | Valid percentage | Cumulative percentage |
|-----------|--------------------|-----------|------------|------------------|-----------------------|
| Ethnicity | MESTIZO | 126 | 35,7 | 63,63 | 63,63 |
| | SHUAR | 9 | 2,6 | 4,55 | 68,18 |
| | INDIGENOUS PEOPLES | 34 | 9,7 | 17,17 | 85,35 |
| | BLANCA | 29 | 8,3 | 14,65 | 100,00 |
| | Total | 198 | 56,3 | 100,0 | |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

Regarding ethnic self-definition, Table 5 shows that 63.63% identify themselves as mestizo, 4.55% as Shuar, 17.17% as part of the original peoples and 14.65% define themselves as part of the white ethnic group.

Table 6. *Selection of suppliers*

| Country | Quality, Delivery times | Price | Personal Reference | Delivery times | Credit Policy | Total |
|----------|-------------------------|-------|--------------------|----------------|---------------|-------|
| Colombia | 4 | 37 | 0 | 0 | 0 | 41 |
| Ecuador | 36 | 75 | 1 | 4 | 11 | 127 |
| Mexico | 3 | 10 | 1 | 1 | 0 | 15 |
| Peru | 8 | 7 | 0 | 0 | 0 | 15 |
| | 51 | 129 | 2 | 5 | 11 | 198 |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

Another aspect to consider is the selection of suppliers, an unavoidable process in an organization because it is necessary to acquire goods and services such as machinery, raw materials, cleaning services, among others. It is common knowledge in most organizations that the purchasing department or supply chain department is responsible for the search and selection of suppliers that best suit the needs of the organization. Table 6 shows the very different results in each of the countries with respect to the selection of suppliers. With respect to the results analyzed, Ecuador, Colombia and Mexico predominate in the selection of the highest supplier based on price, but not in Peru, which prefers quality and delivery times.

Table 7. Correlation of variables: Expectations

| | | Mr. / Ms. / Mr. entrepreneur, what are your EXPECTATIONS S regarding the dynamics of the sector for the coming year? [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] | Mr. / Ms. / Mr. entrepreneur, what are your EXPECTATIO NS regarding the dynamics of the sector for the coming year? [Employment] [Employment] | Mr. / Mrs. / Mr. entrepreneur, what are your EXPECTATIONS regarding the dynamics of the sector for the coming year? [Investments] [Investments] |
|--|---------------------|--|---|--|
| Mr. / Ms. / Mr. entrepreneur, what are your EXPECTATIONS regarding the dynamics of the sector for the coming year? [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] [Sales] | Pearson correlation | 1 | ,284** | ,425** |
| | Sig. (bilateral) | | ,000 | ,000 |
| | N | | 198 | 198 |
| Mr. / Ms. / Mr. entrepreneur, what are your EXPECTATIONS regarding the dynamics of the sector for the coming year? [Employment] [Employment] | Pearson correlation | | 1 | ,645** |
| | Sig. (bilateral) | | | ,000 |
| | N | | | 198 |

| | | | |
|--|---------------------|--|-----|
| Mr. / Mrs. / Mr. entrepreneur, what are your EXPECTATIONS regarding the dynamics of the sector for the coming year? [Investments] [Investments] | Pearson correlation | | 1 |
| | Sig. (bilateral) | | |
| | N | | 198 |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

Table 7 shows that there is a moderate significant correlation between the different categories of the innovation variable. It is observed that the employment category has a coefficient of 0.645 with respect to investment expectations, which means that the majority of enterprises are in function of investments to create more jobs and consequently promote economic growth and particularly market growth where they can offer optimal prices and quality as a competitive advantage.

Table 8. Correlation of variables: External difficulties

| | | EXPECTATIONS EXTERNAL DIFFICULTIES - New competitors entering the market | Difficulty in reaching national markets | EXTERNAL DIFFICULTIES - [Smuggling, unfair competition, informal | Difficulties EXTERNAL-- [Tax burden]. | EXTERNAL Difficulties indicate - [Difficulties for financing and access | External Difficulties Infrastructure, connectivity and access to new Merc. | EXTERNAL difficulties - training of human resources |
|---|---------------------|--|---|--|---------------------------------------|---|--|---|
| EXPECTATIONS EXTERNAL DIFFICULTIES - Entry of new competitors | Pearson correlation | 1 | ,395** | ,376** | ,166* | ,143* | ,066 | ,332** |
| | Sig. (bilateral) | | ,000 | ,000 | ,019 | ,044 | ,354 | ,000 |
| | N | | 198 | 198 | 198 | 198 | 198 | 198 |
| Difficulties in reaching national markets | Pearson correlation | | 1 | ,352** | ,234** | ,357** | ,368** | ,472** |
| | Sig. (bilateral) | | | ,000 | ,001 | ,000 | ,000 | ,000 |

| | | | | | | |
|---|----------------------------|-----|--------|---------------|---------------|--------|
| | N | 198 | 198 | 198 | 198 | 198 |
| EXTERNAL Difficulties- [Smuggling, unfair competition, informal | Pearson correlatio n | 1 | ,295** | ,108 | ,056 | ,197** |
| | Sig. (bilateral) | | ,000 | ,131 | ,432 | ,005 |
| | N | | 198 | 198 | 198 | 198 |
| Difficulties EXTERNAL--[Tax burden]. | Pearson correlatio n | | 1 | ,444** | ,295** | ,292** |
| | Sig. (bilateral) | | | ,000 | ,000 | ,000 |
| | N | | | 198 | 198 | 198 |
| EXTERNAL Difficulties indicate - [Difficulties for financing and access | Pearson correlatio n | | | 1 | ,700** | ,338** |
| | Sig. (bilateral) | | | | ,000 | ,000 |
| | N | | | | 198 | 198 |

| | | | |
|---|---------------------|---|--------|
| EXTERNAL Difficulties- Infrastructure, connectivity and access to new markets | Pearson | 1 | ,416** |
| | correlatio | | |
| | n | | |
| | Sig. (bilateral) | | ,000 |
| | N | | 1 |
| | Sig. (bilateral) | | |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

The correlation analysis in Table 8 shows that it is significant at the 0.01 level (bilateral), therefore, the highest value referring to the categories of financing and access to credit concerning connectivity and new markets reflects a value of 0.700 as a correlation coefficient. A value of 0.472 for human resources training is reflected in relation to the difficulties in reaching the domestic market. It is important to analyze this indicator because if internal clients are not trained through endomarketing and customer service strategies, it is difficult to access national and international markets. It should be considered that staff training generates excellent

competitive advantages in quality and prices; an enterprise that emerges with an efficient and optimal cost structure guarantees the permanence of the company or business in the market.

Table 9. Correlation of variables: Internal difficulties

| | | INTERNAL AL Difficulti es- Failures in the producti on or provisio n of the service | Difficult ies INTERNAL AL distribu tion, sales or custom er service]. | INTERNAL difficulties- failures in the financial area, resource and information management] | INTERNAL Difficulties [Failures in quality and control, attention to complaints, returns | INTERNAL Difficulties i Exploitation of new technologies | INTERNAL difficulties - high innovation, new product designs | INTERNAL Difficulties- Portfolio growth - clients | INTERNAL Difficulties- Infrastructure Capacity |
|---|------------------------|---|--|---|---|--|---|---|---|
| INTERNAL Difficulties Failures in the production or provision of service | Pearson correlation | 1 | ,472** | ,454** | ,443** | ,227** | -,045 | ,073 | -,008 |
| | Sig. (bilateral) | | ,000 | ,000 | ,000 | ,001 | ,529 | ,308 | ,906 |
| | N | | 198 | 198 | 198 | 198 | 198 | 198 | 198 |
| INTERNAL difficulties- | Pearson correlation | | 1 | ,313** | ,242** | ,276** | -,068 | -,012 | -,056 |

| | | | | | | | |
|---|---------------------|------|--------|--------|--------|--------|-------|
| difficulties in distribution, sales, or customer service] | Sig. (bilateral) | ,000 | ,001 | ,000 | ,343 | ,864 | ,433 |
| | N | 198 | 198 | 198 | 198 | 198 | 198 |
| | Pearson correlation | 1 | ,400** | ,199** | ,014 | ,209** | ,087 |
| INTERNAL difficulties-failures in the financial area, resource and information management]. | Sig. (bilateral) | | ,000 | ,005 | ,842 | ,003 | ,223 |
| | N | | 198 | 198 | 198 | 198 | 198 |
| | Pearson correlation | | 1 | ,252** | ,082 | ,424** | ,161* |
| INTERNAL Difficulties [Failures in quality and control, attention to complaints, returns | Sig. (bilateral) | | | ,000 | ,253 | ,000 | ,024 |
| | N | | | 198 | 198 | 198 | 198 |
| | Pearson correlation | | | 1 | ,252** | ,082 | ,161* |

| | | | | | |
|---|------------------------|---|--------|--------|--------|
| INTERNAL Difficulties i Exploitation of new technologies | Pearson correlation | 1 | ,187** | ,190** | ,020 |
| | Sig. (bilateral) | | ,008 | ,007 | ,784 |
| | N | | 198 | 198 | 198 |
| Of the following INTERNAL difficulties- high level of innovation, new designs, new proposals | Pearson correlation | | 1 | ,105 | -,012 |
| | Sig. (bilateral) | | | ,141 | ,865 |
| | N | | | 198 | 198 |
| Of the following difficulties INTERNAL- Portfolio growth -clients | Pearson correlation | | | 1 | ,353** |
| | Sig. (bilateral) | | | | ,000 |
| | N | | | | 198 |

| | | |
|--|--|---|
| Of the following difficulties INTERNAL - Infrastructure Capacity | Pearson correlation Sig. (bilateral) N | 1 |
|--|--|---|

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

The variable competitiveness; expectations with its categories and internal difficulties, a value of 0.472 of bilateral significant correlation is observed with regard to the criterion of production failures, which is directly related to conflicts in sales distribution and customer service with a value of 0.472. In what corresponds to the failures in production and service provision, represented by 0.454, it has a direct impact in proportion to the difficulties of financial order and resource management, in such virtue the basic strategy in this sense lies in the fact that women entrepreneurs should strengthen their knowledge in resource management through training processes. In customer service, there should be important strategies to mitigate the level of complaints due to production failures, Porter's strategies on quality and process control to generate competitiveness, this value reflects a correlation of 0.400, which is acceptable.

Table 10. Correlation: Supplier supply

| | | SUPPLY-SUPPLIERS [Distribution and sales]. | SUPPLY-PROVIDERS [Financial- accounting]. | SUPPLY-SUPPLIERS [Design and development]. | SUPPLY-SUPPLIERS [Quality and control]. | SUPPLY-SUPPLIERS [Technology] |
|---|----------------------------|--|---|--|---|----------------------------------|
| SUPPLY-SUPPLIERS Respecto Distribution and sales | Pearson correlat ion | 1 | ,654** | ,541** | ,600** | ,556** |
| | Sig. (bilater al) | | 0 | 0 | 0 | 0 |
| | N | | 197 | 197 | 195 | 194 |
| SUPPLY - SUPPLIERS With respect to financial and accounting aspects | Pearson correlat ion | | 1 | ,782** | ,780** | ,744** |
| | Sig. (bilater al) | | | 0 | 0 | 0 |
| | | | | | | |

| | | | | |
|--|----------------------------|-----|--------|--------|
| | N | 197 | 195 | 194 |
| SUPPLY-SUPPLIERS Regarding Design and Development | Pearson correlat ion | 1 | ,901** | ,837** |
| | Sig. (bilater al) | | 0 | 0 |
| | N | | 195 | 194 |
| SUPPLY-SUPPLIERS with respect to Quality and control | Pearson correlat ion | | 1 | ,867** |
| | Sig. (bilater al) | | | 0 |
| | N | | | 194 |

Source: Data obtained from surveys of SMEs in Ecuador, Mexico, Peru and Colombia.

Table 10 shows that with regard to the variable supply from different suppliers, there is an excellent correlation between the financial and accounting categories with quality and control, since liquidity allows control over the processes to be maintained. In addition, there is a strong correlation of 0.901 between the quality and control variable and product design and development.

Conclusions

Women's participation in entrepreneurship changes the gender stereotypes that have defined their roles in public life for generations. However, women entrepreneurs and leaders face significant challenges that require solutions.

Adopting a positive attitude is essential for women to reach levels of leadership and excellence. Female entrepreneurship is a way to close the gender gap and can contribute to economic growth, job creation and productivity, which in turn can reduce poverty and promote personal and family development.

The contribution of small and medium-sized enterprises as income earners, generators of employment, poverty reduction and, above all, generators of wealth has been recognized worldwide. SMEs promote the economy, thus achieving the importance of knowing its operation and scope, within them, the role played by women in the attribution of the wealth of the countries is of utmost importance.

Through the studies carried out and investigated, it has been shown that women occupy a lower percentage of positions with high leadership and a higher percentage of informal jobs. This influences the high vulnerability of female participation, with prejudice being the main obstacle faced by women entrepreneurs, especially in the countries that have been part of this study.

The statistical analysis shows a very acceptable interrelation between the financial and accounting categories and quality and control in the production processes. It should be noted that there is a strong correlation between the quality and control variable and product design and development. This situation implies that strategies for new products and markets can be proposed based on quality as a sustainable competitive advantage.

The empowerment of women entrepreneurs linked to the strategies mentioned above, has an impact on a reduction or optimization of the cost, which leads to a structuring of prices accessible to the market perhaps with a very moderate level of income but which, however, generates acceptable returns which will project liquidity and sustainability in the long term, ensuring the permanence in the national and international market.

Reference

- Aguirre, J., Garro-Aburto, L., Quispe, R., & Cáceres, E. (2022). Credit evaluation in Peruvian microfinance institutions. *Revista Venezolana De Gerencia*, 27(98), 634-648. <https://doi.org/10.52080/rvgluz.27.98.16>
- Alvarado, A. (2022). The capabilities approach and variety engineering. A case for social cocreation of value. *AI and Society*, 37, p. 1269-1277. <https://doi.org/10.1007/s00146-021-01353-3>
- Bennett, M. J. (1993). Towards ethnorelativism: A developmental model of intercultural sensitivity. *Education for the Intercultural Experience*, 2, p. 21-71. DOI:10.1002/9781118783665.ieicc0182
- Castellanos, B. J. P. (2017). The use of deductive and inductive methods to increase the efficiency of digital evidence acquisition processing. *Cuadernos de contabilidad*, 18(46). <https://doi.org/10.11144/javeriana.cc18-46.umdi>
- Camarena, M (2018). Empowerment of women-led SMEs in Mexico City. *Universidad & Empresa*, 21(37), p. 76-107. <https://doi.org/10.12804/revistas.urosario.edu.co/empresa/a.6467>
- Duque A et al., (2021). Resilience, leadership and female entrepreneurship within the context of smes: Evidence from Latin America. *Sustainability*, 13(15), 8129, <https://doi.org/10.3390/su13158129>
- Enderica, O., Mayra, J., Lopez, M., Tinoco, E., & Carrion, G. (2018). Good leadership, an experience in the entrepreneurial growth of SMEs, *Revista Espacios*, 39(42), p. 4.

<https://www.revistaespacios.com/a18v39n42/18394204.html>

- Espinoza-Solia, E & Elgoibar, P. (2019). Leadership patterns in ecuadorian managers: the impact of gender and education. *Revista Inclusiones*; 6, (E), p. 178-197. <http://revistainclusiones.org/pdf35/11%20vol%206%20num%203%20especial2019julsep19incl.pdf>
- Franco-Ángel, M., and Awad Urbano, M. R. (2022). An analysis of Marketing Strategy in Colombian Small and Medium Sized Enterprises. *Estudios Gerenciales*, 38(165), 493-506. <https://doi.org/10.18046/j.estger.2022.165.5286>
- García, C., Y., Jimenez, M., & Escamilla, S. (2018). Women's Entrepreneurship in Ecuador. *Revista Publicando*, 5(14), p. 57-66. <https://revistapublicando.org/revista/index.php/crv/article/view/1094>
- García-Contreras, R., Valle-Cruz, D., and Canales-García, R. A. (2021). Organizational selection: resilience and performance of SMEs in the COVID-19 era. *Estudios Gerenciales*, 37(158), p. 73-84. <https://doi.org/10.18046/j.estger.2021.158.4291>.
- Güell, B., Arrasate, M., & Solé, A. (2020). Visibilizing strategies of agency and economic empowerment. The case of women of Pakistani origin in Barcelona. *Migrations*, (48), p. 51-78. <https://doi.org/10.14422/mig. i48y2020.003>.
- Huamán, M. (2021). Las palabras que debo decir. Essay on the images of our national identity. Lima/Arequipa: Dedo Crítico/ Apóstrofe, *Boletín de la Academia Peruana de la Lengua*, (71), p. 489-496, <http://dx.doi.org/10.46744/bapl.202201.017>

- Huamán, F., Guede, B., Cancino, C. A., & Cordova, M. (2022). Female entrepreneurship: High-impact perspective based on evidence from Chile and Peru. *Estudios Gerenciales*, 38(162), 45-56. <https://doi.org/10.18046/j.estger.2022.162.4586>
- Horta, R., Silveira, L., and Francia, H. (2020). Innovations and exports: a new perspective to study the Uruguayan manufacturing industry. *Estudios Gerenciales*, 36(157), p. 402-414. <https://doi.org/10.18046/j.estger.2020.157.3685>
- Medina, M. (2019). Feminist economics versus self-interested economic rationality. *Veritas. Journal of Philosophy and Theology*, 42, 29-48. <http://dx.doi.org/10.4067/S0718-92732019000100029>.
- Molina, E., Córdova, J., Gavilanes, Á., & Casanova, D. (2022). Gender diversity and performance in the Ecuadorian financial sector. *Revista Finanzas y Política Económica*, 14(2), p. 561-586. <https://doi.org/10.14718/revfinanzpolitecon.v14.n2.2022.10>.
- Ordóñez Parra, J., Luna Altamirano, K., Mendieta Andrade, P. and Rodríguez Barrero, M. S. (2023). Parallelisms in the administrative and financial management of artisans in Ecuador and Colombia, *Revista Venezolana de Gerencia*, 28(101), 400-418. <https://doi.org/10.52080/rvgluz.28.101.25>
- Pacheco, L., and Pedrinho, B. (2022). The determinants of SME economic and financial performance: the role of foreign capital. *Estudios Gerenciales*, 38(164), 334-346. <https://doi.org/10.18046/j.estger.2022.164.5104>.
- Pichler, E., & Wallace, M. (2009). Social Capital and Social

- class in Europe: The role of social networks in social stratification, *European Sociological Review*, 25(3), p. 319-332, doi:10.1093/esr/jcn050.
- Rodríguez, A., & Canossa, O., Héctor (2021). Financing strategies, a challenge for commercial SMEs in Guanacaste. *InterSedes: Revista de las Sedes Regionales*, (42), p.104-117, doi: 10.15517/isucr.v20i42.41845.
- Salas-Arbeláez, L., García- Solarte, M., and Azuero-Rodríguez, A. R. (2020). Effect of corporate social responsibility on the Colombian post-conflict: the case of SMEs. *Estudios Gerenciales*, 36(154), 80-90. <https://doi.org/10.18046/j.estger.2020.154.3547>
- Saavedra Garcia, M. L. (2020). Competitiveness in women-led MSMEs in Mexico City. *Ciencias Administrativas*, 15, 055. <https://doi.org/10.24215/23143738e055>.
- Sánchez, J. (2003). Integral strategy for innovative SMEs. *Revista Escuela de Administración de Negocios*, (47). p.34-45
<https://www.redalyc.org/articulo.oa?id=20604703>
- M'zungu S.; Merrilless B. & Miller D. (2017). Growth and networks among women-owned small and medium-sized enterprises (SMEs) in Denmark. *Journal of Small Business Management*, 57(3), p. 943-965. <https://doi.org/10.1111/jsbm.12387>
- Schenkel, E., & Pérez, M. I. (2019). A theoretical approach to qualitative research as a methodological approach. *Acta Geográfica*, 12(30), 227-233. <https://doi.org/10.5654/acta.v12i30.5201>

- Vázquez-Parra, J. C., Arredondo-Trapero, F. G., & de la Garza-García, J. (2020). Social commitment and its impact on corporate volunteering. An approach from gender and age variables. *Estudios Gerenciales*, 36(157), 428-438. <https://doi.org/10.18046/j.estger.2020.157.3879>.
- Solarte, S., Solarte, M., and Barahona, J. (2020). Organizational culture and innovation in the market orientation of family businesses in Pasto (Colombia). *Contaduría y administración*, 65(1) E 149. <https://doi.org/10.22201/fca.24488410e.2019.1725>.
- Vega, C., & Bermudez, H. (2019). Informality, entrepreneurship and female empowerment. Popular economy and paradoxes of direct sales in the south of Quito (Ecuador). *Revista de Antropología Social*, 28(2), 345-370. <https://doi.org/10.5209/raso.65618>
- Villaseca, D., Navío, J., and Gimeno, R. (2020). Money for female entrepreneurs does not grow on trees: start-ups' financing implications in times of COVID-19. *Journal of Entrepreneurship in Emerging Economies*, 13(4), 698-720. doi:10.1108/JEEE-06-2020-0172.
- Zou, N., and Storz, C. (2023). Why do some entrepreneurs thrive? A network content perspective. *Journal of Business Research*, 161, 113821. <https://doi.org/10.1016/J.JBUSRES.2023.113821>

Incidence of personal attitude on the entrepreneurial intention of university students

Marcos Eduardo Cantos Ochoa

Professor of the Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca. Doctor in Social Sciences. Mention: Management from the Universidad del Zulia, Venezuela. Master in Integral Auditing from the Universidad Técnica Particular del Loja, Ecuador. Business Engineer by the Catholic University of Cuenca. mecantoso@ucacue.edu.ec. <https://orcid.org/0000-0002-3340-5085>.

Patricio Esteban Mendieta Andrade

Professor at the Academic Unit of Economic and Business Sciences at the Catholic University of Cuenca. PhD candidate in Philosophy at the Universidad Autónoma de Nuevo León, Mexico. Master in Technological Management from the University of Azuay. Commercial Engineer from the University of Azuay, E-mail: pmendietaa@ucacue.edu.ec. <http://orcid.org/0000-0001-9596-4344>.

José Alciviades Guzmán Ávila

Professor at the Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca. Master in Entrepreneurial Development and Innovation, University of Salamanca, Spain. Specialist in University Teaching, Catholic University of Cuenca. Higher Diploma in Sectional Government Management, Universidad del Azuay. Economist, Catholic University of Cuenca. E-mail: jguzman@ucacue.edu.ec. <https://orcid.org/0000-0002-1558-8826>.

Juan José Brito Corral

Professor at the Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca. Master in Neuromarketing from the International University of La Rioja, Spain. Object Designer from the University of Azuay, Ecuador. E-mail: juan.brito@ucacue.edu.ec. <https://orcid.org/0009-0004-9228-4246>.

Introduction

Currently, entrepreneurship stands out as a crucial tool to boost productivity and job creation, fostering initiative and the ability to face challenges. These skills are applied in work and personal environments, which contributes to the development of capacities to establish businesses, as well as to the stimulation of teamwork, innovation and problem solving in diverse environments (Mendoza et al., 2024).

However, obstacles to starting one's own business arise from the lack of a favorable environment, related to government policies, access to financing, innovation programs, expert support and availability of adequate infrastructure (Mendoza, et al., 2023).

According to Mamani et al. (2022) worldwide, unemployment has reached worrying levels due to the lack of collaboration between governments, entrepreneurs and investors, therefore, they highlight the importance of universities assuming a leading role in the training of students so that they can succeed in the entrepreneurial field and face real market challenges. In this context educational entrepreneurship, as Azqueta (2019) points out, promotes innovative ideas that enrich the understanding of business from a sustainable and effective perspective, thus stimulating the personal development of students and encouraging the creation of new entrepreneurs.

In this framework, Martínez et al. (2021) state that entrepreneurship training is effective in strengthening the

business ideas of university students, and the crucial intentions focus on personal, training and environmental aspects.

In this regard, the study by Chambi and Arohuanca (2019) recognizes that several researchers have shown that personal attitude is closely related to the ability to anticipate entrepreneurial intention (EI), the latter understood as the personal and recognized certainty of starting a new business and consciously planning to carry it out at some point in the future.

Based on the preceding paragraphs, the following research question arises: How does the personal attitude of university students affect their entrepreneurial intention? Therefore, the main objective of this study focuses on analyzing the effect of the personal attitude of university students on their entrepreneurial intention, identifying the dimensions that significantly influence this relationship. As a hypothesis, it is proposed that students' personal attitude has a positive impact on their EI.

This research is defined as quantitative in nature, given that from a numerical reference of a phenomenon we intend to understand the relationships involved, for which in the first instance the questionnaire is evaluated under a statistical perspective such as Crombach's Alpha coefficient, which is contrasted with the application of the computerized facial coding tool (facereader), After confirming the validity of the questionnaire, exploratory and confirmatory factor analysis is applied in order to establish the fit of the model, and after evaluating and proceeding to remove outlier and its

disturbing effect, the structural equation model is established, with its corresponding path graph, to finally evaluate the hypotheses based on the significance found in the effects of the explanatory variables on the research variable.

In this context, it is important to highlight the importance of promoting economic development based on knowledge, encouraging entrepreneurship as an integral component of university culture, in order to train students to identify opportunities (Martínez et al., 2023). According to Dávila et al. (2022) it is important to promote entrepreneurship in university education through innovative teaching methods and the development of creative skills within educational institutions, contributing to the advancement of science and society in general. Therefore, the present study contributes to the knowledge of the proposed phenomenon, constituting an empirical study that seeks to evaluate the hypotheses proposed in a real university environment.

After this introductory section, the theoretical bases of the variables involved are established, followed by a description of the research methodology used. Next, the relevant results are presented, which will later be contrasted with similar studies on the subject, and finally the conclusions are presented.

Theoretical analysis

EI is defined as the mental will or disposition to direct someone towards a particular goal, which in this context would be starting a business (Vélez et al., 2020). According to Jena (2020), attitudes can be understood as the favorable,

unfavorable or neutral orientation that a person has towards an object or concept; thus, intention, among other factors, can predict people's actual behavior.

From this perspective, attitude refers to the set of beliefs, feelings and predispositions of a person towards a specific object, idea or situation; therefore, this mentality facilitates the advancement and promotion of innovative and entrepreneurial processes (Bolaños et al., 2024). The attitude of entrepreneurs is fundamental to identify and take advantage of opportunities, as well as to make decisions in times of uncertainty (Moreno, 2019).

In this context, the entrepreneurial attitude is linked to how someone evaluates entrepreneurial activity (Llanos et al., 2021). According to Amanta (2022), it implies a commitment and active dedication towards the project during its execution period. This disposition offers a signal of the behavior linked to the commitment to undertake an initiative, given that this behavior may be difficult to observe or involve non-predictable time intervals (Mardzuki et al., 2018).

During the initial stage of entrepreneurship, when EI begins to manifest itself, it is crucial to highlight the fundamental role played by people's attitude; according to Drucker (1985), presenting an adequate attitude in a business environment is generally related to perseverance, originality, willingness to take risks and the ability to handle failure.

Attitudes towards entrepreneurship provide information about people's willingness to start a business, which helps to understand their general perception of entrepreneurship, in

this domain they are defined as the level of appreciation or disapproval a person has towards founding a business (Kyvik, 2018). In the context of entrepreneurship, these attitudes can be related to the desire to start a business, as they reflect the perception a person has about entrepreneurship and its potential achievements.

From the point of view of theories that frame people's attitude, the Theory of Reasoned Action (TAR) emphasizes that human beings are rational beings and make decisions based on attitudinal and normative factors that precede their behavior; it is argued that intention precedes action, and that the latter is influenced by the individual's disposition and ability to control his or her behavior (Diez, 2020).

In this regard, Bullón et al. (2023) highlight ART for its scientific approach to analyze human behaviors, especially in the field of entrepreneurship, a topic of great complexity and relevance due to its impact on the economy, with a particular emphasis on employment generation.

Ajzen (1991), based on the TAR findings, presents the Theory of Planned Behavior (TCP), which proposes that human actions are influenced by three main factors: attitude towards behavior, subjective norm and perception of behavioral control. According to this theory, the combination of these variables determines a person's intention to carry out a specific action, which in turn predicts his or her actual behavior.

In analyzing the factors that influence entrepreneurial intention, the studies by Shapero and Sokol (1982), Ajzen's TCP (1991) and Krueger and Brazeal's (1994) Entrepreneurial Potential Model (EPM) analyze several variables such as the perceived desirability and feasibility of entrepreneurial behavior, together with the propensity to undertake. However, they differ in their approaches to the perceived feasibility variable; Shapero and Sokol view it as perceived control over the causes of the event, while Krueger and Brazeal view it as the perception of having the necessary personal capabilities.

An alternative perspective has been proposed by Robinson et al. (1991) through the Entrepreneurial Attitude Orientation Model (EAO). This model focuses on attitudes, considering them as the main driver behind entrepreneurial action. In contrast to the traditional approaches outlined by Ajzen (1991) or Krueger and Brazeal (1994), which although they share certain aspects with Robinson et al. (1991) in terms of skill perception and internal control, the latter focuses on how attitudes and personality traits influence entrepreneurial behavior.

On the other hand, from an approach similar to that proposed in the personal attitude variable, several studies recognize the innate personality traits or those developed through learning or the experience of individuals as the basis for the specification of their capabilities and competencies. Among these, the importance of the willingness to take risks and face adversities stands out (Flores et al., 2021; Montufar, 2020).

Based on the above, this study identifies the independent variable of personal attitudes, analyzed through the factors of self-efficacy (AEF), risk propensity (RP) and LCI (LCI). Next, in order to understand and establish the theoretical basis of this chapter, the theoretical framework corresponding to each one is presented.

Self-efficacy

It is crucial to examine the EFA factor, which, after being incorporated by Ajzen as a determinant of EI, becomes a central pillar of Bandura's (1977) Social Cognitive Theory. In this context, the authors refer to EFA as the personal perception of one's own capabilities in specific situations, suggesting that those individuals with a high sense of EFA are more likely to approach challenging tasks as opportunities to be mastered, rather than to avoid them.

Thus, according to Bandura (1977), both motivations and human behavior are conditioned by thought and the type of expectations it entails; differentiating between expectations of efficacy, which are related to the certainty of achieving an objective through a specific behavior, and on the other hand, expectations of obtaining a desired result with said behavior.

Wardana et al. (2020) highlight the close and significant relationship between entrepreneurial attitudes and entrepreneurial mindset. Therefore, they are considered a crucial factor in determining entrepreneurial intention. In this regard, Ajzen argues that behavioral control affects this

attitude through two elements: self-confidence (self-efficacy) and the ability to influence outcomes (controllability) (Martín, 2021).

EI and entrepreneurial EFA are important issues in entrepreneurship, as they influence the creation of policies for entrepreneurial development. Entrepreneurship is recognized as a complex process that begins with the intention to undertake, while perceived EFA drives people to seek occupations considered viable (D'Armas et al., 2022). Thus, according to Quinde and Alava (2024) EFA would influence the creation of a business, while reinforcing the necessary skills and knowledge required to start and maintain a successful venture in the future.

Thus, EFA, according to various studies (Salazar et al., 2014; Morales et al., 2018; Huerta et al., 2023), is defined as confidence in personal abilities to plan and execute actions that lead to the achievement of specific goals, playing a crucial role in people's motivation, emotional states, thoughts and actions. Those who perceive themselves as effective tend to have an optimistic view of their capabilities, make decisions about their lives and pursue personal and business goals with conviction, security and determination, which facilitates more effective time management and better work performance. Therefore, the first hypothesis of the present work is stated in the following terms:

H1= EFA positively and significantly affects EI of college students.

Risk appetite

At this point it is relevant to highlight Knight's Risk Entrepreneur Theory (1947), which establishes that all individual planning implies a level of uncertainty, where the latter refers to randomness with unknown probabilities. This theory differentiates uncertainty from risk, defining the latter as the randomness of outcomes with known probabilities (Querejazu, 2020).

In this context, Rocha and Giraldo (2015) emphasize that fear is a natural characteristic of human beings, evolving as a defense mechanism. Entrepreneurs are distinguished by their ability to overcome the fear of failure and, as they gain confidence, they face risk with greater success. This ability of entrepreneurs to manage fear is closely linked to their risk aversion, which implies a tendency to avoid dangerous situations and has been associated with the decision to start a business. In this way, the link between RP and entrepreneurship is evident, where all business activity involves some degree of uncertainty. In this context, assuming these risks refers to a person's willingness to commit to opportunities that may result in failure (Sanchez, 2011).

The connection between risk-taking and entrepreneurship has been constant throughout history, it can be conceptualized as an individual attitude that seeks to take advantage of any situation to make decisions, due to the uncertainty inherent in the creation of new products or services, where success cannot be guaranteed in terms of product preference, consumer satisfaction or profit (Al Mamun, et al., 2016).

The willingness to take risks according to Contreras (2017) is linked to both attitude towards behavior and perceived behavioral control, variables that are part of the model proposed by Ajzen (1991). Risk tolerance has also been associated with perceived feasibility and willingness to take action, concepts included in the models of Shapero and Sokol (1982) and Krueger and Brazeal (1994). The second hypothesis of the present research is specified in the preceding framework:

H2= PR positively and significantly affects the EI of university students.

Internal locus of control

Mental locus of control is a concept that refers to a person's perception of the cause of events in his or her life. In this sense Rotter (1966) proposes that people have a general disposition to perceive events as controllable by themselves (LCI) or as controlled by external forces such as fate or luck (external locus of control). This disposition influences how people face challenges, make decisions, and behave in their lives.

A person's perception of control over his or her own abilities and the opportunities available to perform certain behavior is based on his or her control beliefs. These beliefs may arise from personal experience or from information influenced by the social and family environment. When more support is received and fewer difficulties are perceived, the perception of control over the behavior increases. This perception of

control is considered a determining factor in EI (Torres & Vidal, 2019).

Timmy et al, (2022) studying the determinants of entrepreneurial intention in 242 university respondents through structural equation modeling revealed that LCI facilitates perceived behavioral control; thus their results confirm locus of control as a cognitive personality trait that facilitates the cognitive constructs of the theory of planned behavior. Similar to the study by Giang et al, (2022) which showed in a sample of 962 Vietnamese university students that the influence of opportunity recognition on entrepreneurial intentions was positively moderated by LCI. With the above background in reference to the LCI dimension, the third hypothesis of the present study is proposed:

H3= Internal locus of control positively and significantly affects EI of college students.

Methodological Process and Results

The approach of the present study was designed with quantitative characters, because mathematical and statistical tools are used to analyze the phenomenon under analysis, with the aim of describing and explaining it from the numerical data that characterize it (Ali et al. 2021). In this regard, research such as Usman and Yennita (2019), Al-Jubari et al. (2019), and Shi et al. (2020), among others, support the validity of using this approach in the analysis of entrepreneurial intentions, a fundamental variable in our study.

In this order of ideas, the research is descriptive, exploratory and correlational. According to Manterola et al. (2019), Saunders et al. (2012) and Seeram (2019), they consist of describing variables in a specific group of subjects during a short period without using control groups; it poses general questions about a new topic and adjusts its focus as the study progresses, and seeks to identify the relationships between two or more variables in a specific context.

Regarding the types of research employed in this study, several works have been identified that analyze entrepreneurial intentions with a descriptive approach Usman and Yennita (2019), Iwu et al. (2021). In addition, researchers such as Kwapisz (2019) and Matos and Hall (2021) have conducted their studies from an exploratory perspective, investigating the presence of governmental and legal barriers to entrepreneurship promotion. This provides a frame of reference on the applicability of this type of study to innovative phenomena, such as the one addressed here. Finally, the study is correlational, as several works cited above have employed this approach to achieve their stated objectives.

It is important to point out that different research methods were used in this project. Firstly, the documentary methodology was used, which made it possible to identify, compile and analyze documents related to the study phenomenon and its environment, facilitating the exploration of previously published contributions on the subject. Likewise, the field methodology was employed, through which a survey was carried out, using the questionnaire as a means of

measurement, with the purpose of testing the various theoretical hypotheses proposed in order to achieve the research objective established.

The design of the instrument considered using the Likert scale, which is an ordinal scale that evaluates the degree of agreement of an individual with a specific statement (Graus, 2020). In this area Zambrano (2018), Vlelra and Rodríguez (2019) and Chacón and Martínez (2020), argue that the use of a 7-point scale offers more response options, which increases the probability of obtaining an objective response. In addition, it is highlighted that by using this scale it would be considered as an interval or ratio scale, which would facilitate its analysis by parametric statistical methods, with benefits to ensure the robustness of the information analysis.

Based on the above, it was proposed to use a 7-point Likert scale for all the variables proposed, with alternatives ranging from 1, which represents total disagreement, to 7, which indicates total agreement. See Table 1.

Table 1. *Qualitative-quantitative Likert Scale scale*

| QUANTITATIVE VALUE | VALUE QUALITATIVE |
|-----------------------|----------------------------|
| 7 | Strongly disagree |
| 6 | Disagree |
| 5 | Somewhat at odds |
| 4 | Neither agree nor disagree |
| 3 | Somewhat in agreement |
| 2 | Agreed |
| 1 | Totally agree |

Note: This table shows the quantitative and qualitative values of the Likert scale applied. **Source:** Zambrano (2018), Vlelra and Rodriguez (2019) and Chacon and Martinez (2020).

Regarding the construction of the questionnaire in the first instance, to measure EI, the questions used for this purpose in Zhang & Huang's research were adapted to Spanish. (2021) which at the time reported acceptable reliability and validity statistics ($\alpha = 0.817$; AVE = 0.76). As for the AEF, the questionnaire used by Jácome and Jácome (2020) which reported a value for Crombrach's Alpha of 0.79. The items corresponding to the PR dimension were obtained from the instrument used by Sharma (2010) and Zurriaga-Carda et al. (2016) in their research (they refer $\alpha = 0.85$ and $\alpha = 0.753$, respectively) and finally to specify the items of the LCI dimension we started from the instruments of Kopalle et al. (2010) which reported a Crombach's Alpha of 0.753.

The population under study refers to 535 students of the Catholic University of Cuenca. To determine the size of the sample needed for this research work, we take into consideration the indications of Rositas (2014), who includes, among a set of useful tools for estimating this size, Equation 1:

$$n = \frac{NPQ}{(N-1)\left(\frac{e}{z}\right)^2 + PQ}$$

Equation 1. Sample Size Calculation Formula

As a result of the above, it is established that the sample for the study consists of 224 people, to whom a previously

designed instrument will be applied to collect the necessary information, being that the instrument was effectively applied to 186 students of Business Administration, Accounting and Auditing, Market Intelligence and Economics of the Catholic University of Cuenca, Ecuador. Likewise, an incidental non-probabilistic sampling was used, purposively selecting individuals from the population to be surveyed.

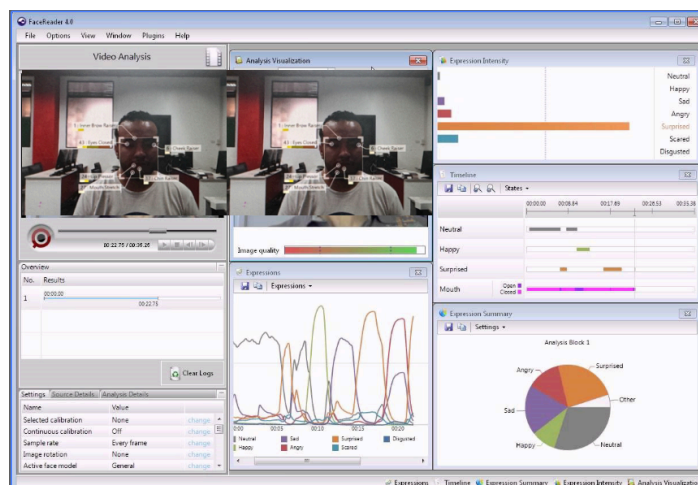
During the analysis of the information obtained, the statistical software SPSS (Statistical Package for the Social Sciences) was used to calculate Cronbach's Alpha coefficient and to evaluate the reliability of the instrument, as well as to carry out correlation analyses. Before performing the calculations, an inspection of the data is carried out in search of outliers and linear relationships. Finally, the association between variables and constructs is determined through the multiple linear regression model.

Data analysis

As an a priori hypothesis to the three theoretical hypotheses raised, it is established that the analysis carried out with the computerized facial coding tool (facereader) will coincide with the analysis carried out by means of statistical procedures such as Cronbach's Alpha coefficient and factorial analysis. Thus, the facereader technique was applied to a sub-sample of 40 respondents, who were submitted to the questions posed in the instrument of this research, to determine the emotions generated in each one of them and to contrast with the tabulated answers.

The data recorded on facial expression are the so-called Action Units (AU), which are performed by one or more muscles that are in contraction or relaxation. This technique can encode the anatomical facial expressions of human beings, the AUs are independent of any interpretation, thus serving the system a high utility for the scientific field. The computer analysis was performed with the FaceReader software, which is a computer program for automatic emotion recognition based on the analysis of facial expressions. The software works in 3 phases: in the initial phase it detects the interviewee's face (Figure 1), then it detects the key points of the face, which it contrasts with those of a three-dimensional model, and then it proceeds to decode the emotions presented.

Figure 1. Screenshot of Facereader software running with one of the study participants.



Note: Prepared by the authors based on research data.

It is noted that the system can encode virtually any anatomically possible facial expression through its deconstruction into specific action units and their temporal segments. The AUs are independent of any interpretation, which gives the system a high utility for the scientific domain.

Thus, in line with what has been presented, it is evident that in the EI construct, item 1 is the one that obtains the greatest variability, showing an average of 0.81 standard deviations, which would show amplitude in the emotional reactions that respondents refer to the question posed, according to the data presented in Table 2.

Table 2. *Standard deviation and average of the standard deviations of the variable IE*

| Ask | Happiness | Surprise | Anger | Disgust | Fear | Sadness | Average standard deviations |
|-----|-----------|----------|-------|---------|------|---------|-----------------------------|
| i1 | 3,93 | 0,36 | 0,29 | 0,16 | 0,07 | 0,07 | 0,81 |
| i2 | 0,72 | 0,59 | 0,35 | 0,20 | 0,08 | 0,07 | 0,33 |
| i3 | 0,43 | 0,81 | 0,64 | 0,20 | 0,10 | 0,10 | 0,38 |
| i4 | 1,30 | 1,00 | 0,44 | 0,29 | 0,05 | 0,09 | 0,53 |
| i5 | 0,60 | 1,18 | 0,38 | 0,26 | 0,06 | 0,10 | 0,43 |

Note: Prepared by the authors based on research data.

With regard to the FEA dimension, according to the data presented in Table 3, greater stability is evident, in general, in the emotional responses to the questions posed, with item a6 being the item that shows the greatest variability (0.83).

Table 3. Standard deviation and average of the standard deviations of the FEA dimension

| Ask | Happiness | Surprise | Anger | Disgust | Fear | Sadness | Average standard deviations |
|-----|-----------|----------|-------|---------|------|---------|-----------------------------|
| a1 | 0,44 | 1,54 | 0,57 | 0,12 | 0,08 | 0,08 | 0,47 |
| a2 | 0,78 | 1,13 | 0,79 | 0,42 | 0,11 | 0,08 | 0,55 |
| a3 | 0,99 | 1,59 | 0,46 | 0,14 | 0,09 | 0,08 | 0,56 |
| a4 | 1,16 | 1,02 | 0,42 | 0,37 | 0,10 | 0,07 | 0,52 |
| a5 | 1,16 | 1,02 | 0,42 | 0,37 | 0,10 | 0,07 | 0,52 |
| a6 | 1,59 | 1,95 | 1,04 | 0,24 | 0,08 | 0,08 | 0,83 |
| a7 | 1,52 | 1,32 | 0,95 | 0,14 | 0,10 | 0,08 | 0,68 |

Note: Prepared by the authors based on research data.

According to the data referred to in Table 4 in the PR dimension, items p1, p5 and p6 show the highest average standard deviations, which shows their variability in terms of the emotions aroused by each of the questions.

Table 4. Standard deviation and average of the standard deviations of the FEA dimension

| Ask | Happiness | Surprise | Anger | Disgust | Fear | Sadness | Average standard deviations |
|-----|-----------|----------|-------|---------|------|---------|-----------------------------|
| p1 | 2,56 | 1,80 | 0,37 | 0,07 | 0,08 | 0,06 | 0,82 |
| p2 | 1,12 | 0,45 | 0,39 | 0,10 | 0,08 | 0,07 | 0,37 |
| p3 | 1,88 | 1,01 | 0,26 | 0,07 | 0,08 | 0,09 | 0,57 |
| p4 | 1,43 | 1,09 | 0,14 | 0,10 | 0,08 | 0,13 | 0,49 |
| p5 | 2,69 | 1,66 | 0,37 | 0,07 | 0,08 | 0,11 | 0,83 |

p6 3,14 1,20 0,27 0,10 0,07 0,06 0,81

Note: Prepared by the authors based on research data.

Regarding the LCI dimension, it is evident that item i5 shows a higher degree of variability in emotions (see Table 5).

Table 5. *Standard deviation and average of the standard deviations of the FEA dimension*

| Ask | Happiness | Surprise | Anger | Disgust | Fear | Sadness | Average standard deviations |
|-----|-----------|----------|-------|---------|------|---------|-----------------------------|
| I1 | 1,02 | 0,38 | 0,45 | 0,06 | 0,07 | 0,09 | 0,34 |
| I2 | 2,66 | 0,60 | 0,45 | 0,07 | 0,08 | 0,08 | 0,66 |
| I3 | 0,75 | 1,27 | 0,46 | 0,07 | 0,10 | 0,07 | 0,45 |
| I4 | 1,02 | 1,26 | 0,16 | 0,08 | 0,09 | 0,10 | 0,45 |
| I5 | 3,59 | 0,79 | 0,16 | 0,08 | 0,12 | 0,08 | 0,80 |

Note: Prepared by the authors based on research data.

At the statistical analysis level, the reliability and validity of the EI, EFA, PR and LCI scales were evaluated with SPSS and AMOS. Cronbach's alpha coefficient was applied as a measure of reliability; Cronbach's alpha was found to be 0.867, 0.929, 0.913, 0.867 for the IE, AEF, PR, LCI scales in their order, as shown in Table 6. It is noted that for the IE variable, item 2 is considered to be removed, which increases the statistic to a value of 0.924, and on the other hand, it refers to greater simplicity in the analysis.

The validity of the questionnaire was tested with exploratory factor analysis and confirmatory factor analysis. The KMO values for the IE, AEF, PR, LCI scales are 0.846, 0.915, 0.904

and 0.855 respectively, as presented in Table 2, all presenting a p value < 0.001 . Consequently, the three scales are considered to have good structural validity. It is confirmed that item 2 of the EI variable presents a factorial load outside the factor, so it is considered congruent to remove this item from the analysis.

Table 6. *Crombach's Alpha score and exploratory factor analysis tests.*

| | | IE | AEF | PR | LCI |
|------------|---------------------------------------|-------------|-------------|-------------|-------------|
| Relativity | Crombach Alpha | 0,867 | 0,929 | 0,913 | 0,867 |
| | KMO | 0,846 | 0,915 | 0,904 | 0,855 |
| | Bartlett's test of sphericity P-value | <0,01 | <0,01 | <0,01 | <0,01 |
| Valides | Total variance explained | 82,09% | 71,06% | 69,97% | 65,81% |
| | Load factor | 0,844~0,941 | 0,688~0,910 | 0,773~0,887 | 0,746~0,855 |

Note: Own elaboration based on the analysis of results with the SPSS AMOS program.

Based on the verification of several indicators, the three scales adopted in this study are considered to have good reliability and validity, which supports the report that they include accurate and effective questions and can collect reliable research data.

The different indicators are reviewed in order to assess model fit; thus the GFI (Goodness of Fit Index) measures the proportion of variance-covariance in the observed data that is explained by the specified model, the CFI (Comparative Fit

Index) as a measure of the proportion of improvement in the fit statistic based on non-centrality; the IFI (Incremental Fit Index) evaluates the improvement in the fit of a specified model compared to a null model, adjusting for model complexity, and the TLI (Tucker-Lewis Index) as an indicator of the proportion of improvement in the expected χ^2 values provided by the estimated model relative to the null model; values (GFI=0.905 CFI=0.915; IFI=0.916 and TLI=0.902, as shown in Table 3) were found at a general level in the model, which would indicate a good model fit according to the specifications of Torres (2020).

Table 7. Results of the confirmatory factor analysis tests per factor

| | GFI (>0,9) | IFC (>0,9) | IFI (>0,9) | TLI (>0,9) |
|-----|---------------|---------------|---------------|---------------|
| AEF | 0,909 | 0,956 | 0,956 | 0,933 |
| PR | 0,971 | 0,931 | 0,988 | 0,979 |
| LCI | 0,919 | 0,973 | 0,983 | 0,965 |

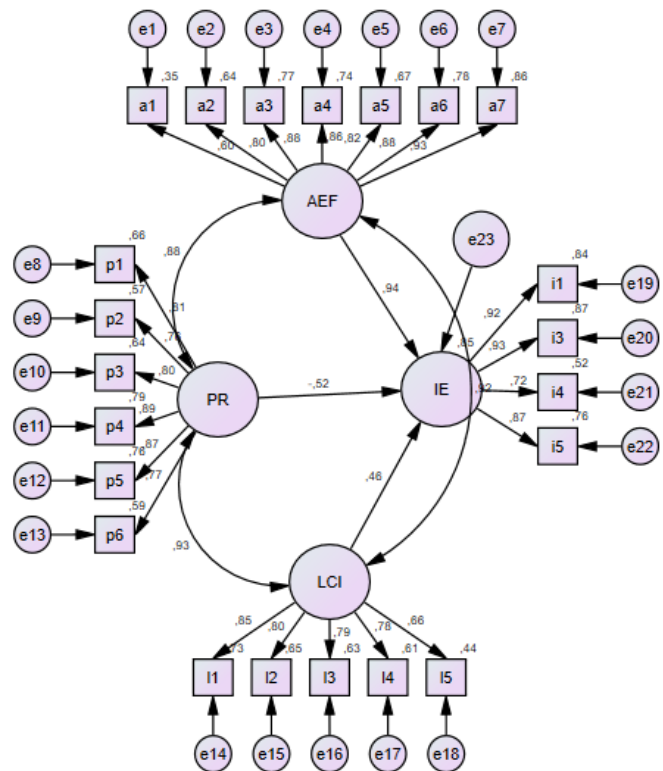
Note: Own elaboration based on the analysis of results with the SPSS AMOS program.

Structural equation modeling test

After the analysis of the reliability and general validity of the three factors, namely, AEF, PR, LCI, AMOS is adopted to build a structural equation model, which generates a model with path coefficients, presented in Figure 2, performing analysis on the effects of the path. This step is applied to verify Hypothesis 1, Hypothesis 2 and Hypothesis 3.

To present the relationship between the endogenous variable IE and the exogenous variables AEF, PR, LCI, a structural equation model is specified (Figure 2) based on the assumptions of the study:

Figure 2. Structural equation modeling, path diagram, coefficients and partial correlations.



Note: Prepared by the authors based on research data.

With the analysis of the structural equation modeling diagram of the EI scale and its explanatory variables AEF, PR and LCI, the results of the model fit evaluation are presented in Table 8. Most of the indicators meet the ideal standard (GFI = 0.901, CFI = 0.909, IFI = 0.910 and TLI = 0.901), indicating that the model fits. This suggests that the hypotheses may be established in the model.

Table 8. *Evaluation of model fit*

| Model evaluation | GFI | IFC | IFI | TLI |
|------------------|--------|--------|--------|--------|
| | (>0,9) | (>0,9) | (>0,9) | (>0,9) |
| Results | 0,901 | 0,909 | 0,910 | 0,901 |

Note: Own elaboration based on the analysis of results with the SPSS AMOS program.

When running the structural equation model based on the data collected (Table 9). A positive and statistically significant effect of EFA ($\beta=0.94$; $p<0.05$), on EI is evident; the existence of a positive, but not significant effect ($\beta=0.46$; $p>0.05$) of LCI on EI is recognized and finally a statistically non-significant negative effect ($\beta=-0.56$; $p>0.05$) of RP on EI in the study group. Similarly, Table 5 shows the positive and significant correlation between the factors AEF and PR; AEF and LCI; PR and LCI.

Table 9. *Evaluation of the effects of the factors*

| | | | Estimate | S.E. | C.R. | P | Label |
|-----|------|-----|----------|-------|--------|-------|--------|
| IE | <--- | AEF | 1,104 | 0,209 | 5,284 | *** | par_19 |
| IE | <--- | LCI | 0,507 | 0,266 | 1,904 | 0,057 | par_20 |
| IE | <--- | PR | -0,509 | 0,185 | -2,749 | 0,006 | par_21 |
| AEF | <--> | PR | 1,096 | 0,188 | 5,817 | *** | par_22 |
| AEF | <--> | LCI | 1,015 | 0,184 | 5,521 | *** | par_23 |
| PR | <--> | LCI | 1,24 | 0,199 | 6,243 | *** | par_24 |

Note: Own evaluation based on research data.

*** <0,001

In reference to the results obtained, H2 and H3 are rejected; being that, based on the analysis developed, H1 is not rejected, so it is accepted that in the study group the theoretical hypothesis that EFA positively and significantly affects the EI of the students studied is accepted.

The results of the present research contribute to the understanding of a phenomenon that has been widely studied and of which different contributions have been made; in this way, three theoretical hypotheses were put forward in the work developed, namely the first one by which EFA would have a positive and significant effect on EI, which was confirmed in the present study; thus confirming that the perception of university students' own abilities influences their entrepreneurial intention.

In this context, the results of the present study coincide with Bandura's postulates, in the sense that the intention towards a behavior is conditioned by the expectations of achieving the objectives and the certainty of having the ability to achieve them.

In this same sense, it is important to highlight the notes of Ajzen, who already highlights the role of self-confidence in the attitude and then entrepreneurial behavior, an aspect that is evident today, since it is important to recognize the motivating effect that the positive messages they receive through social networks, mainly, have on young students, and that could become factors that enhance the intention to start their own business.

In this context, it is worth highlighting the role of the university ecosystem as a driving factor for the entrepreneurial intention of students, since, according to authors such as Salazar et al., Morales et al. and Huerta et al., the self-confidence of students is solidified with the development of the ability to plan and execute actions that lead to the achievement of the goal, in this case to the creation of a company that generates benefits for the entrepreneur.

On the other hand, recognizing that the hypothesis that both risk propensity and locus of mental control affect in a non-statistically significant way in the present research is rejected, shows that the context of the research may affect the results of the same, since risk, being defined as the level of uncertainty, which in colloquial terms implies the natural fear

of human beings of the unknown, is not considered an important aspect in the development of EI of the study group.

Finally, the present study rejected the hypothesis that the LCI would affect the development of entrepreneurial intention; for the study group, the LCI, understood as the person's perception of control over his or her abilities, skills and achievements, is not a preponderant factor for the development of EI.

Conclusions

In response to the objective of this research to analyze the effect of the personal attitude of university students on their entrepreneurial intentions, identifying the dimensions that significantly influence this relationship, it is highlighted, from the literature review, that the study of the personal attitude construct can be studied through three dimensions, namely, self-efficacy, risk propensity and internal locus of control, finding theoretical evidence of the effect of these three dimensions on entrepreneurial intentions.

The contribution of the present research is evident in that it presents a viable alternative to evaluate the internal consistency of the questionnaire, finding items that showed greater variability in the emotional effects measured in response to the items proposed.

Regarding the evaluation of the instrument and its consistency, it is specified as pertinent from the postulates of Crombach's Alpha coefficient and the factor analysis, being that after specifying a good fit in the model, the positive and

significant relationship of the EFA in EI is verified; being that the PR and LCI dimensions have a non-significant effect on the studied variable.

From the above it can be concluded that the study of EI is very broad and includes a large spectrum of explanatory variables, which in this case were restricted to those related to personal attitudes, where it could be said that a partial effect is verified, since it is specified that one of the three dimensions proposed is significantly incident.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
- Al Mamun, A., Binti Che Naw, N., Dewiendren, A., & Fazira Binti, S. (2016). Examining the effects of entrepreneurial competencies on students' entrepreneurial intention. *Mediterranean Journal of Social Sciences*, 7(2), 119-127. Doi:10.5901/mjss.2016.v7n2p119.
- Ali, F., Koseoglu, M., Okumus, F., Putra, E., Yildiz, M., & Dogan, I. (2021). Is lodging research suffering from methods bias? An assessment of published research during 1990-2016. *Journal of Hospitality and Tourism Technology*, 12(3), 423-438, 423-438.
- Al-Jubari, I., Hassan, A., & Liñan, F. (2019). Entrepreneurial intention among University students in Malaysia: integrating self-determination theory and the theory of planned behavior. *International Entrepreneurship and Management Journal*, 15(4), 1323-1342.

- Ananta, R. (2022). Does entrepreneurship education promote students entrepreneurial intentions in Indonesia? The mediating role of motivation and attitude. *Proceedings on Engineering Sciences*, 4(2), 125-136. <https://doi.org/10.24874/PES04.02.003>.
- Azqueta, A. (2019). Analysis of the 'entrepreneur' concept and its incorporation into education. *Teoría de la Educación*, 31(1), 57-80. <https://doi.org/10.14201/teri.19756>.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191.
- Bolaños, P., Vargas, V., Orozco, E., & Naranjo, M. (2024). Factor analysis for the assessment of entrepreneurial attitude in higher education students. *Revista de Ciencias Sociales*, XXX(1), 361-380. <https://produccioncientificaluz.org/index.php/rcs/articulo/view/41661/48161>.
- Bullón, O., Carhuancho, I., Valero, F., & Moreno, R. (2023). University youth entrepreneurship: approach from attitude, education and behavioral control. *Venezolana De Gerencia*, 28(Special No. 9), 377-389. <https://doi.org/10.52080/rvgluz.28.e9.24>.
- Chacón, R., & Martínez, N. (2020). Relationship between physical activity practice and healthy employees in a sport-social club. *Cuadernos de Psicología del Deporte*, 20(3), 64-73.
- Chambi, J., & Arohuanca, P. (2019). Comparative study of entrepreneurial intentions in management students in the city of Puno. *Global Business Administration Journal*, 3(1), 11-17. doi: 10.31381/gbaj.v3i1.2288.

- Contreras, F., Espinoza, J., Soria, K., Portalanza, A., Jáuregui, K., & Omaña, J. (2017). Exploring entrepreneurial intentions in Latin American university students. *International Journal of Psychological Research, 10*(2), 46-59. DOI 10.21500/20112084.2794.
- D'Armas, M., Mejías, A., Fajardo, L., D'Armas, H., Álvarez, W., & Noboa, P. (2022). Self-efficacy and Entrepreneurial Intention in university students: a Systematic Literature Review. *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology*
- Dávila, R., Martín, M., Zapana, D., & Velarde, L. (2022). University education and student entrepreneurship at a limean university. *Revista Universidad y Sociedad, 14*(4), 486-494.
- Diez, S. (2020). Key factors for the entrepreneurial development of university students. *Revista Venezolana de Gerencia, 25*(89), 145-158. <https://www.redalyc.org/journal/290/29062641011/html/>.
- Drucker, P. (1985). *Innovation and Entrepreneurship*. Harper & Row, Publishers, Inc.
- Flores, I., Espinoza, J., Tristán, B., & Torres, M. (2021). Traits of the potosino entrepreneur: an analysis between men and women. *Tlatemoani: Revista Académica de Investigación, 12*(38), 109-126. <https://dialnet.unirioja.es/servlet/articulo?codigo=8238815>.
- Giang, H., Tuan, T., Thuy, T., & Anh, K. (2022). Dark Triad traits affecting entrepreneurial intentions: The roles of opportunity recognition and locus of control. *Journal of Business Venturing Insights, 17*.

- Graus, M. (2020). Statistical scale and software to evaluate didactic coherence in mathematics teaching-learning processes. *Didasc@lia: Didactics and Education*, 11(1), 140-165.
- Huerta, R., Ramirez, E., Norabuena, R., & Lorenzo, V. (2023). Entrepreneurial self-efficacy and performance of Peruvian micro and small enterprises. *Revista Venezolana de Gerencia*, 28(102), 751-768. <https://doi.org/10.52080/rvgluz.28.102.19>.
- Iwu, G., Opute, P., Nchu, R., Erasia-Ece, C., Tengeh, R., Jaiyeoba, O., & Aliyu, O. (2021). Entrepreneurship education, curriculum and lecturer-competency as antecedents of student entrepreneurial intention. *The International Journal of Management Education*, 19(1), 100295.
- Jacome, M., & Jacome, O. (2020). Entrepreneurial Intentions: A Look at the Behavior of University Students in Ecuador. *Reporte Nacional GUESSS 2018 - 2019. Ecuador: Universidad Católica de Cuenca*.
- Jena, R. (2020). Measuring the impact of business management Student's attitude towards entrepreneurship education on entrepreneurial intention: A case study. *Computers in Human Behavior*, 107, <https://doi.org/10.1016/j.chb.2020.106275>.
- Kopalle , P., Lehmann, D., & Farley, J. (2010). Consumer expectations and culture: The effect of belief in karma in India. *Journal of consumer research*, 37(2), 251-263.
- Krueger, N., & Brazeal, D. (1994). Entrepreneurial Potential and Potential Entrepreneurs. *Entrepreneurship Theory and Practice*, 18(3), 91-104. <https://doi.org/10.1177/104225879401800307>.

- Kwapisz, A. (2019). Do government and legal barriers impede entrepreneurship in the US? An exploratory study of perceived vs. actual barriers. *Journal of Business Venturing Insights*, 11, e00114.
- Kyvik, O. (2018). The global mindset: A must for international innovation and entrepreneurship. *International Entrepreneurship and Management Journal*, 14(2), 309-327.
- Llanos, O., Hebles, M., & Álvarez, C. (2021). Entrepreneurial attitude development: a qualitative study of a university training model. *REOP-Revista Española de Orientación y Psicopedagogía*, 32(3), Art.3. <https://doi.org/10.5944/reop.vol.32.num.3.2021.32560>.
- Mamani, D., Zamata, J., & Bautista, J. (2022). Meaning of teaching in entrepreneurship and the development of entrepreneurial culture at university. *New Trends in Qualitative Research*, 15, DOI: <https://doi.org/10.36367/ntqr.15.2022.e756>.
- Manterola, C., Quiroz, G., Salazar, P., & Garcia, N. (2019). Methodology of the most frequently used study types and designs in clinical research. *Revista médica clínica las condes*, 30(1), 36-49.
- Manzano, L., De Luna, D., Moctezuma, J., & Luna, S. (2020). Entrepreneurial intention. Between idealism and obligatoriness. *Revista de El Colegio de San Luis*, 10(21), 5-30. <https://doi.org/10.21696/rcsl102120201227>.
- Mardzuki, K., Ariffin, Z., Abdullah, A., & Norshaheeda, M. (2018). A Theoretical Review on Intention and Perception of University Students towards

- Entrepreneurship Program. *International Journal of Business and Management*, 2(1), 43-48. https://www.ijbmjournal.com/uploads/2/6/8/1/26810285/006-vol_2_issue_1_2018-ijbm_-_43-48.pdf.
- Martín, N. (2021). Sustainable tourism in holiday tourism companies. Motivations and constraints in the implementation of sustainable measures in Catalonia. *PASOS Journal of Tourism and Cultural Heritage*, 19(3), 419-435.
- Martínez, J., Durán, S., & Serna, W. (2021). COVID-19, entrepreneurship education and intentions to undertake: Decision factors in university students. *Revista de Ciencias Sociales*, 27(2), 272-283. <https://www.redalyc.org/journal/280/28066593019/html/>.
- Martínez, L., Franco, J., Ríos, S., Morán, H., Ochoa, F., & Uribe, Y. (2023). Technological innovation capacity and level of entrepreneurship in students of the National University of Cañete. *Data and Metadata*, 2, DOI: <https://doi.org/10.56294/dm2023229>.
- Matos, S., & Hall, J. (2021). An exploratory study of entrepreneurs in impoverished communities: when institutional factors and individual characteristics result in non-productive entrepreneurship. *Entrepreneurship & Regional Development*, 32(1-2), 134-155.
- Mendoza, J., Barrutia, I., Bejar, L., Huamani, O., Borja, J., & Flores, P. (2024). Education and entrepreneurial intention in university students: A review in Latin America. *Revista Conhecimento Online*, 16(1), Online: <https://periodicos.feevale.br/seer/index.php/revistaconhecimentoonline/article/view/3599/3276>.

- Mendoza, L., Ríos, S., Morán, H., Ochoa, F., Ochoa, F., & Uribe, Y. (2023). Motivation and entrepreneurship in students of the last cycles of administration at the National University of Cañete. *Data and Metadata*, 2, DOI: <https://doi.org/10.56294/dm2023230>.
- Montufar, A. (2020). Design and validation of a scale to measure attitudes toward entrepreneurship. *Journal of Psychology and Behavioral Sciences*, 11(2), 132-146. DOI: <https://doi.org/10.29059/rpcc.20201215-121>.
- Morales, F., Gimenez, J., & Morales, A. (2018). Relationships between entrepreneurial self-efficacy and other psycho-educational variables in university students. *European Journal of Investigation in Health, Psychology and Education*, 8(2), 91-102. <https://doi.org/10.30552/ejihpe.v8i2.247>.
- Moreno, D. (2019). *Factores clave en la intención de emprender de los estudiantes universitarios: El papel moderador do entorno*. [Doctoral dissertation, Universidade Estadual do Oeste do Paraná]: TEDE Repository: <https://tede.unioeste.br/handle/tede/4552>.
- Quinde, M., & Álava, N. (2024). Leadership styles and mediation of self-efficacy in the social entrepreneurial intention of young university students. *Journal of Social Sciences*, 30(1), 345-360. DOI: <https://doi.org/10.31876/rcs.v30i1.41660>.
- Robinson, P., Stimpson, D., Huefner, J., & Hunt, H. (1991). An Attitude Approach to the Prediction of Entrepreneurship. *Entrepreneurship Theory and Practice*, 15(4), 13-32. <https://doi.org/10.1177/104225879101500405>.

- Rocha, W., & Giraldo, G. (2015). Propensity to take risks, make decisions and tolerate uncertainty in entrepreneurs in Valledupar. *Investigium IRE: Ciencias Sociales Y Humanas*, 6(2), 24-37. Doi: <http://dx.doi.org/10.15658/CESMAG15.05060203>.
- Rositas, J. (2014). Sample sizes in social science surveys and their impact on knowledge generation. *Business Innovations*, 11(22), 235-268.
- Rotter, J. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied*, 80(1), 1-28. <https://doi.org/10.1037/h0092976>.
- Salazar, P., Herrera, I., Rueda, S., & León, J. (2014). The effect of resource conservation on entrepreneurial intention in the context of economic crisis: the moderating role of self-efficacy and creativity. *Annals of Psychology*, 30(2), 549-559. <http://dx.doi.org/10.6018/analesps.30.2.159281>.
- Sánchez, J. (2011). University training for entrepreneurial competencies: its impact on intention of venture creation. *International Entrepreneurship and Management Journal*, 7(2), 239-254. <https://doi.org/10.1007/s11365-010-0156-x>.
- Saunders, M., Philip, L., & Thornhill, A. (2012). *Research methods for business students* (Sixth edition ed.). England: Pearson Education Limited.
- Seeram, E. (2019). An overview of correlational research. *Radiologic technology*, 91(12), 176-179.
- Shamara, P. (2010). Measuring Personal Cultural Orientations: Scale Development and Validation. *Journal of the Academy of Marketing Science*, 38(6), 787-806.

- Shapiro, A., & Sokol, L. (1982). *The social dimensions of entrepreneurship*. Englewood Cliffs, NJ: Encyclopedia of entrepreneurship.
- Shi, Y., Yuan, T., Bell, R., & Wang, J. (2020). Investigating the relationship between creativity and entrepreneurial intention: the moderating role of creativity in the theory of planned behavior. *Frontiers in Psychology, 11*, 1209.
- Timmy, H., Yu-Min, W., Hsin-Hui, L., Shin-jeng, L., & Yi-Shun, W. (2022). Relationships between locus of control, theory of planned behavior, and cyber entrepreneurial intention: The moderating role of cyber entrepreneurship education. *The International Journal of Management Education, 20*(3).
- Torres, L. (2020). Robustness of the fit indices of I confirmatory factor analysis to outliers. *JOURNAL OF MATHEMATICS: THEORY AND APPLICATIONS 2020, 27*(2), 383-404.
- Torres, T., & Vidal, M. (2019). The importance of perceived behavioral control as a determining element in entrepreneurial intention among undergraduate students. *University and Business, 21*(37), 108-135. Doi: <http://dx.doi.org/10.12804/revistas.urosario.edu.co/empresa/a.6522>.
- Usman, B., & Yennita (2019). Understanding the entrepreneurial intention among international students in Turkey. *Journal of Global Entrepreneurship Research, 9*(10), 1-21.
- Vélez, C., Bustamante, M., Loor, B., & Afcha, S. (2020). Entrepreneurship education as a predictor of entrepreneurial intention of university students.

- Formación Universitaria*, 13(2), Online: <https://doi.org/10.4067/s0718-50062020000200063>.
- Vlelra, M., & Rodríguez, A. (2019). Competency training at university: an empirical study on its typology. *Journal of educational research*, 27(1), 27-47.
- Wardana, L., Narmaditya, B., Wibowo, A., Mahendra, A., Wibowo, N., Harwida, G., & Rohman, A. (2020). The impact of entrepreneurship education and students' entrepreneurial mindset: the mediating role of attitude and self-efficacy. *Heliyon*, 6(9), DOI:<https://doi.org/10.1016/j.heliyon.2020.e04922>.
- Zambrano, E. (2018). Pedagogical practices for the development of citizenship competencies. *Electronic journal of educational research*, 20(1), 69-82.
- Zhang, J., & Huang, J. (2021). Entrepreneurial self-efficacy mediates the impact of the post-pandemic entrepreneurship environment on college students' entrepreneurial intention. *Frontiers in Psychology*, 12, 643184.
- Zurriaga, A., Kageyama, K., & Akai, K. (2016). Effects of risk attitude, entrepreneurship education and self-efficacy on entrepreneurial intentions: A structure equation model approach to entrepreneurship. *International Review of Management and Business Research*, 5(4), 1424.

Fuzzy logic as a new computational technique in financial indicators

Luna Altamirano, Kléber Antonio

Postdoctor in Knowledge Management and Public Policy from the International Academy of Political and Administrative Sciences and Future Studies (IAPAS), Mexico. Doctor in Social Sciences, mention in Management, Universidad del Zulia (Venezuela). Master in Business Administration, mention in Human Resources and Marketing. Economist. Research Professor, Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca, Ecuador. E-mail: klunaa@ucacue.edu.ec. Scopus Author ID: 57214720890. ORCID: <http://0000-0002-4030-8005>.

Melean Romero, Rosana Alejandra

Postdoctor PhD in Social Sciences, mention in Management. Master in Business Management, mention in Industrial Management. Bachelor's Degree in Administration. Professor/Researcher attached to the Center for Business Studies at the Universidad del Zulia, Maracaibo, Venezuela. Accredited by the Program of Stimulus to Innovation and Research of the National Observatory of Science and Technology (ONCTI), Level B. E-mail: rosanamelean@gmail.com. Scopus Author ID: 22954427400. <https://orcid.org/0000-0001-8779-738X>.

Luna Idrovo, Sebastián Antonio

Master in Procedural Law and Oral Litigation from Universidad Católica de Cuenca. Lawyer. E-mail: bastianlunaidrovo98@gmail.com. <https://orcid.org/0000-0002-9175-0274>.

Calle Masache, Oscar Rene

Master in Business Administration, mention in Human Resources and Marketing. Commercial Engineer. Professor of the Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca, Ecuador. E-mail: ocalle@ucacue.edu.ec. <https://orcid.org/0000-0002-1605-9555>

Introduction

Estimating financial indicators becomes a valuable tool for understanding the true financial situation in organizations. This, in turn, supports executives and managers in making better decisions for the benefit of their companies. The fuzzy logic-supported financial approach to decision making challenges traditional paradigms filled with uncertainty, especially when calculated in a traditional way. In scenarios where the conventional conception of business management may restrict the development of other tools, this study offers a broader perspective with the purpose of improving decision making.

The problem of the research lies in the conventional way used to calculate financial indicators in small and medium manufacturing companies in Cuenca, Ecuador. In addition, there is a lack of knowledge about other ways of estimating and analyzing financial ratios. Hammi (2014), suggests that the premise is to get accurate and timely financial information, and to address financial situations related to financial risks, low profitability, inefficient investments and the inability to generate internal financing.

Small and medium-sized manufacturing companies in Cuenca, Ecuador, operate in a dynamic business environment, where they must exhibit their capabilities both to adopt new methodologies and to establish strategic collaborations that foster a remarkable transformation. Small and medium-sized

enterprises represent a determining factor in the economic dynamism of countries (Eggers, 2020; Chesbrough, 2020; Clauss et al., 2022). In the financial sector, there is a constant concern about the impending challenges in financial analysis facing SMEs, especially in terms of making sound decisions (Larrán et al., 2010; Ritter and Pedersen, 2020; Chavosh et al., 2021). SMEs have consistently faced a variety of obstacles that demand meticulous and thorough planning and constant revision of their methods, particularly with regard to financial analysis (Kindström et al., 2022; Zhou et al., 2023).

The objective of the study is to calculate financial indicators through confidence intervals and triangular fuzzy numbers (TFN), fuzzy logic tools, in order to reduce uncertainty. A confidence interval can be defined as an uncertain datum that helps to predict the value of a variable within two limits, one lower and one upper (Casanovas and Fernandez, 2003). A fuzzy number combines two concepts: the confidence interval, linked to the idea of uncertainty, and the level of presumption, related to individual perception, i.e., the notion of valuation (Boloş et al., 2019; Muhamediyeva & Abdul, 2022).

From the methodological point of view, the research is of an explanatory type, which explains the development of advanced tools offered by fuzzy logic, whose central purpose is to discern and anticipate the possible relationships between various variables involved in the study. The research has a quantitative approach, therefore Hernández et al. (2014) point

out that its orientation is focused on the quantitative approach, which employs data collection to examine hypotheses through numerical measurements and statistical analysis, its main purpose lies in identifying behavioral patterns and verifying theories through quantitative methods.

Expatriation and counter-expertization techniques, tools derived from fuzzy logic for the field of finance, are of utmost importance to improve business management. These tools require data provided by experts in the financial field, obtained through the survey technique. Using this information, various financial indicators are developed, such as liquidity, solvency and acid test, among others, from a fuzzy logic-based perspective. This involves the use of triangular fuzzy numbers (TFN) and confidence intervals to reduce the uncertainty associated with the analysis of financial data.

The introduction of the study deals with the statement of the problem, the objective and the methodology used. In the essential basics, previous research related to the topic is highlighted to support the structure of the research. The section financial indicators focused on fuzzy logic, details the methodological aspect and the development of fuzzy logic tools to calculate financial indicators, explaining a new approach to financial estimation, which will allow managers to make more informed decisions in the financial field.

Financial Indicators: essential basics

The calculation of financial indicators is based on the structure of the financial statements, which is essential for a proper financial analysis. This process evaluates the present and past financial situation of a company, making it possible to make estimates and projections for the future. Several authors theoretically support this study with their publications. For example, Arimany et al. (2016) provide an overview of the main economic and financial indicators used to diagnose the financial health of companies during the period 2008-2013, covering both the short and long term and including a review of results, changes in equity and cash flows, as well as making comparisons with Catalan wine companies during the same period.

Correa et al. (2018) explain the relationship between operational and financial performance metrics in nonprofit cooperatives of the solidarity sector, their approach involves the calculation of conventional financial indicators, as well as concepts such as value generation and factors that facilitate their evaluation. On the other hand, Nava (2009) highlights the relevance of financial analysis as an essential tool for effective financial management, focuses on the calculation of financial indicators and emphasizes that, although an organization with liquidity may be solvent, not all solvent companies necessarily possess liquidity, and suggests that inflation-adjusted financial

analysis provides valid, updated, truthful and accurate financial information.

Bernal and Amat (2012) detail the financial ratios that have a high predictive potential through their respective formulas, together with the configuration of a research tool aimed at evaluating the relevance of a publication. Financial analysis is considered the only means to evaluate the state of a company, with the purpose of making sound decisions that meet the business objectives, aligned with the generation of profits or benefits (Morelos et al., 2012; Partanen et al., 2018)

In the field of fuzzy logic, its origin dates back to 1965, when the former professor of the University of Berkeley (California), Lotfi Asker Zadeh, merged the principles of multivalued logic and fuzzy subsets. Zadeh introduced the notion of degrees of membership into systems theory, recognizing that in complex systems precise statements lose relevance. This theory was supported by Kaufmann and Gil-Aluja (1986), who applied the concepts of fuzzy subsets to business management, using triangular fuzzy numbers to deal with uncertainty, and since the early days of the integration of fuzzy logic in organizational problems, its effectiveness has been recognized. This theory is presented as a powerful tool to capture the uncertainty of the business environment and address the subjectivity inherent in expert opinions (Reig and Gonzalez, 2002; Cavus, 2010; Korol, 2018).

Luna et al. (2020) conducted an analysis of the financial information system used by companies in the ceramic industrial sector in the city of Cuenca, Ecuador, given that this city houses the only four flat ceramic companies, they propose a new approach to estimate financial ratios using fuzzy logic, this involves the development of expertization and counter-expertization techniques, represented by confidence intervals and triangular fuzzy numbers (TFN). In contrast, Sanchez et al. (2023) analyze decision making in the financial domain, employing fuzzy logic on highly relevant indicators to support decisions in the automotive industry, this approach aims to validate the degree of relevance of the selected indicators in relation to their risk qualifiers; to implement this theory, it is essential to use linguistic variables whose ranges are evaluated on a scale from 0 to 1, the application of fuzzy logic facilitates the evaluation and confirmation of current financial risks, allowing a more accurate representation of reality, either showing higher risk levels or highlighting solid solvency.

Saldaña and Guamán (2019), employ the fuzzy logic analysis technique, which enables the consideration of the current data in accurate decision making, addressing uncertainty through the principle of simultaneity, it is crucial, since it facilitates an analysis closer to the reality of the financial statements, by allowing the evaluation of two different scenarios: the most favorable and the least favorable, it enables the generation of projected financial

statements that support informed decision making, providing the company with more reliable and higher quality information, this technique has revealed significant differences between conventional financial analysis and the application of fuzzy logic, contributing to obtain more realistic results to guide future decisions, it offers a valuable alternative for decisional accounting.

Córdova et al. (2017), explain the application of fuzzy logic in financial indicators, it represents a little known proposal in the accounting field, it enables the observation of the results of financial ratios from a broader perspective, presenting results that are neither completely true nor completely false, since they can acquire an indeterminate value of truthfulness within a set of values, fuzzy logic is applied specifically in financial risk indicators, using ratios to evaluate the level of relevance in comparison with the standardized goal of the CAMEL model and its risk ratings, using linguistic variables with ranges valued in scales from 0 to 1, creates a more flexible environment to understand the financial information, where decision making within this environment is more efficient, through the use of fuzzy logic, the decision maker will visualize in a real way the levels of belonging to each of the proposed credit ratings.

Londoño, (2020) examines the elements that influence decision-making in small and medium-sized companies, which is linked to understanding the business context and labor

efficiency variables in relation to the effectiveness of good operating practices. Fuzzy logic is used to analyze this aspect, using six SMEs located in Medellin, Colombia, as a reference, applying the Total Factor Productivity Index (TFPI) model.

The connection between fuzzy logic and decision making is especially manifested in situations of uncertainty, this relationship involves a detailed examination of how fuzzy logic interacts with decision criteria and how these interactions are influenced by uncertainty, this analysis leads to more objective results in the desired decision making process (Castiblanco, 2013; Nagy et al., 2019). Structured financial indicators obviously need to know how they should be analyzed for decision making, with this we will use or combine with fuzzy logic allowing us to support us to discover the level in which it is in the most accurate way, in addition to knowing which areas need immediate change or improvement and which are in a correct standard, helping in the mission of the company (Vidyadhar et al., 2016; Lee & Wong 2017; Sanchez et al., 2023).

Fuzzy mathematics and its relevance in various models applied in economic and administrative sciences, highlight its usefulness in improving the treatment and quality of accounting and financial information, which in turn contributes to more effective decision making, seeks to mitigate subjectivity and imprecision in the design, development and analysis of information systems and associated dynamics

(Sadeghi, 2018; Agrawal et al., 2017). The current state of the art in the applications of fuzzy subset theory and fuzzy inference systems in financial problem solving criticizes traditional models of financial decision making, arguing that they do not clearly capture the dynamics of market behavior (Medina, 2006; Herghilgiu et al., 2019; Gopi & PG, 2024).

Kaufmann and Gil-Aluja (1987) introduce in their work *Operational Management Techniques for the Treatment of Uncertainty* a solid perspective by describing a fuzzy number as a series of finite or infinite confidence intervals. Their contribution stands out as a significant advance in the development of knowledge within the field of fuzzy logic.

Financial indicators under the fuzzy approach

The research is of an explanatory type and adopts a quantitative approach. The survey technique is developed through the structure of a questionnaire for the collection of data provided by financial experts from the financial departments of manufacturing SMEs in the city of Cuenca, Ecuador. These experts complete a survey that addresses the most relevant financial indicators, related to a four-year history. As an example, some financial ratios of one SME studied, identified as "SME A" for confidentiality reasons, are presented as shown in Table 1 of the study.

Table 1. *Financial indicators*

SME "A

| FINANCIAL INDICATORS | YEARS | | | |
|----------------------|-------|------|------|------|
| | 2020 | 2021 | 2022 | 2023 |
| Liquidity Ratio | 1,45 | 1,18 | 0,85 | 1,25 |
| Solvency Ratio | 1,84 | 1,89 | 1,74 | 1,22 |
| Acid Test | 1,96 | 1,37 | 1,85 | 1,78 |
| Asset Turnover | 1,34 | 1,38 | 1,51 | 1,66 |
| Inventory turnover | 1,73 | 1,65 | 1,91 | 1,95 |

Source: Own elaboration

Based on the data presented in Table 1, the techniques of expertizing and counter-expertizing are developed. Expertization involves consulting a specific group of experts with relevant knowledge on a particular topic, with the objective of reducing uncertainty (Luna and Sarmiento, 2019). Counterexpertizing can be conceptualized as a mathematical process that relies on fuzzy subsets to reduce entropy in the variables or categories under investigation, this is achieved by applying a specific formula: $E_i + ([E_s - E_i] \times \text{experton})$ (Rico and Tinto, 2010).

To implement the techniques provided by fuzzy logic, it is essential to have the participation of financial experts. For this purpose, a simple random sample of 15 financial experts was chosen from a universe of 171 manufacturing SMEs in the city of Cuenca Ecuador, according to the Chamber of Small Industry of Azuay. These experts responded to a structured

questionnaire using the endecadary scale, a fuzzy logic tool, with the purpose of gathering information to mitigate uncertainty and adjust the established values. The introduction of a graduated valuation between 0 and 1 allows the incorporation of levels of veracity in the idea of incidence, values ranging from 0 to 1, known as endecadary valuation (Kaufmann and Gil Aluja, 1989). This explanation is detailed in Table 2.

Table 2. *Endecadary scale*

| PRESUMPTION GRADE α | INCIDENCE |
|-------------------------------|---|
| 0 | No influence |
| 0,1 | Has minimal influence |
| 0,2 | Has little influence |
| 0,3 | It has some influence |
| 0,4 | Has a regular influence |
| 0,5 | It can influence as well as not influence |
| 0,6 | It has a great deal of influence |
| 0,7 | It has an important influence |
| 0,8 | It has a lot of influence |
| 0,9 | It has a lot of influence |
| 1 | Maximum influence |

Based on the data presented in Table 1, a range or confidence interval associated with the liquidity indicator is established [0.85, 1.45], where the lowest value corresponds to the year 2022 and the highest value to the year 2020. Fifteen financial

experts from manufacturing SMEs are consulted, who respond to a structured question regarding the ranges: "What is the importance of the liquidity indicator in the years with optimistic and pessimistic values?", with responses evaluated on an evaluation scale from 0 to 1.

Table 3. *Expert Opinion*

| No. SURVEYED | PESSIMISTIC VALUE | VALUE OPTIMIST |
|--------------|-------------------|----------------|
| 1 | 0,2 | 0,8 |
| 2 | 0,4 | 1,0 |
| 3 | 0,0 | 0,6 |
| 4 | 0,1 | 0,8 |
| 5 | 0,3 | 0,9 |
| 6 | 0,4 | 0,8 |
| 7 | 0,2 | 0,7 |
| 8 | 0,3 | 0,6 |
| 9 | 0,1 | 1,0 |
| 10 | 0,3 | 1,0 |
| 11 | 0,2 | 0,7 |
| 12 | 0,1 | 0,9 |
| 13 | 0,2 | 0,7 |
| 14 | 0,2 | 0,6 |
| 15 | 0,5 | 0,7 |

Source: Own elaboration

As for the experts' opinions on the pessimistic value, it is noted that the response of 0 is recorded once, the response of 0.1 is repeated three times, the response of 0.2 is recorded

five times, and so on until all the experts have been consulted. Similarly, the same procedure is followed for the optimistic value.

Frequency normalization is performed, which involves dividing the frequency values obtained for each degree of presumption of the endecadary scale by the total number of experts (15) in each range. For example, for the liquidity indicator (I_p), values such as $1 \div 15 = 0.07$; $3 \div 15 = 0.20$; and $5 \div 15 = 0.33$, and so on, are obtained. This process is repeated in a similar manner for the optimistic indicator (I_o). Then, the accumulation of frequencies is carried out, starting from the end of the series and adding up to unity, the latter being considered as the value of one (1.00) in each range. This procedure is known as expertization, as shown in Table 4.

To carry out the counterexpertization, the formula proposed by the authors Rico and Tinto is used, where (E_i) represents the lower end and (E_s) the upper end. In the context of the study, the abbreviations I_p (pessimistic indicator) and I_o (optimistic indicator), related to the liquidity indicator, are used. The formula is applied by substituting the corresponding values:

$$I_p + ([I_o - I_p] \times \text{expertón} \quad) \quad (1)$$

$$0,85 + ([1,45 - 0,85] \times 1,0) = 1,45$$

This process is repeated for all pessimistic and optimistic indicators, ranging from zero to one degree of assumption. Then, the counter-expected bands are summed from unity to 0.1; the total is divided by 10, excluding the zero degree of assumption. Applying this technique to the initial interval of the liquidity indicator [0.85, 1.45] reduces the entropy within the band, yielding a new interval of [0.99, 1.32]. All the detailed steps are presented in Table 4.

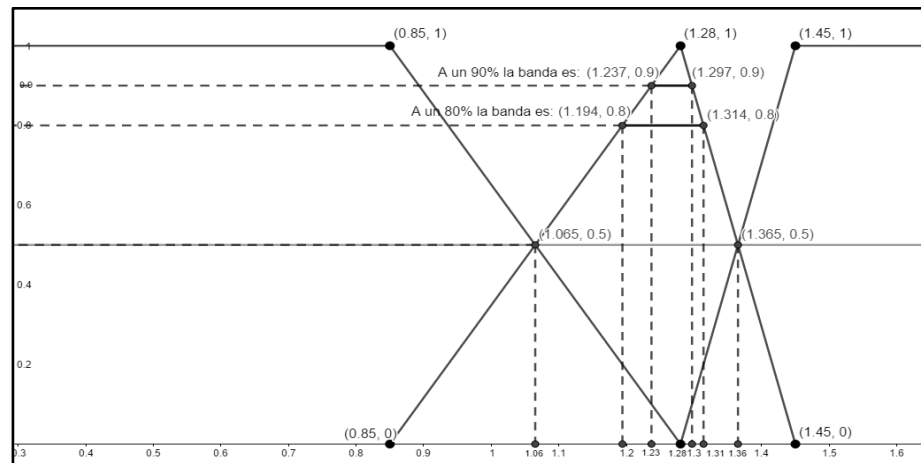
Table 4. *Expertized and Counterexpertized Values*

| PRESUMPTION GRADE α | FREQUENCY | | FREQUENCY NORMALIZATION | | FREQUENCY ACCUMULATION (Experton) | | COUNTEREXPERTIZED BELTS | |
|-------------------------------|-----------|-----------|----------------------------|-------------|---|------|----------------------------|--------------|
| | lp | lo | lp | lo | lp | lo | lp | lo |
| 0 | 1 | 0 | 0,07 | 0,00 | 1,00 | 1,00 | 1,45 | 1,45 |
| 0,1 | 3 | 0 | 0,20 | 0,00 | 0,93 | 1,00 | 1,41 | 1,45 |
| 0,2 | 5 | 0 | 0,33 | 0,00 | 0,73 | 1,00 | 1,29 | 1,45 |
| 0,3 | 3 | 0 | 0,20 | 0,00 | 0,40 | 1,00 | 1,09 | 1,45 |
| 0,4 | 2 | 0 | 0,13 | 0,00 | 0,20 | 1,00 | 0,97 | 1,45 |
| 0,5 | 1 | 0 | 0,07 | 0,00 | 0,07 | 1,00 | 0,89 | 1,45 |
| 0,6 | 0 | 3 | 0,00 | 0,20 | 0,00 | 1,00 | 0,85 | 1,45 |
| 0,7 | 0 | 4 | 0,00 | 0,27 | 0,00 | 0,80 | 0,85 | 1,33 |
| 0,8 | 0 | 3 | 0,00 | 0,20 | 0,00 | 0,53 | 0,85 | 1,17 |
| 0,9 | 0 | 2 | 0,00 | 0,13 | 0,00 | 0,33 | 0,85 | 1,05 |
| 1 | 0 | 3 | 0,00 | 0,20 | 0,00 | 0,20 | 0,85 | 0,97 |
| TOTAL | 15 | 15 | 1,00 | 1,00 | | | 9,90 | 13,22 |
| NEW BAND | | | | | | | 0,99 | 1,32 |

Source: Own elaboration

This process is repeated as many times as necessary until the upper end of the band remains unchanged, which represents the maximum assumption or the optimal value of the liquidity indicator. After the third counterexpertization, the value of I_p turns out to be 1.28, thus indicating the maximum level of presumption. By means of a geometrically represented scalene triangle, the pessimistic, ideal and optimistic levels are defined in terms of alpha cut-off (α), as shown in Figure 1.

Figure 1. Analysis of the liquidity indicator under the fuzzy approach



Source: Own elaboration

Figure 1 shows a triangular fuzzy number (TFN) with the values [0.85, 1.28, 1.45]. The lowest value corresponds to the liquidity indicator of the year 2022, the highest value to the year 2020, and the central value represents the maximum

degree of presumption or the highest possibility of occurrence of this indicator.

With this new calculation methodology, it is proposed that as the alpha cutoff (α) approaches 100%, the confidence interval becomes smaller. For example, with an alpha cut-off of 80%, the interval [1.19, 1.31] is obtained, and with an alpha cut-off of 90%, the interval [1.24, 1.30] is obtained. This process implies that any value within these intervals will be considered ideal in financial terms for the SME under study. The application of this new form of estimation seeks to reduce uncertainty in the financial analysis, which will allow directors or management to make more informed decisions.

Liquidity is a fundamental financial indicator for companies, since it evaluates their capacity to generate cash and their short-term payment capacity. It is calculated by dividing current assets by current liabilities. If the result is greater than one, it means that the company has the capacity to meet its financial obligations.

The use of tools provided by fuzzy logic to determine this indicator and present its calculation in triangular fuzzy numbers [0.85, 1.28, 1.45] reveals that the central number does not reflect an average value between the extremes. Instead, it represents the highest degree of assumption or the maximum possibility of occurrence of the liquidity indicator.

This helps to reduce uncertainty and eliminate the subjectivity and imprecision associated with the traditional calculation.

The calculation of financial indicators using confidence bands or intervals provides management with a broader view to make better decisions. From a geometric analysis, it is possible to consider alpha cuts of 80% and 90%, with their respective bands of [1.19, 1.31] and [1.24, 1.30]. These results suggest that any value within these ranges would be optimal for the organization's financial objectives.

Using the same procedure previously used to calculate the liquidity indicator, which involved the development of expert, counter-expert and geometric plotting techniques, other relevant indicators were obtained for company "A". These indicators were calculated using triangular fuzzy numbers (NBT), and from them confidence intervals were generated with a level of 80% and 90% of possibility of reaching these goals at the financial level. These results are presented in Table 5.

Table 5. Triangular Fuzzy Numbers and Confidence Intervals

Commercial Company "A

| FINANCIAL INDICATORS | DEGREE OF PRESUMPTION 80% | DEGREE OF PRESUMPTION 90% |
|----------------------|---------------------------|---------------------------|
| Liquidity ratio | [0,85, 1,28, 1,45] | [1,24, 1,30] |
| Solvency ratio | [1,22, 1,69, 1,74] | [1,44, 1,61] |
| Acid test | [1,37, 1,81, 1,96] | [1,66, 1,94] |
| Asset Turnover | [1,34, 1,52, 1,66] | [1,42, 1,62] |
| Inventory turnover | [1,65, 1,84, 1,95] | [1,74, 1,92] |

Source: Own elaboration

Confidence intervals can be developed by means of other sciences, particularly statistics, since it helps to perform a predictive analysis of the information to forecast future results. They are determined by specific limits known as confidence intervals, which indicate the probability that the population mean is within that range, they can be calculated for various statistical measures, such as means, variances, standard deviations, medians, proportions, correlation coefficients, regression lines, parametric estimation, differences between

measures and other aspects (Dagnino, 2014; Domínguez and Merino, 2015; Martínez et al., 2017).

As can be seen, confidence intervals can be determined by means of statistics, which is part of the exact sciences, as it has two extremes, this science calculates the arithmetic mean or average value between the bands. On the other hand, the technique of counterpetition, typical of fuzzy logic, breaks this traditional or ambiguous scheme, reduces the uncertainty within this calculation by estimating the maximum incidence between the extremes of the confidence interval, it represents the highest possibility of occurrence of the financial indicators studied, referring to the presence of an eventuality or situation that could occur, since it does not represent an average between the extreme values of the interval, against the position of statistics.

Through this novel approach to calculating financial indicators, the executives and management of the manufacturing SMEs studied will be able to gain a more complete understanding of financial management. This will enable them to make better decisions that will benefit their companies.

Conclusions

Financial analysis focuses on examining both the current and past situation of a company in order to identify potential threats and opportunities to improve its financial situation and

prospects. This is achieved by calculating financial indicators, which helps to mitigate potential risks in the future.

Through the study, it was observed that manufacturing SMEs in the city of Cuenca, Ecuador, operate following the perspective of conventional financial indicator systems. In other words, financial management is carried out using information provided by financial statements and basic financial information. These data are represented through indicators or ratios, which help to make weak decisions by analyzing the current and future behavior of the companies. Although they have information systems to address internal management needs and meet customer demands with the advice of expert professionals, they lack financial control tools to facilitate risk and uncertainty management.

The estimation of financial indicators using the fuzzy logic approach involves the use of advanced tools such as triangular fuzzy numbers (TFN), which are derived from a triangular geometric graph generated through alpha cuts. This allows the derivation of confidence bands or intervals, which helps to reduce uncertainty and vagueness in the calculation. In this way, more accurate and realistic results are obtained in financial terms, overcoming traditional models that are usually full of subjectivity and imprecision in the information.

Making a decision at the financial level considering a single value is very different from making a decision by means of a

confidence interval or a triangular fuzzy number, the latter helps management to visualize reality in a clearer and more objective way, allowing decision making to be framed in a more efficient way for better business management.

Therefore, it is important to support these organizations, through the development of these instruments of fuzzy logic in the calculation of financial indicators, as a necessary contribution for better management within their organizations. Fuzzy logic does not alter norms or principles, it relies on exact sciences such as mathematics and geometry to analyze problems and make decisions based on accuracy, adjusting to the reality of the current market, this will allow executives and management to make safer and more accurate decisions at the financial level.

Thanks to this contribution, the SMEs studied will be able to improve their financial management. This will be achieved through an accurate assessment of their current situation and the establishment of appropriate monitoring and controls. Based on this information, they will be able to draw up financial and budgetary planning in line with the organization's expectations, which will enable them to make efficient future projections.

This new method of estimating financial indicators has proven to be effective, demonstrating financial management with precise and specific estimates that support the decisions and

actions taken. However, in situations of uncertainty such as the present, the calculation of financial ratios becomes crucial in business management. Fuzzy logic, through its tools, is presented as an alternative that manufacturing SMEs should consider, contributing effectively to financial management activities. The implementation of this option requires trained and prepared personnel, as well as the adoption and integration of specialized technology (software) to carry out such activities. Its benefits are focused on having a broad scope that can improve organizational processes and decision making at the executive level in these companies, which in turn contributes to local, regional and national development.

References

- Agrawal, R., Asokan, P., & Vinodh, S. (2017). Benchmarking fuzzy logic and ANFIS approaches for leanness evaluation in an Indian SME: a case study. *Benchmarking: An International Journal*, 24(4), 973-993. <https://doi.org/10.1108/BIJ-06-2016-0083>
- Arimany, N., Farreras, A., & Rabaseda, J. (2016). Financial economic analysis of the wine sector in La Rioja in a crisis environment. *Intangible Capital*, 12(1): 268-294.
- Bernal, D., and Amat, O. (2012). Yearbook of sectoral financial ratios in Mexico for business benchmarking. *Ra Ximhai*, 8(2), 271-286.
- Boloş, M. I., Bradea, I. A., & Delcea, C. (2019). A fuzzy logic algorithm for optimizing the investment decisions within companies. *Symmetry*, 11(2), 186. <https://doi.org/10.3390/sym11020186>.

- Chamber of Small Industry of Azuay (CAPIA) (2023). *Members*.
<https://www.capia.com.ec/>
- Casanovas, M., and Fernández, A. (2003). *Treasury management under uncertainty*. Madrid, Spain: Ediciones Pirámide.
- Castiblanco, F. A. (2013). Uncertainty and subjectivity in decision making: a review from fuzzy logic. *Lúmina*, 14, 116-141.
<https://doi.org/10.30554/lumina.14.1086.2013>.
- Cavus, N. (2010). The evaluation of Learning Management Systems using an artificial intelligence fuzzy logic algorithm. *Advances in Engineering Software*, 41(2), 248-254.
<https://doi.org/10.1016/j.advengsoft.2009.07.009>
- Chavosh Nejad, M., Mansour, S. & Karamipour, A. (2021). An AHP-based multi-criteria model for assessment of the social sustainability of technology management process: A case study in banking industry. *Technology in Society*, 65. <https://doi.org/10.1016/j.>
- Chesbrough, H. (2020). To recover faster from Covid-19, open up: Managerial implications from an open innovation perspective. *Industrial Marketing Management*, 88, 410-413.
<https://doi.org/10.1016/j.indmarman.2020.04.010>.
- Clauss, T., Breier, M., Kraus, S., Durst, S., & Mahto, R. V. (2022). Temporary business model innovation-SMEs' innovation response to the Covid-19 crisis. *R&D Management*, 52(2), 294-312.
<https://doi.org/10.1111/radm.12498>.
- Córdova, J. F. D., Molina, E. C., & López, P. N. (2017). Fuzzy logic and financial risk. A proposal for financial risk

- classification to the cooperative sector. *Contaduría y Administración*, 62(5), 31-32, 1670-1686.
- Correa, J., Gómez, S., & Londoño, F. (2018). Financial indicators and their efficiency in explaining value generation in the cooperative sector. *Revista Facultad de Ciencias Económicas: Investigación y Reflexión*, XXVI (2), 129-144.
- Dagnino, J. (2014). Confidence intervals. *Revista Chilena de Anestesia*, 43(1), 129-133.
- Domínguez-Lara, S. A., and Merino-Soto, C. (2015) Why is it important to report Cronbach's alpha coefficient confidence intervals? *Latin American Journal of Social Sciences, Childhood and Youth*, 13(2), 1326-1328.
- Eggers, F. (2020). Masters of disasters? Challenges and opportunities for SMEs in times of crisis. *Journal of business Research*, 116, 199-208. <https://doi.org/10.1016/j.jbusres.2020.05.025>
- Gopi, V., & PG, S. (2024). Modelling the inhibitors of integrated sustainable lean manufacturing system in the South Indian SMEs using fuzzy logic. *Journal of Modelling in Management*, 19(3), 842-870. <https://doi.org/10.1108/JM2-05-2023-0107>
- Hammi, A. (2014). *Internal financial control under uncertainty: liquidity management control*. [Doctoral dissertation, Department of Economics and Business Organization. University of Barcelona, Spain]. <http://diposit.ub.edu/dspace/handle/2445/64786>
- Herghiligi, I. V., Robu, I. B., Pislaru, M., Vilcu, A., Asandului, A. L., Avasilcăi, S., & Balan, C. (2019). Sustainable environmental management system integration and business performance: A balance assessment approach

- using fuzzy logic. *Sustainability*, 11(19), 5311.
<https://doi.org/10.3390/su11195311>.
- Hernández, R., Fernández, C., & Baptista, M. (2014). *Metodología de la Investigación*, 6th edition. Mexico: McGraw Hill.
- Kaufmann, A., & Gil-Aluna, J. (1986). *Introduction of fuzzy subset theory to the management of firms*. Madrid, Spain: Milladoiro.
- Kaufmann, A., & Gil-Aluja, J. (1987). *Operational management techniques for dealing with uncertainty*. Barcelona: Hispano-europea.
- Kaufmann, A., and Gil, J. (1989). *Models for neglected effects research*. Madrid, Spain: Milladoiro.
- Kindström, D.; Carlborg, P. and Nord, T. (2022). Challenges for growing SMEs: A managerial perspective. *Journal of Small Business Management*.
<https://doi.org/10.1080/00472778.2022.2082456>
- Korol, T. (2018). The implementation of fuzzy logic in forecasting financial ratios. *Contemporary Economics*, 12(2), 165-187.
- Larrán, J., García, A., and Giner, Y. (2010). Determinants of credit rationing to SMEs. An empirical study in Andalusia. *European Research in Management and Business Economics*, 16 (2), 63-82.
- Lee, C. S., & Wong, K. Y. (2017). A fuzzy logic-based knowledge management performance measurement system for SMEs. *Cybernetics and Systems*, 48(4), 277-302.
<https://doi.org/10.1080/01969722.2017.1284532>.
- Londoño-Patiño, J. A. (2020). Productivity-based decision making in manufacturing SMEs: Fuzzy Logic approach.

- CEA *Journal*, 6(12), 181-207.
<https://doi.org/10.22430/24223182.1507>
- Luna, K., Melean, R., and Montes De Oca, Y. (2020). Financial information systems in the ceramic industrial sector of Cuenca-Ecuador. *Revista Risti*, (E39), 143-155.
- Luna, K., and Sarmiento, W (2019). Economic evaluation under the fuzzy approach: Case industries of the city of Cuenca- Ecuador. *Revista Venezolana de Gerencia*, 24 (86), 547-562.
- Martínez-Ezquerro, J. D., Riojas-Garza, A., & Rendón-Macías, M. E. (2017). Clinical significance over statistical significance. How to interpret confidence intervals at 95%. *Revista alergía México*, 64(4), 477-486.
- Medina, S. (2006). State of the art on the use of fuzzy logic in financial problems. *Cuadernos de Administración*, XIX (32), 195-223.
- Morelos, J., Fontalvo, T., and De la Hoz Granadillo, E. (2012). Analysis of financial indicators in port companies in Colombia. *Entramado*, 8 (1), 14-26.
- Muhamediyeva, D., & Abdul-Azalova, M. (2022). Application of the theory of fuzzy logic for analysis of management systems of business processes of an enterprise. *Scientific Collection InterConf*, 22 (113), 467-471.
<https://doi.org/10.51582/interconf.19-20.06.2022.049>
- Nagy, B.; Basbous, R.; Tajti, T. (2019). Lazy evaluations in Łukasiewicz type fuzzy logic. *Fuzzy Sets and Systems*, 376 (1), 127-151.
<https://doi.org/10.1016/j.fss.2018.11.014>.
- Nava, A. (2009). Financial analysis: a key tool for efficient financial management. *Revista Venezolana de Gerencia*, 14(48), 606-628.

- Partanen, J., Kauppila, O. P., Sepulveda, F., & Gabrielsson, M. (2018). Turning strategic network resources into performance: The mediating role of network identity of small-and medium-sized enterprises. *Strategic Entrepreneurship Journal*, 14(52), 178-197. <https://doi.org/10.1002/sej.1296>.
- Reig, J., and González, J. (2002). Fuzzy model of materials management control. *Spanish Journal of Finance and Accounting*, 31(112), 431-459.
- Rico, M., and Tinto, J. (2010). Fuzzy subset-based tools. A procedural proposal to apply expertization and recover forgotten effects in accounting information. *Actualidad Contable Faces*, 13(21), 127-146.
- Ritter, T., & Pedersen, C. L. (2020). Digitization capability and the digitization of business models in business-to-business firms: Past, present, and future. *Industrial Marketing Management*, 86, 180-190. <https://doi.org/10.1016/j.indmarman.2019.11.019>.
- Sadeghi, A. (2018). Success factors of high-tech SMEs in Iran: A fuzzy MCDM approach. *The Journal of High Technology Management Research*, 29(1), 71-87. <https://doi.org/10.1016/j.hitech.2018.04.007>
- Saldaña, C. X., and Guamán, G. A. (2019). Financial analysis based on the Fuzzy Logic technique, as a tool for decision making in the company Italimentos Cia. Ltda. *Revista Economía y Política*, (30), 72-95.
- Sánchez, B., Días, L. A. T., Estrella, P. P. J., & Villafuerte, P. A. P. (2023). Analysis of financial indicators and their profitability in the automotive sector in the province of Tungurahua. *Religación: Revista de Ciencias Sociales y Humanidades*, 8(37), 1-19.

- Vidyadhar , R., Sudeep Kumar, R., Vinodh, S., & Antony, J. (2016). Application of fuzzy logic for leanness assessment in SMEs: a case study. *Journal of Engineering, Design and Technology*, 14(1), 78-103. <https://doi.org/10.1108/JEDT-05-2014-0029>
- Zadeh, L. A. (1965). *Fuzzy Sets and their applications to cognitive and decision processes*. London, Academic Press Inc.
- Zhou, H., Uhlener, L. M., & Jungst, M. (2023). Knowledge management practices and innovation: A deliberate innovation management model for SMEs. *Journal of Small Business Management*, 61(4), 2126-2159. <https://doi.org/10.1080/00472778.2021.1888383>.

Influence of knowledge management on business effectiveness. An analysis with PLS

Yonimiler Castillo Ortega

Catholic University of Cuenca

ycastillo@ucacue.edu.ec

<https://orcid.org/0000-0002-7710-5199>

Jessica Marisol Delgado Marquez

Catholic University of Cuenca

jessica.delgado@est.ucacue.edu.ec

<https://orcid.org/my-orcid?orcid=0009-0006-3909-5715>

Andrés Francisco Ugalde Vásquez

Catholic University of Cuenca

andres.ugalde@ucacue.edu.ec

<https://orcid.org/0000-0002-8832-0935>

Gina Patricia Cuadrado Sánchez

Catholic University of Cuenca

gcuadrado@ucacue.edu.ec

<https://orcid.org/0000-0002-4259-4906>

Introduction

In the current environment, in which information flows at dizzying speeds, knowledge management is a fundamental component for companies to achieve competitiveness and sustainable growth (Nonaka & Takeuchi, 1995). These aspects are not achieved only with the efficient management of their productive and financial assets as it was from the dawn of the industrial revolution (Perez et al., 2019). Intangible variables must be incorporated, such as the understanding of customer expectations, tastes and preferences; as well as technological and social trends and the changes they bring; knowledge and

its effective management therefore becomes the fundamental variable that determines success or failure in the organizations of the 21st century (Pacheco & Cabrera, 2020).

In this context, the presence of SMEs in the economy and in the development of the country stands out, since they play an important role as generators of employment. According to information from the Superintendencia de Compañías, Valores y Seguros (2023), they generate 28% of private employment, contribute to social inclusion, and contribute to regional development, representing 30% of all companies incorporated in Ecuador. However, the difficulties they face in economic, business and information access, processing and use terms are also well known (Santamaria, 2018).

SMEs face higher operating costs and less financial flexibility, in addition to being small, in some cases they have to deal with a lower availability of resources, which leads to vulnerability to internal and external events, including the abandonment or resignation of efficient collaborators in their work, detriment in financing alternatives, lower demand due to the entry of new competitors or even crises (Eggers, 2020).

In this sense, Rangel et al. (2020) indicate that knowledge management fosters creativity and the generation of new ideas, which boosts the innovation capacity of SMEs and makes them more competitive; through a process that involves a sequence of activities that include the identification of data and information sources, their acquisition and storage, as well as the development of knowledge, distribution and

socialization in the organization and its use to make decisions and measure the impact generated.

When these steps are carried out properly, it is possible to say that knowledge is effectively managed in the organization, regardless of whether it was acquired internally or externally. Its effective management allows companies to access valuable information, improve decision making, foster innovation, optimize processes and improve overall performance (Rangel et al., 2020).

Therefore, one of the key challenges in knowledge management is handling the vast amount of information available, both structured and unstructured, so organizations are faced with the task of filtering and analyzing it to extract useful and relevant knowledge (Adan et al., 2022).

It is important to note that knowledge management is not limited only to the acquisition and analysis of data, but also involves the creation of an organizational culture that promotes continuous learning, innovation and knowledge transfer; therefore, companies must establish structures and systems that facilitate the effective capture, storage and dissemination of knowledge, ensuring that it is available to those who need it at the right time (Echeverri et al., 2018).

In the present research, we start from the consideration of 3 basic assumptions proposed by Marulanda et al. (2021): 1) Knowledge management is fundamental in business performance, 2) SMEs are important actors in economic development and 3) SMEs have difficulties in accessing, processing and exploiting information.

Based on the above analysis, the research question is: How does knowledge management influence business effectiveness in SMEs in the construction sector in the city of Cuenca? In order to answer the research question, the general objective was formulated to analyze the relationship between knowledge management and business effectiveness in the SMEs of the construction sector in the city of Cuenca.

For this purpose, the chapter will be divided into four parts: the first part will address theoretical and conceptual aspects on which the research is based; the second part will refer to the study variables and the methodological process developed and the results of the research; in the third part there will be a discussion of the results, contrasting them with other research and theoretical currents; in the fourth part there will be fundamental conclusions of the research.

Knowledge Management in SMEs

Knowledge management (KM) is an aspect that has aroused the interest of different researchers, as well as entrepreneurs since it has been proposed that its efficient management contributes to business competitiveness (Hu et al., 2019). In addition, it is considered that it can generate greater effectiveness, as well as have a favorable impact at the business level (Gaviria et al., 2019). It is also believed that it is more viable to develop knowledge management in large companies as they have the resources for productive development, have information and communication technologies, are competitive and have contributed to the revolution in business administration (Lotti & Kotabe, 2019).

However, according to Lin et al. (2013), SMEs have conditions that allow them to easily adopt knowledge management, although there are also obstacles such as the need to adapt to their particularities, i.e. the structure of the organization, its administration, business culture, available resources, among others. For his part, Arguello (2017) states that due to the high turnover of employees, there is an informality in the labor relationship, which becomes a challenge in terms of the implicit knowledge of individuals, acquired through their experiences, since it is lost when they leave their positions, forcing companies to constantly incur in training costs and preparation of new employees.

Therefore, SMEs, despite the difficulties they face, must seek ways to develop and acquire strengths through competitive advantages that are sustainable, which is why they have the great need to be innovative and flexible, with a great capacity to adapt to changes and that is where knowledge management acquires a very important role; this requires adequate planning and control of what to do and how to do it. (Mirabal, 2015).

It is also important to keep in mind that knowledge management involves various methodologies that should be applied to administrative management so it can be considered innovation, quality, continuous improvement, etc., favoring the experiences obtained by the collaborators regarding their accumulated experiences and knowledge, which at a certain point will allow them to create knowledge that can be applied to the organization (Rodriguez, 2018).

Thus, knowledge management is based on human capital, which contributes to the company from its experience, the way in which it executes its tasks and procedures, which are perfected and transmitted to other collaborators, thus promoting the development of activities effectively and efficiently, minimizing errors and failures. But it also has to do with other learning that allows the management of relevant aspects for the company such as its internal and external data, development and innovation processes, program design, coordination of timely actions, communication and relationship between the different areas, and the adoption of information and communication technologies (Solórzano et al., 2021).

All these aspects allow the company to improve in different areas such as distribution channel, work groups, relationship with customers, suppliers or collaborators, etc. In this sense, Solórzano et al. (2021) affirm that organizations that manage to be flexible and adaptable to changes are those whose human talent is capable of promoting variations, which derive in adaptations in the company, being these the ones that allow it to face the new environments of administrative management.

On the other hand, Machado & Davim (2021) suggest 5 dimensions that could be favored with an adequate and efficient knowledge management in organizations, mentioning customers, financing, processes, innovation and collaborators. Each of these dimensions may vary according to the size of the organization and its requirements. Table 1

shows the potential impacts in each of the dimensions as a consequence of a correct knowledge management.

Table 1. *Business dimensions benefited by knowledge management*

| Customers | Financing | Processes | Innovation | Collaborators |
|---|-----------------------------------|--------------------------------------|-------------------------------------|--|
| Reduced reaction time. | Improved risk management. | Accelerates processes. | Research + Development Improvement. | Increased motivation. |
| Increase in the quality of the product and/or service. | Increase in the company's volume. | Reduces the double process. | New ICTs are applied. | Participation of collaborators. |
| Improved communication with the customer. | Increased market share. | Reuse internal knowledge. | New products and/or services. | Teamwork. |
| Increased customer satisfaction. | Optimize marketing actions. | Lower transaction costs. | New business segments. | Shorter incorporation time. |
| Customer retention. | Reduces administrative costs. | Increased transparency in processes. | | Development of competencies. |
| Customer knowledge. | | Increased productivity. | | Increase in personal value. |
| | | Fewer errors. | | Increased personal knowledge. |
| | | I save time in routine activities. | | Speed in the company's learning process. |

Note: Prepared based on Machado & Davim (2021).

The application of an efficient knowledge management mechanism allows companies to improve innovation, profitability and effectiveness by adopting new business models, adapting to changing markets and meeting demands quickly, as concluded by Solis et al. (2020).

Relationship between knowledge management and business effectiveness

For most authors, effectiveness is related to the concepts of efficiency and efficacy (Koontz & Wehrich, 2007). (Koontz & Wehrich, 2007).effectiveness is understood as the ability to achieve the objectives set, while efficiency includes the use or optimization of resources in the achievement of goals, so that effectiveness can be defined as the ability to achieve the objectives at the lowest possible cost. Thus, for Koontz & Wehrich (2007) the key components of effectiveness are, among others, sustainable profitability and operational efficiency.

The goals set by each company depend on many factors and respond to the specific needs of its stakeholders such as shareholders, managers, employees, customers, government and society; they are also directly related to the cycle in which the organization is, for example, growth, consolidation, maintenance, etc.; finally, we can mention the environment and the specific market conditions because it may be going through periods of expansion or contraction depending on the conditions of safety, health, economy, among many others (Ramirez et al., 2022).

In line with the above, it can be said that regardless of their conditions, size and time in the market, all companies have as a goal the generation of economic resources through the achievement of profits in line with their activity and additionally that these resources are obtained at the lowest possible cost. In this context, Montero et al. (2016) point out that in order to assess effectiveness, the following aspects considered key should be taken into account: correctly defining the organization's objectives, identifying the processes related to the critical factors for the company's success or that provide competitive advantages, determining the needs of the different resources for the achievement of the goals, identifying the needs of the external client and orienting the company towards their satisfaction and establishing in each process the performance indicator and improvement objective.

Business effectiveness is, therefore, closely related to the strategy and objectives of each organization, with its level of development, its size and mainly with the expectations that shareholders have in the results they expect to obtain in a certain period of time (Santa Cruz et al., 2022), this variety of factors according to Camue et al. (2017) makes that the metrics can be different for each company, however, key factors that constitute typical indicators of effectiveness can be identified, thus the following can be pointed out:

Financial profitability, revenue growth, customer satisfaction, operational efficiency and innovation, among others.

These are the main indicators of effectiveness; however, as already noted, it will depend on the objectives of each company and could include other magnitudes such as market share, quality of products or services, human resources, social responsibility and sustainability, among others.

Previous studies have analyzed knowledge management and its relationship with business effectiveness, such as Rodriguez et al. (2022) in Mexico, in whose descriptive and correlational study they investigated 4 variables through a questionnaire with 92 items applied to 35 employees of the business conglomerate "Grupo MIVASA". The knowledge management variable (dependent) included the dimensions storage, application and protection, acquisition and transfer, and 3 independent variables were also considered: organizational culture, leadership and ICTs. The results showed a negative perception of the collaborators in terms of knowledge management, that is to say that there is no such action, on the other hand they showed agreement with the organizational culture, leadership and information and communication technologies. A correlation was found between the variables knowledge management and leadership (0.781) and between knowledge management and ICTs (0.749).

Another analysis, developed by Ávalos et al. (2021) in Peru, who focused on determining the relationship between knowledge management and productivity for the company "Constructora PBG E.I.R.L. San Martín de Porres" in the form of a correlational study, working with 70 informants to whom a survey was applied to assess these variables. Regarding the

dimensions, knowledge management was composed of creation, transfer and application of knowledge; while productivity presented the dimensions of efficiency, effectiveness and competitiveness. The results showed a fair perception of knowledge management by 42.9% and a poor perception by 35.7%. In addition, a moderate positive and direct relationship was determined between the variables studied with an Rho of 0.622 and $p= 0.000$, which indicates that by increasing knowledge, greater productivity will be achieved in the company.

Another research developed in Mexico presented by Villegas et al. (2017) with a quantitative, parametric, correlational-causal approach, in which they worked with 32 companies listed on the Mexican Stock Exchange. The results of Villegas et al. (2017) demonstrated the existence of a strong relationship between VAIC™ and ROA (0.677), high average correlation, positive and statistically significant with human capital (0.534) as well as with structural capital (0.620).

Valdez (2017) In a research conducted in Cartagena with 903 SMEs in which the relationship between the variables business growth, company size, information and communication technology, and knowledge management was studied, the OLS linear regression model was used. The findings denoted a positive and significant relationship between ICTs and, training and training of employees in the knowledge management system ($\beta=0.221$, $p<0.01$). There was also a positive and significant effect of knowledge management on sales growth ($\beta=0.010$, $p<0.10$), of SME size on sales growth ($\beta=0.110$, $p<0.01$) and on employee growth ($\beta=0.369$,

$p < 0.01$). ICTs have a positive and significant influence on sales growth ($\beta = 0.098$, $p < 0.01$).

In the Ecuadorian context, there is the contribution of Gómez et al. (2023) developed with the intellectual value coefficient model (VAIC™) applied in 45 textile companies in Ecuador. The results evidenced the decrease of ROA from 11.67% to 5.20% between the years 2014 to 2019, likewise there is a decrease of ROE from 35.48% to 20.59% in the same period. Significant moderate relationships were identified between VAIC™ and human capital efficiency (0.324), structural capital efficiency (0.336), and a strong relationship between human capital efficiency and capital employed efficiency (0.84).

In addition, Ugalde (2021) developed a quantitative study for the collection of information from 50 companies in the manufacturing sector in the city of Cuenca, using the method of partial least squares analysis, identifying a positive and statistically significant relationship between knowledge management and business performance.

On the other hand, the contribution of Rocha (2020) whose approach was quantitative and of correlational-causal design, working with 8 software industries in the city of Guayaquil in which case the mathematical method was applied in which statistical analysis and probability calculation were used. The results showed that there was no impact of knowledge management on labor performance in the companies investigated with Tau_b Kendall values 0.038 and $p = 0.899$ with Rho Spearman correlation coefficient 0.121 and $p = 0.775$.

Mention can also be made of the study by Pardo et al. (2018) carried out with 1,665 Ecuadorian manufacturing companies from which the financial statements were obtained through the Superintendencia of Companies, Securities and Insurance between the periods 2012 to 2016 with which they proceeded to calculate the data of economic profitability (ROA), financial profitability (ROE) and intellectual capital. The results of ROA and ROE averaged in negative which indicated that the returns between the years 2012 to 2016 were not positive, a positive correlation was also identified between both ratios, as well as between: efficiency of human capital with ROA and ROE, efficiency of structural capital with ROA and ROE, efficiency of intellectual capital with ROA and ROE, and efficiency in capital employed with ROA and ROE. While the relationship of intellectual value-added coefficient with ROA and ROE was also positive (Pardo et al., 2018).

Methodological process, study variables and research results

In Ecuador, SMEs in 2022 represented 31% of the total number of companies nationwide. In first place are microenterprises with 66% of participation; large companies only 3% according to data from the Superintendencia of Companies, Securities and Insurance (2023).

Twenty-eight percent of SMEs nationwide are in the construction sector, a segment in which the hardware industry represents 23% of the total number of companies nationwide. In the province of Azuay, 6% of the SMEs that exist in the country are concentrated, being the third province with more registrations. The hardware segment represents 10% of the

construction SMEs in the city of Cuenca. This segment is relevant because there are a large number of SMEs that provide manufacturing services for construction materials, as well as others that provide architectural services or design of spaces (Organization for Economic Cooperation and Development, 2020).

In this context, knowledge management acquires interest since it has been considered as a strategic resource for the development of competitive advantages, and the hardware sector is not far from this reality, since market competition is increasing, in which customers know more about services, products and brands, so they are demanding and thus set high levels of quality, as well as safety and environmental care (Méndez & Olarte, 2021).

The study variables of this research are operationalized in Table 2. It shows that knowledge management is defined as an independent variable, with its dimensions and indicators. Business effectiveness as a dependent variable.

Table 2. *Operationalization of variables*

| Variable | Dimension | Indicator | Item |
|---|-----------|--|------------------------------|
| INDEPENDENT Knowledge management: process of identifying, organizing, storing and disseminating information in an organization (Rangel et al., 2020). | Customers | Reaction time. | Questionnaire 1.1. a 1.6. |
| | | Quality of the product and/or service. | |
| | | Communication with the client. | |
| | | Customer satisfaction. | |
| | | Customer retention. | |
| | Financing | Customer knowledge. | |
| | | Risk management. | |

| | | | |
|---|------------------------------|---------------------------------|-------------------|
| <p>DEPENDENT</p> <p>Business effectiveness: ability of an organization to achieve its objectives in an efficient and sustainable manner (Camue et al., 2017).</p> | | Company volume. | 2.1. a 2.5. |
| | | Market share. | |
| | | Marketing actions. | |
| | | Administrative costs. | |
| | Processes | Process agility. | Questionnaire |
| | | Double process. | 3.1. a 3.8. |
| | | Internal knowledge. | |
| | | Transaction cost. | |
| | | Transparency in processes. | |
| | | Productivity. | |
| | | Errors. | |
| | | Routine activities. | |
| | Innovation | R&D improvement. | Questionnaire |
| | | New ICT. | 4.1. a 4.4. |
| | | New products and/or services. | |
| | | New business segments. | |
| | Collaborators | Motivation. | Questionnaire |
| | | Participation of collaborators. | 5.1. a 5.8. |
| | | Teamwork. | |
| | | Incorporation time. | |
| | Development of competencies. | | |
| | Personal value. | | |
| | Personal knowledge. | | |
| | Company learning. | | |
| | Margin | Percentage | Information |
| | Asset turnover | Percentage | BASE SUPERCIAS |
| | ROI | Percentage | |

Note: Prepared from dependent and independent variable.

Independent variable: Knowledge management

To obtain information on the knowledge management of SMEs in the hardware sector in the city of Cuenca, a data collection instrument was designed. It consists of 5 dimensions and 31 items, each one distributed as follows: Customers 6 items, Financing 5 items, Processes 8 items, Innovation 4 items and Collaborators 8 items. The Likert scale (1 - 5) was used for their evaluation, so that each of the items of the questionnaire was evaluated according to the following equivalence: 1. These results had to be normalized, so they were weighted as a percentage and then converted into decimals to be able to work in Smart PLS.

It is important to identify that the questionnaire provided information on the perception of knowledge management by the informants, since the criteria are subjective to assess the actions implemented in each entity. This is understood insofar as it is not possible to perform an effective verification of the execution of the knowledge management activities that the questionnaire evaluates, so it is soft data, understood as those derived from subjective assessments of the observers (informants). (Weinberger, 2012).

In order to obtain the information, a request was sent to the SMEs informing them of the objectives of the research and their interest in participating in it, which was sent via e-mail or delivered personally by the researcher. This document is endorsed by the responsible tutor and is attached in Annex 2. Subsequently, a link was sent to the contacts established in

the company or by the agreed means so that the assigned informant could answer the online questionnaire. The information gathering process was carried out between November 6 and December 5, 2023. Once the results were obtained, they were validated by reviewing the database for inconsistencies in order to resolve them prior to processing.

Dependent variable: Business effectiveness

For the measurement of business effectiveness, we considered the dimensions of profitability margin, asset turnover and return on investment (ROI) for fiscal year 2022. These indicators are obtained directly from the web page of the Superintendency of Companies, Securities and Insurance. (2023). Each dimension is measured in percentage terms, so they were transformed to decimals to normalize the data and work in PLS. In addition, the information of these indicators is characterized by coming from objective assessments carried out through standardized processes, i.e. they are hard or solid data, precisely characterized by being retrospective (they correspond to past management), in general it can be said that they are reliable because they are verifiable and measurable. (Weinberger, 2012).

The population used for the data collection was 55 SMEs registered in the financial statements database of the Superintendencia de Compañías, Valores y Seguros (2023). (2023) corresponding to the province of Azuay, city of Cuenca, with economic activity related to construction from January to December 2022. Prior to determining the final number of companies, the information in the database was validated to identify that all the fields contained information; as a result, 37

SMEs in the hardware sector were obtained. The database is composed of the following variables: year, file, company name, type of company, economic activity, region, province, city, size, sector, number of employees, year of creation, ROI, profitability margin and asset turnover.

The partial least squares (PLS) method was used to analyze the information, since this multivariate statistical technique is capable of analyzing complex data sets and generating results that allow decisions to be made that would otherwise be hidden under large amounts of data (Demuner et al., 2022).

The application of the partial least squares method in knowledge management is a methodology for working with theoretical models. In this sense, PLS allows modeling and predicting different scenarios, which facilitates informed decision making. Using this approach, organizations can analyze changes in the environment and adjust their strategies accordingly, avoiding risks and taking advantage of emerging opportunities (Ibarra et al., 2020).

As expounded by Guzman et al. (2018), the partial least squares method enables organizations to gain a deep understanding of their internal and external knowledge, identifying patterns, trends and relationships that may otherwise go unnoticed; which contributes to informed and strategic decision making, supported by robust data and rigorous analysis. Furthermore, with the application of PLS in knowledge management, by analyzing complex data sets together, different teams and departments can integrate their knowledge and perspectives, generating a multidisciplinary

approach and enriching the decision-making process (Martinez & Fierro, 2018).

The results of the survey were the years of permanence in the market and the number of collaborators, as shown in Table 3.

Table 3. *SMEs, years in the market*

| Years in the market | Freq. | % |
|--------------------------------|-----------|-------------|
| Less than 5 years | 10 | 27% |
| 5 to 10 years | 13 | 35% |
| Between 11 and 20 years old | 12 | 32% |
| More than 30 years | 2 | 5% |
| Total | 37 | 100% |

Note: Prepared based on information from the Superintendency, of Companies, Securities and Insurance (2023).

This shows that 27% of the SMEs investigated have been in the market for less than 5 years, 35% have been in business for between 5 to 10 years and 32% for between 11 to 20 years, while 5% of them have been in business for more than 30 years. This indicates an important maturity of the companies in their economic activity, since the time of existence denotes knowledge of the branch performed, suppliers, clients, products, services, among other factors.

Table 4. SMEs, number of employees

| Number of collaborators | Freq. | % |
|--------------------------------|-----------|-------------|
| Less than 10 employees | 28 | 76% |
| Between 10 to 20 collaborators | 6 | 16% |
| More than 20 collaborators | 3 | 8% |
| Total | 37 | 100% |

Note: Prepared based on information from the Superintendency of Companies, Securities and Insurance (2023).

According to the number of collaborators, Table 4 shows that 76% have less than 10 employees, 16% have between 10 and 20 people, while 8% have more than 20 workers. In this sense, SMEs tend to generate diverse workplaces consistent with their diversity as well; thus, in the group of 37 companies analyzed, a total of 335 workers were concentrated.

In order to study the correlation between the variables, a factor analysis was carried out, through which 14 indicators of the knowledge management variable were reduced because they presented null relationships.

According to the dimensions, the reduced indicators were:

Customer dimension: reaction time, product and/or service quality, customer satisfaction, customer retention. Financing dimension: risk management, Process dimension: errors, Innovation dimension: R&D improvement, new business segments, and Employee dimension: motivation, employee

participation, teamwork, time of incorporation, personal value, personal knowledge.

In addition, with respect to the business effectiveness variable, two indicators were reduced: profitability margin and asset turnover because they presented null correlations, so we proceeded to work only with ROI (see Figure 1).

Thus, the calculation of the PLS model with bootstrapping is performed through 17 constructs, of which 16 correspond to knowledge management distributed in its 5 dimensions and 1 only in business effectiveness as follows: Dimension customers: communication with the customer and customer knowledge, Financing: company volume, market share, marketing actions and administrative costs, Processes: process agility, double process, internal knowledge, transaction cost, transparency in processes, productivity and routine activities, Innovation: new ICT, new products and/or services, Employees dimension: development of competencies and company learning.

Of the Business Effectiveness variable, the analysis remained with the ROI.

Regarding bootstrapping, this method is based on the creation of subsamples with analyses that are randomly extracted from the original base of modified information or with replacements as in the case of the SMEs in the hardware sector that are the object of this research, in which case, constructs were reduced by means of factor analysis. In this way, the resulting subsample is used for the estimation of the PLS path model, this procedure is executed until a large

number of random subsamples are created. This method is characterized by the fact that the external weights and loadings, as well as the coefficients obtained from the subsamples are used for the derivation of confidence intervals at 95% in significance testing exercises. It is also important to consider that the confidence level considered is 0.05.

The Path coefficient (standardized) was used to assess the magnitude and weight of the relationships between the latent variables, the results of which can be seen in Table 5.

Table 5. *Relationships between latent variables*

| | Business effectiveness |
|----------------------|------------------------|
| Knowledge management | 0.363 |

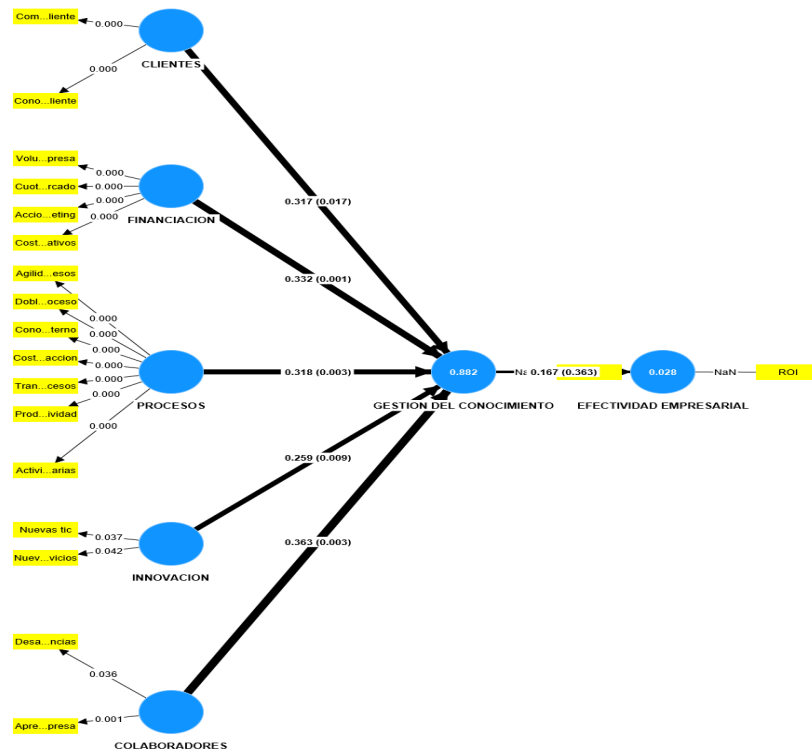
Note: Prepared using the PLS method.

The relationship between the variables knowledge management and business effectiveness shows a positive association. This shows that for the exercise carried out there is an impact of knowledge management on business effectiveness.

Figure 1 shows all the existing relationships between the variables, dimensions and indicators, being important to analyze that the dimensions of the independent variable have the following relationships: Customers with 0.017, Financing with 0.001, Processes with 0.003, Innovation with 0.009 and Collaborators with 0.003. That is, less than the 0.05 indicator,

so it is understood that they are significant positive correlations.

Figure 1. Relationship diagram with PLS method



Note: Prepared using the PLS method.

Similarly, there is a direct relationship (0.317) between clients and knowledge management, which confirms the relationship between the construct and the variable. There is also a relationship between financing (0.332), processes

(0.318), innovation (0.259) and collaborators (0.363) and knowledge management (see Figure 1).

The model was validated with a confidence level of 97.5% under the bootstrapping model in PLS. To validate the reliability of the model, the R-square (coefficient of determination) was used, which was 0.028. It is understood that there are adequate estimates among the variables, which can also be interpreted as an adequate level of prediction.

Table 6. *Validity and reliability*

| | Cronbach's Alpha | Composite reliability (rho_c) | Average variance extracted (AVE) |
|---------------|------------------|-------------------------------|----------------------------------|
| Customers | 0.639 | 0.844 | 0.731 |
| Collaborators | 0.127 | 0.692 | 0.533 |
| Financing | 0.724 | 0.831 | 0.556 |
| Innovation | -0.005 | 0.665 | 0.499 |
| Processes | 0.848 | 0.885 | 0.526 |

Note: Prepared using the PLS method.

In addition, the analysis verified an increase in reliability of latent variables in which all coefficients reached the minimum levels required. The average variance extracted measures the amount of variance achieved by a latent variable over that caused by measurement error, being greater than or equal to 0.50. Table 6 shows Cronbach's Alpha coefficients, which show positive values, although the most significant are financing (0.724) and processes (0.848), so the constructs have a good relationship; as well as the composite reliability

through significant constructs such as customers (0.844), financing (0.831) and processes (0.885), which are greater than 0.7. Thus, to a large extent, the coefficients show a good level of model fit.

Conclusions

In conclusion, it was found that there was a positive correlation between the independent and dependent variables (0.363). These results are in agreement with other studies in which positive relationships were also found, one of them, that of Ávalos et al. (2021) in whose analysis they found a moderate positive and direct relationship between knowledge management and business productivity (0.622). Also presented is the research by Rodríguez et al. (2022) in which significant relationships were found between knowledge management and different variables, such as leadership (0.781) and ICTs (0.749). Thus, in both studies it can be concluded that as knowledge increases in the organization, there is a better productive management, leadership and ICT (as appropriate). In this regard, Echeverri et al. (2018) states that knowledge management is not limited only to the acquisition and analysis of information, as it also addresses aspects related to the development of organizational culture, the promotion of continuous learning, innovation and creativity, among others.

The results for companies in the construction sector in Cuenca can also be compared with studies carried out with the VAIC model™ (intellectual value coefficient) in that they are very similar and in which positive relationships between their components are not always found. An example of positive

relationships is the case of Villegas et al. (2017) in which a moderate positive relationship was identified with return on assets (0.677) as well as with human capital (0.534) and structural capital (0.620). Furthermore, they can be compared with the results of Gómez et al. (2023) who also used the intellectual value coefficient model in textile companies in Ecuador, finding a strong relationship between human capital and capital employed (0.84), as well as moderate correlations between intellectual value (knowledge) and human capital (0.324) and with structural capital (0.336). In these studies, it is concordant that those actions of relevance for the company that are based on knowledge have a significant impact on the profitability of the entities surveyed.

While Ugalde (2021) in his study with manufacturing industries in Cuenca, also using the PLS method, determined a significant relationship between knowledge management and business performance, being relevant the correlations between the design of accounting and management control systems (SCCG) and the internal acquisition of knowledge (0.728) being a strong positive relationship, and the design of SCCG and internal effectiveness of the company (0.370) being a moderate positive relationship.

In this scenario of results, it is important to recognize that knowledge management, according to Rangel et al. (2020) favors the competitiveness of SMEs, being a process that consists of a series of activities ranging from the recognition of information, sources, acquisition and storage of data, in addition to the development of knowledge, its dissemination and socialization in the company, as well as its use in decision

making and the measurement of its impact in different areas. In such a way that when these actions are executed correctly, there is an adequate knowledge management which favors the general performance of the company, on the contrary, it is understood that if it is not done, its processes will be less effective and in general the organization tends to be less competitive with respect to its similar ones in the market in which it develops.

Reference

- Adan, J., Munar, L., Romero, G., & Gordillo, A. (2022). New challenges of small and medium enterprises in times of pandemic. *Tecnura*, 26(72), 185-208. <https://doi.org/10.14483/22487638.17879>.
- Arguello, C. (2017). Development of a knowledge management model for SMEs in the. *Industrial Data*, 20(2), 79-86. <https://www.redalyc.org/articulo.oa?id=81653909011>
- Ávalos, R., García, D., Merma, N., & Villamares, E. (2021). Knowledge management and productivity of a Peruvian construction company. *South Florida Journal of Development*, Miam, 2(4), 5183-5194. <https://10.46932/sfjdv2n4-017>.
- Barclay, D., Thompson, R., & Higgins, C. (1995). The partial least squares (PLS) approach to causal modeling: using personal computers as an illustration. *Technology Studies*, 2(2), 285-309. https://www.researchgate.net/publication/242663837_The_Partial_Least_Squares_PLS_Approach_to_Causal_Modeling_Personal_Computer_Use_as_an_Illustration.

- Beltramino, N. (2019). The Role of Intellectual Capital in Product and Process Innovation and SME Performance. *Journal of Economics and Statistics*, 57(1), 75-113. <https://doi.org/10.55444/2451.7321.2019.v57.n1.31316>
- Calvo, A., & Criado, F. (2005). Validity analysis of the European model of excellence for quality management in university institutions: a managerial approach. *European journal of management and business economics*, 14(3), 41-58. <https://dialnet.unirioja.es/servlet/articulo?codigo=1399287>.
- Cuenca Chamber of Construction (2023). *List of Members*. Cuenca: Cámara de la Construcción de Cuenca. <https://www.camaraconstruccioncuenca.com/>
- Camue, A., Carballal, E., & Toscano, F. (2017). Theoretical conceptions of organizational effectiveness and its evaluation in universities. *Cofin Habana*, 11(2), 136-152. http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2073-60612017000200010
- Catania, A. (2018). *Calculation of confidence intervals*. RStudio. <https://rpubs.com/acatania/396921>
- Demuner, M., Saavedra, M., & Cortes, M. (2022). Entrepreneurial Performance, Resilience and Innovation in SMEs. *Administrative Research*, 51(130), 1-20. <https://www.redalyc.org/articulo.oa?id=456071633003>. <https://www.redalyc.org/articulo.oa?id=456071633003>
- Echeverri, A., Lozada, N., & Arias, J. (2018). Incidence of Knowledge Management Practices on Organizational Creativity. *Technological Information*, 29(1), 71-82. <https://dx.doi.org/10.4067/S0718-07642018000100071>

- Eggers, F. (2020). Masters of disasters? Challenges and opportunities for SMEs in times of crisis. *Journal of business research*, 1(116), 199-208. <https://doi.org/10.1016/j.jbusres.2020.05.025>
- Escobedo, M., Hernández, J., Ortega, V., & Martínez, G. (2016). Structural equation models: characteristics, phases, construction, application and results. *Science & Work*, 18(55), 16-22. <https://www.scielo.cl/pdf/cyt/v18n55/art04.pdf>.
- Gaviria, M., Merigó, J., & Baier, H. (2019). Knowledge management: a global review based on bibliometric analysis. *Technological Forecasting and Social Change*, 140(1), 194-220. <https://doi.org/10.1016/j.techfore.2018.07.006>.
- Gómez, M., López, A., & Totoy, E. (2023). Intellectual capital in the textile apparel sector: An explanatory study of profitability. *AD-GNOSIS*, 12(12), 1-21. <https://doi.org/10.21803/adgnosis.12.12.635>
- Guzmán, B., Jiménez, M., & Hernández, I. (2018). Measuring knowledge management in the public university of Mexico City. *Revista Iberoamericana para la Investigación y el Desarrollo Educativo*, 9(17), 1-19. <https://doi.org/10.23913/ride.v9i17.398>
- Hu, Q., Williams, S., Mason, R., & Found, P. (2019). Knowledge management in consultancy-involved process improvement projects: cases from Chinese SMEs. *Production Planning & Control*, 30(10), 866-880. <https://doi.org/10.1080/09537287.2019.1582095>.
- Ibarra, M., Vela, J., & Ríos, E. (2020). Intellectual capital, knowledge management and performance in

- universities. *Administrative Research*, 49(126), 1-19.
<https://doi.org/10.35426/iav49n126.06>
- National Institute of Statistics and Census (2022). *Registro de Empresas 2022*. Quito: INEC.
<https://www.ecuadorencifras.gob.ec//directoriodeempresas/>
- Koontz, H., & Weihrich, H. (2007). *Elements of management*. Mexico: McGraw-Hill Interamericana.
- Legato, A., & Alonso, A. (2013). Optimal results demand higher precision tools: the contribution of Partial Least Squares (PLS). *Journal of the Faculty of Economics*(10), 37-61. <http://sedici.unlp.edu.ar/handle/10915/116356>.
- Leyva, O., & Olague, J. (2014). Structural equation modeling by the partial least squares (PLS) method. In K. Sáenz, & G. Tamez, *Métodos y técnicas cualitativas y cuantitativas aplicables a la investigación en ciencias sociales* (p. 515). Mexico D.F.: Tirant Humanidades.
- Lotti, F., & Kotabe, M. (2019). Knowledge management barriers, practices, methods and tools in startups. *Journal of Knowledge Management*, 23(12), 1838-1856. https://www.researchgate.net/publication/331356540_Barriers_practices_methods_and_knowledge_management_tools_in_startups
- Machado, C., & Davim, P. (2021). *Knowledge Management and Learning Organizations*. Braga: Springer International Publishing.
- Martínez, M., & Fierro, E. (2018). Application of the PLS-SEM technique in knowledge management: a practical technical approach. *RIDE. Iberoamerican Journal for Educational Research and Development*, 8(16). <https://doi.org/10.23913/ride.v8i16.336>

- Marulanda, C., López, M., & Gómez, C. (2021). Knowledge management and intellectual capital of companies in the tourism sector of the Department of Caldas - Colombia. *Engineering and Competitiveness*, 24(1), 1-15. <https://doi.org/10.25100/iyc.24i1.11058>
- Méndez, N., & Olarte, J. (2021). *Design of a prototype of a business information system for knowledge management in a family MSME of the hardware sector in Bogota*. Bogotá. [Engineering Thesis, Repositorio Universidad de La Salle] https://ciencia.lasalle.edu.co/ing_industrial/166
- Mirabal, J. (2015). Dynamic organizational knowledge management. *Venezuelan Journal of Information, Technology and Knowledge*, 12(2), 55-78. <https://www.redalyc.org/pdf/823/82340995005.pdf>
- Montero, Y., Leyva, E., & Ballester, T. (2016). Methodology for assessing entrepreneurial effectiveness. *Caribbean Journal of Social Sciences*, 1(1), 1-7. <https://www.eumed.net/rev/caribe/2016/05/efectividad.html>
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge creating company*. New York: Oxford University Press.
- Organization for Economic Cooperation and Development (2020). *Macroeconomic impact of Covid-19 in Ecuador: challenges and responses*. Quito: OECD Development Centre. <https://www.oecd.org/dev/Impacto-macroeconomico-COVID-19-Ecuador.pdf>
- Oufkir, L., Fredj, M., & Kassou, I. (2017). Performance Measurement for Knowledge Management: Designing a Reference Model. *Journal of Organizational Knowledge Management*, 7(1), 1-13.

- <https://ibimapublishing.com/articles/JOKM/2017/733562/733562.pdf>
- Pacheco, M., & Cabrera, M. (2020). Management of intangibles as a fundamental pillar in the development of new organizations. *University and Society*, 12(3), 398-406.
http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2218-36202020000300398
- Pardo, M., Armas, R., & Higuerey, Á. (2018). The influence of intellectual capital on the profitability of Ecuadorian manufacturing firms. *Espacios*, 39(51), 1-14.
<https://www.revistaespacios.com/a18v39n51/18395114.html>.
<https://www.revistaespacios.com/a18v39n51/18395114.html>
- Pérez, Y., Posada, Y., & Marrufo, R. (2019). Recognition of intangible assets as a key success factor in micro, small and medium enterprises. *Espacios*, 40(32), 1-11.
<https://www.revistaespacios.com/a19v40n32/a19v40n32p11.pdf>
- Ramírez, G., Magaña, D., & Ojeda, R. (2022). Productivity, aspects that benefit the organization. Systematic review of scientific production. *Transcender, Accounting and Management*, 7(20), 189-208.
<https://doi.org/10.36791/tcg.v8i20.166>
- Rangel, J., Mata, & Silvia (2020). The influence of business strategy on intellectual capital and innovation in small and medium-sized enterprises. *International Competitiveness Researchers Network*, 13(1), 1099-1115.
<https://riico.net/index.php/riico/article/view/1841/1600>

- Robles, C. (2022). Incidence of knowledge management on the innovative performance of root and tuber agroindustrial firms in Costa Rica. *Investiga TEC*, 3(2), 20-22.
https://revistas.tec.ac.cr/index.php/investiga_tec/article/download/6216/5982/20471.
- Rocha, J. (2020). *Knowledge management and impact on job performance: methodological proposal for software development industries in the city of Guayaquil*. Guayaquil. [Master's Thesis, Repositorio Universidad Politécnica Salesiana]
<https://dspace.ups.edu.ec/bitstream/123456789/19636/1/UPS-GT003091.pdf>
- Rodríguez, H. (2018). Towards an inclusive knowledge management. *Cuadernos Latinoamericanos de Administración*, 14(27), 1-3.
<https://www.redalyc.org/journal/4096/409658132015/409658132015.pdf>.
- Rodríguez, M., Tortolero, R., Favila, S., & Ortiz, A. (2022). Knowledge management and the main organizational factors that influence it in a business conglomerate in Durango Mexico. *Ciencia Latina Revista Multidisciplinar*, 6(4), 1436-1452.
https://doi.org/10.37811/cl_rcm.v6i4.2673.
- Santa Cruz, A., Córdova, A., Cruz, J., & Almestar, C. (2022). Knowledge management and organizational effectiveness in municipalities in the province of San Martín, Peru. *Revista de Gobierno y de Gestión Pública*, 9(1), 1-14.
<https://revistagobiernoygestionpublica.usmp.edu.pe/index.php/RGGP/article/view/239/395>

- Santamaria, R. (2018). SMEs and factors to obtain success, start for the referential framework. *Industrial Engineering. Actualidad y Nuevas Tendencias*, 6(21), 131-144.
<https://www.redalyc.org/journal/2150/215058535009/html/>
- Solís, S., Zerón, M., & Sánchez, Y. (2020). Effects of Absorptive Capacity on Industrial Sector Innovation in Northern Mexico. *Nova scientia*, 11(23), 447-472.
<https://doi.org/10.21640/ns.v11i23.2039>
- Solórzano, A., Maridueña, L., & Mora, N. (2021). Model of knowledge management and organizational learning in SMEs in the Province of El Oro. *593 Digital Publisher*, 6(2), 252-260.
<https://doi.org/10.33386/593dp.2021.2.424>
- Superintendence of Companies, Securities and Insurance (2023). *Estadística de Constitución de Compañías*. Quito: Superintendencia de Compañías, Valores y Seguros.
<https://appscvsmovil.supercias.gob.ec/portaldeinformacion/reporteCias.zul>
- Superintendency of Companies, Securities and Insurance (2023). *Financial Statements*. Quito: Superintendencia de Compañías, Valores y Seguros.
<https://appscvsmovil.supercias.gob.ec/ranking/reporte.html>
- Ugalde, A. (2018). The role of management control systems and CEOs in knowledge acquisition: effects on effectiveness. *Memorias XIV Foro Internacional del Emprendedor*(14), 42-63.

<https://revistas.uazuay.edu.ec/index.php/memorias/article/view/179/169>.

- Ugalde, A. (2021). *The role of accounting and management control systems, top management teams and knowledge management in business effectiveness*. Sevilla. [Doctoral Thesis, Repositorio Universidad Pablo de Olavide] <https://rio.upo.es/xmlui/bitstream/handle/10433/11721/ugalde-vazquez-tesis-20-21.pdf?sequence=1&isAllowed=y>
- Valdez, L. (2017). *Knowledge management and ICT, its effect on innovation and SME performance: an empirical study*. Cartagena. [Doctoral Thesis, Repositorio Universidad Politécnica de Cartagena] <https://core.ac.uk/download/pdf/159378377.pdf>
- Villegas, E., Hernández, M., & Salazar, B. (2017). The measurement of intellectual capital and its impact on financial performance in firms in the industrial sector in Mexico. *Contaduría y administración*, 62(1), 184-206. <https://doi.org/10.1016/j.cya.2016.10.002>
- Weinberger, H. (2012). *Differential equations in partial derivatives with complex variable methods and integral transformations*. Barcelona: Editorial Reverté.

Analysis of Governmental Accounting in Parochial Autonomous Governments: case study of the execution of public works in Tayuza

Ana Alexandra López-Jara

Catholic University of Cuenca, alopezj@ucacue.edu.ec, ORCID: 0000-0001-6905-9025

Klever Alfonso Morales-Pazmiño

Catholic University of Cuenca, kmoralesp@ucacue.edu.ec, ORCID: 0000-0002-0148-3556

Sara Nathaly Ayala-Pasquel

Catholic University of Cuenca, sayalap@ucacue.edu.ec, ORCID: 0000-0002-1620-0627

Ernesto Bolívar Rizzo-Orellana

Catholic University of Cuenca, ernesto.rizzo@ucacue.edu.ec, ORCID: 0009-0006-4040-5995

Introduction

The purpose of this paper is to present the results of a bibliographic research on Governmental Accounting applied to Parochial Autonomous Governments. In addition, it includes a practical part detailing the procedures for the realization of public works. The fundamental tool for inferring, recording and analyzing the activities of non-financial public institutions in Ecuador is the public accounts. These institutions must manage the resources allocated by the

national government, ensuring that each one fulfills the objectives for which it was created, for the benefit of society.

In this context, we analyze the stages and budget items for the execution of the "NATEMTSA" court, a minor work, identified as a need by the Parish Autonomous Government of Tayuza, belonging to the Santiago Méndez canton, in the province of Morona Santiago. The paper will address several key issues related to current expenditures within the framework of government accounting. The challenges and opportunities in the management of these expenditures will be examined, as well as their impact on the financial sustainability of public entities. In addition, an evaluation of the efficiency in the execution of these expenditures will be carried out, analyzing their impact on administrative management and the achievement of governmental objectives. The legal and regulatory framework of current expenditures in Ecuador will be reviewed in detail, highlighting the relevant regulations and provisions. Finally, the phases of public procurement in the Ecuadorian context will be explored, identifying the procedures and stages involved in this fundamental process for the management of public resources.

This study was carried out based on a descriptive type, by means of observation, in its first stage documentary information related to Governmental Accounting, the management of public entities and financial decision making was collected; in the second stage, information of the same characteristics was collected and analyzed through interviews with public servants.

On the other hand, this report has a quantitative and qualitative approach, due to the collection of numerical data and the analysis of the variables; as for the instruments, the technique of interviews was used, which were applied to the most senior officials of the Decentralized Autonomous Parish Government of Tayuza in order to know the process of budget execution of the work "NATEMTSA".

The system of public financial administration and the accounting process in the public sector applied in the parochial decentralized autonomous governments.

According to López (2011) in the legal lexicon, the notion of Public Administration was consolidated in the French Revolution, and it is from that historical moment (18th century) that we can properly speak of public administration, which can only be understood from the legal-political point of view.

"Public administration is the organization in charge of making political decisions and enforcing them through a series of bodies or departments (government, ministries, state secretariats, territorial or regional governments, social security police, etc.)" (p. 22).

It is represented by the organization that is responsible for making and implementing political decisions, through entities created for this purpose and ordered in different hierarchical levels ranging from the general government to regional bodies, and other institutions that are responsible for meeting the needs and requirements of the population. (Orozco, 2015).

In this regard, public administration is composed of an objective element which is the organ of the state, a subjective element which is the activity or competence attributed to that organ, and a finalistic element which is represented by the benefit intended to be generated for society through the satisfaction of the needs of its inhabitants. (p. 19).

"A public servant is one who renders his services in the public administration as an official, employee or worker in general." (ENCYCLOPEDIA JURÍDICA OMEBA, 2007, pg. 181).

According to this quote, the persons involved as active subjects of crimes such as illicit enrichment are public servants who render their services for the administration of the State, in the different institutions through which the provision of services related to the attention and satisfaction of the requirements of the citizenship is fulfilled.

The public servant is considered as the person who, through a labor dependency relationship with the state, provides services to the public administration, as an official, employee or worker, this type of classification is established based on the nature of the activities carried out by the public servant, (Lopez, 2011, p. 202)..

The public administration is, therefore, the administrative system of a state, a city, a commune or a population center; and it exists mainly for two things:

- To provide public services to the community to whom it is owed; and

- Exercise public controls over persons and property within its domain. With these objectives in mind, the norms and laws that regulate public administration should:
- Establish the appropriate administrative agencies; granting them certain powers, describing their scope and limits.
- Provide the means to enforce administrative decisions made in the exercise of these powers.

The accounting procedures, incorporated into the public accounting regime (CPR), are a set of binding guidelines that, based on the conceptual framework and standards, develop the processes of recognition, measurement, disclosure and presentation for particular issues.

Article 74 of the Organic Code of Planning and Public Finance (COPLAFIP) establishes the duties and powers of the governing body of the National Public Finance System (SINFIP). One of them, which appears in numeral 33, is: "To prepare the consolidated financial statements of the entities and agencies that are part of the public sector". This responsibility falls on the Undersecretariat of Government Accounting, which has as its mission: "Consolidate, carry out and analyze the financial statements of the public sector, as well as the issuance of accounting guidelines, policies and procedures manuals related to assets, liabilities and public equity, updating of accounting account catalogs and of long-lived assets and stocks for the public sector (Martinez, 2018).

The accounting process within the public sector comprises three phases consisting of the source documentation, which is

where the operation performed by the entities of the Non-Financial Public Sector is evidenced, and which is supported by reliable documentation that validates the transaction being carried out by the entity. Caizabanda (2014) says that accounting information refers to the methods involved in the processes, such as accounting records, because the ability of the authorities to make decisions that are correct and adjusted to the needs of the organization depends on it, as well as the preparation of reports that are fully reliable, establishing control measures in the different daily activities.

The Initial Statement of Financial Position is the beginning of the accounting process in the entities of the Non-Financial Public Sector, where it starts with values of previous years that will serve for the new period as an update of the accounting information both in assets, liabilities and equity, the source documentation is very important because it is the one used to support the transactions that are being made in the entity whether it is the acquisition of a good or provision of services, besides serving to collect information and starts the government accounting cycle. (Cañar, Carrera, & Yagual, 2014)..

It continues with the integral journal, which chronologically records the economic events that occur in the entity and that will be used to perform the respective Majorization, and together with the budget documents that help in the preparation of the Financial Statements and present reliable information and will serve at the time of accountability, which as public entities are obliged to perform them. Among the characteristics of governmental accounting are those of

allowing public entities an adequate control in the distribution of revenues and expenditures assigned by the state, which allows them to produce effective, reliable and timely information, and the transparency of activities carried out by public institutions, in order to determine what has been the destination of the financial resources allocated by the national government to each entity. (Castillo & Morocho, 2015).

Governmental Accounting has the characteristic of controlling the distribution of income and expenditures, in addition to allowing the integrity of the registry and to execute an accounting control of the assets, this allows the institutions to produce effective, reliable and timely information for decision making. It is concluded that the Ecuadorian public administration is not concentrated in a single one, but is structured by different types of administrations, among which are the institutional public administration of the Executive Function, territorially Decentralized Administration, Autonomous Administration and Central Public Administration, Administration which is the central axis of the State because its action is performed at the national level, in view that it is made up of the presidency, vice presidency, ministries and agencies attached to them.

Quality assurance of financial information in the public sector and the regulations of parochial decentralized autonomous governments

Medina (2016), indicates that financial information refers to the technique used to record transactions, internal transformations and other activities that financially affect the company, which prepares financial information in a systematic

and structured manner. It also mentions that it consists of quantitative information and qualitative information expressed in monetary units, i.e. descriptive information, which shows the location and financial performance of the company, and its main purpose is to be useful for users to make decisions.

On the other hand, financial, budgetary and accounting information is expressed in monetary units on the transactions carried out by a public sector entity and those identifiable and quantifiable economic activities, which is presented through financial reports, reports, statements and explanatory notes that specify the financial situation and results of the organization. (Arvizu, 2018).

The Financial Asset Pricing Model is a standard used to establish the return expected from an asset, or in turn the profit that an investor who has made a previous investment will obtain. However, it is necessary to take into account that there is a close relationship between the profitability of the asset and the risk it carries, since the higher the risk the higher the profitability so that if there were the possibility of measuring and giving values to the risk assumed, it would be possible to know exactly the percentage of profitability of the asset (Juste, 2017). On the other hand, CPAs should obtain sufficient and appropriate audit evidence to demonstrate the accuracy and completeness of the information. This will help the auditor to obtain evidence related to some specific balances. In addition, the auditor should use external confirmation so that the assessed risk can be taken into account in direct communication with third parties, and obtain

evidence from the opening and closing balance sheets to demonstrate that appropriate accounting practices have been applied... (Villar, 2020). (Villar, 2020).

According to the criteria of Suárez, Ramírez, & Sánchez (2020), they mention that financial information must have the following qualitative characteristics:

Relevance. - Financial information can influence users' decisions, even if some users choose not to benefit from the information or are already aware of it from different sources. In addition, it influences decisions if it has predictive value, verification value, or both, i.e., it has predictive value if it can be used as input to a process that users use to predict future outcomes. So, it does not need to be a forecast or a prediction with an expected value. (p. 9)

True and fair representation. - Financial reports use words and numbers to represent economic facts. To be useful, financial information must not only reflect the phenomenon in question, but also faithfully reflect the activity it is intended to represent. To be a fully faithful representative, the description will have three characteristics. It will be complete, neutral and error-free. Of course, perfection is difficult to achieve. (p. 10)

Reliability. - For information to be useful, it must be reliable. If it is free from material error, bias or fraud, it has the quality of reliability and the information can be taken as what it was intended to represent or could represent. (p. 10)

Understandability. - The information must be comprehensible in its entirety to the interested parties, who must have a

reasonable knowledge of the economic, commercial and accounting activity, as well as the desire and willingness to analyze the information in sufficient depth. (p. 10)

Under this context, Valderrama, Rivera, & Valecillos (2018), in their research work express that quality control refers to the set of processes developed by auditors and their teams to provide reasonable assurance that the examination of financial statements has been performed in accordance with applicable professional standards. On the other hand, it is stated that "quality control is the evaluation of the various stages of the audit, developing plans for the timely detection of deficiencies and non-compliance with established standards".

They also write that supervision or operational monitoring is the process performed by audit firms to ensure that the work is performed in accordance with International Standards on Auditing. Thus, it is defined as "a control process designed to provide reasonable assurance that work is planned, performed and supervised in accordance with auditing standards". As such, auditors should develop monitoring procedures for each stage of the audit to ensure that the client or interested third party adjusts the work to the best possible level of quality in accordance with International Standards on Auditing and other professional standards.

The Parochial Decentralized Autonomous Governments are legal entities under public law, as determined in Article 63 of the Organic Code of Territorial Organization, Autonomy and Decentralization:

Article 63 - Legal nature. - The decentralized autonomous regional governments are legal persons under public law with political, administrative and financial autonomy. They shall be consolidated by the bodies established in this Code for the exercise of the corresponding powers. The seat of the autonomous decentralized rural parish council shall be the parish priest indicated in the founding statutes of the parish. (p. 19)

In this process of reorganization and decentralization, the implementation, operation and development of self-government have legal elements. Everything presented allows us to speak of the past, since in the old constitution there are restrictions to the implementation of democratic rights of participation, demonstrates the privilege of the minority in the hands of the power group in charge of the governance of the country. In this sense, the general objective of this study is to analyze the legal basis of the Autonomous Decentralized Rural Parochial Decentralized Government (Piza, Tello, & Tello). (Piza, Tello, & Rodríguez, 2020)..

On the other hand, it is provided that every parish shall have a parish council of universally elected members, whose member with the most votes shall be the chairman of the council. The composition and duties of the parish council are extinguished by law. Thus, Article 64 of the Organic Code of Territorial Organization, Autonomy and Decentralization states the following:

The Autonomous Decentralized Rural Parish Government is defined as a constitutionally ordered level of decentralized

autonomous government, like all other decentralized bodies, having a series of administrative functions ranging from the formulation and development of policies and promotion in the field of inclusion and justice.

Having mentioned the above, it is noted that what is not indicated in this article is that the function of the parish councils is their capacity to dictate the necessary norms to carry out these tasks at the corresponding local level.

Arias (2019), alludes that the composition, assignment and responsibility of the Parish Council will be determined by law. Article 65 of the Organic Code of Territorial Organization, Autonomy and Decentralization states that the Decentralized Rural Government is a decentralized self-government subject to the territorial organization of Ecuador, and therefore has the following powers:

Art. 65.- Exclusive competencies of the rural parish decentralized autonomous government: the following exclusive competencies shall be exercised, without prejudice to others that may be determined:

- Plan the development of the parishes and their corresponding regional organizations, in coordination with the national and district governments together with other institutions and social actors of the public sector within the framework of respect for interculturality.
- Plan, construct and maintain the physical infrastructure, equipment and public spaces of the parish, included in

the development plan and included in the annual participation budget;

- Coordinate with the provincial government in the planning and maintenance of rural roads;
- Promote the development of community productive activities, biodiversity conservation and environmental protection;
- Manage, coordinate and administer public services authorized or delegated by other levels of government;
- Promote citizens' organizations in municipalities, electoral districts and other rural areas with local popular organization;
- Manage international cooperation to implement its mandate; and,
- Supervise the execution of works and the quality of public services.

In relation to the financial capacity, it is estimated that it will be composed of budget allocations and its capacity to generate its own income. As stipulated in Article No. 298 of the Constitution of the Republic of Ecuador:

Art. 298.- Budget allocations are established for the decentralized governments, the health sector, the education sector, higher education, and research, science, technology and innovation under the conditions established by law. Transfers equivalent to the above distribution shall be predictable and automatic. It is prohibited to create additional budgetary allocations.

In definition, the fiscal capacity of autonomous and decentralized parish municipalities is very low, understood as the existence of sufficient funds to carry out much needed infrastructure works for the citizenry; however, in addition to the budget deficit and limited capacities in terms of revenue generation, it should be mentioned that the people elected to administer and integrate autonomous and decentralized parish municipalities in rural areas are well-known and popular neighbors, but not trained, nor professionals (Arias, 2019).

The accounting-budgetary association and financial reporting in parochial decentralized self-governments

With respect to this topic, it refers to the relationship between accounting and budgeting in the parish decentralized autonomous governments, in effect the use of the budget classifier and chart of accounts.

On the other hand, integration is technically known as the accounting process for recording the equity, budgetary and cost incidence of operations, a process that must be integral, unique and uniform in order to achieve consistency between the equity and budgetary aspects of the financial information produced by the non-financial public sector entities, In order to improve the financial administration, a technical mechanism is established to eliminate the divergence of criteria at the time of executing the budget in view of the occurrence of the economic events that are the subject of the accounting record, which facilitates the concord, integration and interrelation between these two components of the Financial Administration. This association must be specified in the chart of accounts. (Simaleza Muñoz, 2015, pp. 53-54)..

Next, we present a figure on the link that exists within the accounting and the budget to be able to exercise it in the public entity, in the upper part we observe the budget classifier, which is constituted by group, subgroup and item, in the lower part we present the chart of accounts that consists of the title, group, subgroup, account level 1, 2, 3, and 4; where it indicates the relationship between the two parts.

Figure 1. Accounting and budgetary association.



Note 1. In the following figure we observe the budgetary classification and the chart of accounts used in governmental accounting. (Simaleza Muñoz , 2015).

On the other hand, the following figure shows in detail how the budget and accounting are related, according to the above mentioned, in this image it is extended more on how the classifier and the chart of accounts are related:

Figure 2. Accounting and budgetary association



NOTE 2. IN THE FOLLOWING FIGURE WE CAN VERIFY THE RELATIONSHIP BETWEEN THE BUDGET AND ACCOUNTING. (SIMALEZA MUÑOZ , 2015).

As regards financial entities, the Ministry of Finance indicates that they are those agencies created by law, decrees or ordinances:

According to the Ministry of Finance (2016) accounting entities are the agencies, entities, funds or projects created by law, decree or ordinance, with their own independent existence, which manage resources and obligations of the State and are responsible for ensuring the proper functioning of the government accounting component. The agencies, funds or projects that make up the Central Government constitute a single accounting entity (p. 10).

According to Caballero (2013)the "budget constitutes the State's management instrument for the achievement of results in favor of the population, through the provision of services and the achievement of coverage goals with efficiency and effectiveness by the Entities" (p. 1). (p. 1).

It is also the quantified, joint and systematic expression of the expenses to be incurred during the fiscal year by each of the Entities that are part of the Public Sector and reflects the revenues that finance such expenses.

The budget is directly related to the expenses incurred during the fiscal year and their respective financing, which makes it possible to know whether the results of the goals achieved have been attained as established in the budget for said product.

On the other hand, the Council of Citizen Participation and Social Control in article 215 talks about the budget of the Decentralized Autonomous Governments, where it states the following:

The budget of the decentralized autonomous governments shall be adjusted to the regional, provincial, cantonal and parish plans respectively, within the framework of the National Development Plan, without detriment to their competencies and autonomy.

The budget of the decentralized autonomous governments shall be prepared in a participatory manner, in accordance with the provisions of the Constitution and the law. Budgetary investments shall be adjusted to the development plans of

each district, which shall be territorialized to guarantee equity within them. Every program or project financed with public resources will have objectives, goals and deadlines, at the end of which they will be evaluated. In the case of rural parish decentralized autonomous governments, they shall be governed by the provisions of this chapter, in all that is applicable to them and does not oppose their structure and purposes. (pág. 3)

In this context, it is said that an accounting budget or financial budget is a document that reflects the economic situation of an entity over a period of time, allowing us to know the company's income and expenses, and therefore its profits.

Regarding the different financial statements that a public entity such as the Autonomous Decentralized Parochial Governments must present, according to the Organic Code of Planning and Public Finances (COPLAFIP):

Article 74 establishes the duties and attributions of the governing body of the National Public Finance System (SINFIP). One of them, stated in numeral 33, is: "To prepare the Consolidated Financial Statements of the entities and agencies that are part of the Public Sector" (Ministry of Economy and Finance, 2021, p. 4). (Ministry of Economy and Finance, 2021, p. 4)..

According to the same author, the Public Sector institutions and their decentralized operating entities (DOEs) are responsible for financial management, the administration of their budgets and ensuring the proper functioning of the governmental accounting component. In turn, the employees

of the financial units are responsible for complying with accounting regulations. The preparation of financial reports for internal or external use, not regulated by this norm, shall be subject to the periodicity, form and conditions determined by the users, based on the principle of the National System of Public Finances "Information Exposure". The comparative information will be made only in the annual Financial Statements and will be made with reference to the corresponding figures of the previous fiscal year.

For the Ministry of Economy and Finance (2022) In the month of January of each year, as of December 31, the financial and budgetary information specified below, in addition to that indicated in the preceding paragraph, shall be delivered in digital form, duly legalized and with the corresponding disclosures (explanatory notes):

Statement of Financial Position: The Statement of Financial Position will be prepared with the balances of the accounts at level 2, according to the General Catalog of Accounting Accounts of the Non-Financial Public Sector; if there is more than one grouping option for the same account, with respect to the short and long term, its balance will be broken down into those corresponding to its nature and characteristics. Current Assets and Liabilities shall include Temporary Investments and Temporary Securities, in accordance with the maturity terms of their portfolios, considering that the short term is one year from the closing date of the statement; the long term is when it exceeds the aforementioned time and shall be reported under Long-Term Assets and Liabilities. (page 258)

According to the Gestión website (2013) "The Statement of Financial Position is a basic financial statement that reports on a given date the financial position of the company and is structured by Assets, Liabilities and Equity" (p. 1)

Statement of Financial Performance (Results): The Statement of Financial Performance will be prepared with the balances of the Revenue, Cost and Expense accounts at level 2, as contained in the General Catalog of Accounting Accounts of the Non-Financial Public Sector.

The statement of financial performance shall include at least the following items, if applicable: Revenues, Costs, Expenses, Share in the results of Associates and Joint Ventures accounted for by the equity method; Pre-tax gains or losses recognized on the disposal of assets or settlement of liabilities attributable to the liquidation operations of entities; Profit for the period, Profit for the period attributable to minority interests; Profit attributable to owners of the consolidating entity. (page 59)

This financial statement shows for a given period of an entity what its revenues, profits, expenses and losses were, which is also called performance.

Statement of Changes in Stockholders' Equity: An entity shall present in the statement of changes in stockholders' equity, if applicable, at least the following items: Stockholders' equity, Reserves, Profit for the year, each item of profit and loss for the period that as required by other standards is recognized directly in stockholders' equity and the total of these items; Total income and expenses for the period calculated as the

sum of the two previous items, showing separately the value attributed to the owners of the consolidating entity and to the minority interest; The effects of changes in accounting policies and in the correction of errors in each component of stockholders' equity. The effects of changes in accounting policies and in the correction of errors in each component of shareholders' equity. (Ministry of Economy and Finance, 2022, p. 260).

This is a financial statement that is related to the shareholders of the company with the meetings, that is to say, it is a financial statement that seeks to reflect the result of the decisions made by the shareholders, it is not a financial statement related to the management of the company that corresponds to the general management, but is produced as a result of the decision of the shareholders regarding their own investment, as the name says statement of changes in equity what it will show is how the equity changes.

Cash Flow Statement: The Cash Flow Statement will be obtained by applying the direct method, starting from obtaining the sources and uses of funds of the credit flows of the Accounts Receivable and the debit flows of the Accounts Payable, respectively, and calculating separately the Current and Capital Surplus or Deficit; from the sum of the aforementioned concepts the Total Surplus or Deficit will be obtained. The application of the Surplus or the Financing of the Deficit, according to the result obtained in the previous paragraph, shall be determined by adding to the Financing Surplus or Deficit, the net result of the variations in the credit flows of the Accounts Receivable and debit flows of the

Accounts Payable that are not associated to budgetary groups, and the non-budgetary variations recorded in the accounts of Cash and Cash Equivalents, Advances of Funds, Deposits and Third Party Funds. (Ministry of Economy and Finance, 2022, p. 261).

With the above mentioned, it is noted that the cash flow statement is intended to report the cash movements in the entity, both in terms of investment decisions and in terms of financing decisions. Cash analysis is fundamental for financial planning purposes and to understand the liquidity and solvency of a company.

Budgetary Execution Statement and its annexes (Income and Expenditure Budget Charts): The Statement of Budget Execution shall be prepared with data at the Budget Group level, obtained from the accrual of the Trial Balance. Its totals shall be reconciled with the accumulated debtor and creditor flows of the Accounts Receivable and Accounts Payable associated with the nature of the revenue or expenditure, respectively. (Ministry of Economy and Finance, 2022, p. 262)..

Finally, it is essential to mention that in public sector accounting the difference determined in the execution, which is the result of comparing the sum of revenues and expenditures, will be called Budget Surplus or Deficit, as the case may be.

Comprehensive implementation of accounting and budgeting principles in parochial decentralized autonomous parish governments

By means of the results obtained from the research carried out, we will present the study and economic analysis of the execution of the "NATEMTSA" court, a minor work in the Parish Autonomous Government of Tayuza, belonging to the Santiago Méndez canton of the province of Morona Santiago.

The following is the process to be followed during the execution of the "NATEMTSA" court:

Preparatory Stage

To begin with, the Shuar Center "NATEMTSA" has determined the need of the inhabitants to have a covered space (multi-pitch) in the community. Subsequently, a technical study has been carried out to determine the general and particular conditions of the contract and the specifications, as well as the compliance form with all the parameters to be fulfilled, the plans and the estimated budget for the construction.

Next, the financial certification is prepared, showing the registration of the budget item, in this case under number 75.01.07.06.00 called constructions and buildings to finance the construction for a value of \$19,250.12 including VAT. On the other hand, the forecast of the contracting is indicated in the Annual Contracting Plan, and the record of the budget item in the Annual Operating Plan.

Next, the bidding documents are prepared for the smallest amount of works, where the particular conditions, object of the contract, reference budget, technical specifications and the schedule of the procedure are presented, in order to evaluate the bids and determine the obligations of the parties and initiate the contracting process by means of an administrative resolution.

Pre-contractual stage

During the pre-contractual stage, letters of acceptance of the economic reference budget, the bidding documents prepared, the object of the contract, the reference amount, the technical specifications and other requirements included in the invitation are issued.

Later on, the questions section is carried out, where suppliers may specify any doubts or concerns, as well as the validation of errors expressed in a record. To close this stage, the qualification report is made according to the existing bidders, validation of errors in the documentation submitted, verification of compliance with minimum parameters with the item complies or does not comply, in the case of this work the bidders are responsible for hidden defects, authenticity and falsity of the documentation delivered. However, we proceeded to request the information through the auditor or administrator and it was determined that the construction company TACAVILO S.A. passed the lottery and an award certificate was issued.

Contract execution stage

In the third stage, the execution of the minor works contract was carried out between the Decentralized Autonomous Rural Parish Government of Tayuza and the construction company TACAVILO S.A. for the construction of the "Multicancha construction for the community of Natemtsa".

Afterwards, the policies of guarantee of good use are received, since this is a minor work, followed by the notification of the accreditation of the transfer for the contracting of the work as an advance payment of 50% with a value of \$8,593.80, so that the advance payment forms are issued, the payment to the Internal Revenue Service and finally the delivery of the liquidation form.

In the same line, audit and administrator reports are prepared to verify compliance with pre-contractual parameters, the financial progress of the works, the time used at the cut-off date, compliance with contractual obligations, the execution schedule, variations in work quantities, guarantees, price readjustments and financial discounts, in order to issue the respective observations and conclusions.

Finally, the provisional acceptance delivery certificate and the final acceptance delivery certificate are processed after verifying that the works executed have been carried out in accordance with the standards, general technical specifications and clauses.

The following is a table on the payment of the advance payment schedule 1 with a value of \$ 16,488.27 for the

construction of the Multicancha in the Natemtsa community, where the account of constructions and buildings with a value of 14,721.67 and the collection of value added tax with \$ 1,766.60 is presented; on the other hand, also the accounts payable of goods tax of Internal Revenue Services of 30% and supplier 70%, which we obtain from the value of VAT.60; on the other hand, there are also the accounts payable for the tax on goods of the Internal Revenue Service of 30% and of the supplier 70%, which we obtain from the value of the VAT, in the same way there are the accounts payable for public works with a value of \$ 14,464.04.

On the other hand, the account for constructions and buildings is presented with a value of \$1766.60 and the contra account is the accounts payable for public works with the same value. To close the account, the account payable for public works is presented as a debit and the account receivable Value Added Tax (VAT) is presented with a value of \$1766.60.

Table 1. Payment Form

| | | | | |
|---|-------------------------|----------------------------|--|--------------------------|
| Date : 19/02/2021 | No. Seat : 39 | Type : Financial | Internal Doc: GAS-2021-FEB-00010 | Value : 16,488.27 |
| Beneficiary : 0190408590001 TACAUILO CONSTRUCTION COMPANY STATUS : APPROVED | | | | |
| Detail : 0190408590001 CONSTRUCTORA TACAUILO [] FOR THE PAYMENT OF THE PROGRESS REPORT FOR THE CONSTRUCTION OF THE MULTI-PITCH IN THE COMMUNITY OF NATEMSA. | | | | |
| AccountingSHOULD | | | HAVE | |
| 151.51.07 Buildings and Constructions | | | 14,721.67 | |
| 113.81.01 Accounts Receivable Value-Added Tax - Purchases | | | 1,766.60 | |
| 213.81.04 Accounts Payable Value Added Tax Goods - SRI 30% 529.98 | | | | |
| 213.81.03 Accounts Payable Value Added Tax Goods - Supplier 70% 1,236.62 | | | | |
| 213.75 Accounts Payable Public Works | | | 14,464.04 | |
| 213.75 Accounts Payable Public Works | | | 257.63 | |
| 151.51.07 Buildings and Constructions | | | 1,766.60 | |
| 213.75 Accounts Payable Public Works | | | 1,766.60 | |
| 213.75 Accounts Payable Public Works | | | 1,766.60 | |
| 113.81.01 Accounts Receivable Value Added Tax - Purchases | | | 1,766.60 | |

Payment of the progress report 1 of the Multicancha construction.

Next, we analyze the second payment of the advance payment schedule 1 of the work, with a total value of \$7,360.84, where we have the accounts payable of public works with a value of \$6,124.22, having a value added tax of goods - supplier 70% which is \$ 1,236.52 and on the other hand to the advances to contractors of works with the sum of total in the two accounts.

Table 2. Spreadsheet

| | | | | |
|--|-------------------------|----------------------------|--|---|
| Date : 19/03/2021 | No. Seat : 91 | Type : Financial | Internal Doc: PAG-2021-MAR-00018 | Value : 7,360.84 |
| Beneficiary : 0190408590001 TACAVILO CONSTRUCTION COMPANY STATUS : APPROVED | | | | |
| Detail : Payment of Voucher : GAS-2021-FEB-00010 0190408590001 CONSTRUCTORA TACAVILO [] FOR THE PAYMENT OF THE PROGRESS REPORT FOR THE CONSTRUCTION OF THE MULTI-PURPOSE COURT IN THE COMMUNITY OF NATEMSA | | | | |
| AccountingSHOULD | | | HAVE | |
| 213.75 Accounts Payable Public Works | | | 6,124.22 | |
| 213.81.03 Accounts Payable Value-Added Tax Goods - Supplier 70% 1,236.62 | | | 1,236.62 | |
| 112.03 Advances to Construction Contractors | | | 7,360.84 | |
| Total, Accounting | | | 7,360.84 | 7,360.84 7,360.84 |
| | | | BudgetEXECUTED | |
| Payment | | | | |
| 00.00.000.017 - 000 - 99.99.99.99.99 - [75.01.07] - 000.001 CONSTRUCTIONS AND BUILDINGS [] | | | 6,124.22 | CONSTRUCTION OF THE NATEMSA COMMUNITY MULTICANCH] Total Payment |
| | | | | 6,124.22 |

Note 5. The following figure shows the second payment of the first advance payment of the construction.

Table 3 describes the third payment of the advance payment schedule 1 of the construction with a monetary value of \$ 8,339.82, in which the accounts payable of public works are found and the Central Bank of Ecuador Currency of Legal Course as the counter account, where the respective deposit of the same is made.

Table 3. Payment Form

| | | | | |
|--|-------------------------|----------------------------|--|-------------------------|
| Date : 19/03/2021 | No. Seat : 89 | Type : Financial | Internal Doc: PAG-2021-MAR-00016 | Value : 8,339.82 |
| Beneficiary : 0190408590001 TACAUILO CONSTRUCTION COMPANY STATUS : APPROVED | | | | |
| Detail : Payment of the Voucher : GAS-2021-FEB-00010 0190408590001 CONSTRUCTORA TACAUILO [] FOR THE PAYMENT OF THE PROGRESS REPORT FOR THE CONSTRUCTION OF THE MULTI-PURPOSE COURT IN THE COMMUNITY OF NATEMTSA | | | | |
| Accounting SHOULD | | | HAVE | |
| 213.75 Accounts Payable Public Works | | | 8,339.82 | |
| 111.03 Banco Central del Ecuador Legal tender | | | 8,339.82 | |
| 8,339.82 | | | Total, Accounting | 8,339.82 |
| | | | | Budget EXECUTED |
| Payment 00.00.000.017 - 000 - 99.99.99.99.99 - [75.01.07] - 000.001 CONSTRUCTIONS AND BUILDINGS [8,339.82 CONSTRUCTION OF THE MULTICANCHA COMMUNITY OF NATEMTSA] - 000.001 CONSTRUCTIONS AND BUILDINGS [8,339.82 CONSTRUCTION OF THE MULTICANCHA COMMUNITY OF NATEMTSA]. | | | | |

Note 6. In this figure we identify the third payment of the first advance payment of the construction.

Likewise, the following figure shows the payment of taxes for the month of February 2021 with a monetary value of \$ 272.90, where the following accounts are used: accounts payable for consumer goods and services with \$0.62, accounts payable for other expenses \$0.27, accounts payable for goods and services for investment \$0.73, accounts payable for public works with a value of \$ 257.63; accounts payable for investments in long-lived assets of \$13.65 and all the tax money is deposited at the Central Bank of Ecuador.

Table 4. Internal Revenue Service Payment Form

| | | | | |
|---|-------------------------|----------------------------|--------------------------------|-----------------------------|
| Date : 23/03/2021 | No. Seat : 94 | Type : Financial | Internal Doc: 268910 | Value : 272.90 |
| Beneficiary : 1760013210001 Internal Revenue Service SRI STATUS : APPROVED | | | | |
| Detail : [1760013210001 Servicio de Rentas Internas SRI] FEBRUARY TAX PAYMENTS FOR THE MONTH OF FEBRUARY FORM 103 | | | | |
| Accounting SHOULD HAVE | | | | |
| 213.53 Accounts Payable Consumer Goods and Services | | | 0.62 | |
| 213.57 Accounts Payable Other Expenses | | | 0.27 | |
| 213.73 Accounts Payable for Investment Goods and Services | | | 0.73 | |
| 213.75 Accounts Payable Public Works | | | 257.63 | |
| 213.84 Accounts Payable Investments in Long-Lived Assets | | | 13.65 | |
| 111.03 Central Bank of Ecuador Currency of Legal Tender | | | | 272.90 |
| | | | Total, Accounting | 272.90 272.90 272.90 |
| Budget EXECUTED | | | | |

| Payment | |
|--|---------------|
| 00.00.000.000 - 000 - 99.99.99.99.99 - [53.08.04] - 000.001 OFFICE MATERIALS [Activities of GAD] - 000.001 OFFICE MATERIALS [Activities of GAD] - 000.001 OFFICE MATERIALS [Activities of GAD] - 000.001 OFFICE MATERIALS | 0.62 |
| 00.00.000.000 - 000 - 99.99.99.99.99 - [57.02.01] - 000.001 INSURANCE [GAD's activities] - 000.001 INSURANCE [GAD's activities] - 000.001 INSURANCE [GAD's activities] - 000.001 INSURANCE | 0.27 |
| 00.00.000.000 - 000 - 99.99.99.99.99 - [73.08.13] - 000.001 SPARE PARTS AND ACCESSORIES [GAD activities] | 0.73 |
| 00.00.000.000 - 000 - 99.99.99.99.99 - [84.01.04] - 000.001 MACHINERY AND EQUIPMENT [GAD activities] - 000.001 - [GAD activities] - 000.001 - 000.001 - 000.001 - 000.001 - [GAD activities] - 000.001 | 13.65 |
| 00.00.000.017 - 000 - 99.99.99.99.99 - [75.01.07] - 000.001 CONSTRUCTION AND BUILDING [257.63 CONSTRUCTION OF THE MULTI-PURPOSE COURT FOR THE COMMUNITY OF NATEMTSA [257.63 CONSTRUCTION OF THE MULTI-PURPOSE COURT FOR THE COMMUNITY OF NATEMTSA]. | |
| Total, Payment | 272.90 |

Payment of taxes for the month of February to the Internal Revenue Service.

According to the advances that are being made in the work, the following payment of the advance payment schedule 2 of the liquidation of the Multicancha is presented with a total value of \$2,951.16, where there is the account of constructions and buildings with a value of \$2634.96, the account receivable of value added tax of \$316.20, accounts payable value added tax goods SRI 30% and supplier of 70%, where the value of VAT is taken out, on the other hand, accounts payable public works are presented with a value of \$ 2,588.85 and \$ 45.11. In constructions and buildings the value of \$316.20 is presented and the contra account is the accounts payable of public works; in this case the same account is placed to the debit and the respective deposit is made to the Central Bank of Ecuador.

| | | | | |
|--|-----------------------|----------------------------|--|-----------------------------------|
| Date : 30/07/2021 | No. Seat : 292 | Type : Financial | Internal Doc: GAS-2021-JUL-00017 | Value : 2,951.16 |
| Beneficiary : 0190408590001 TACAUILO CONSTRUCTION COMPANY STATUS : APPROVED | | | | |
| Detail : 0190408590001 CONSTRUCTORA TACAUILO [] PAYMENT OF THE PROGRESS REPORT 2 OF THE LIQUIDATION OF THE MULTI-PITCH CONSTRUCTION IN THE COMMUNITY OF NATEMTZA | | | | |
| Accounting SHOULD HAVE | | | | |
| 151.51.07 Buildings and Constructions | | | | 2,634.96 |
| 113.81.01 Accounts Receivable Value Added Tax - Purchases | | | | 316.20 |
| 213.81.04 Accounts payable Value Added Tax Goods - SRI 30% 94.86 | | | | |
| 213.81.03 Accounts Payable Value Added Tax Goods - Supplier 70% 221.34 | | | | |
| 213.75 Accounts Payable Public Works | | | | 2,588.85 |
| 213.75 Accounts Payable Public Works | | | | 46.11 |
| 151.51.07 Buildings and constructions | | | 316.20 | |
| 213.75 Accounts Payable Public Works | | | | 316.20 |
| 213.75 Accounts Payable Public Works | | | 316.20 | |
| 113.81.01 Accounts Receivable Value Added Tax - Purchases | | | | 316.20 |
| | | | Total, Accounting | 3,583.56 3,583.56 3,583.56 |
| Budget EXECUTED | | | | |

| | |
|--|-----------------|
| Accrued | |
| 00.00.000.017 - 000 - 99.99.99.99.99 - [75.01.07] - 000.001 CONSTRUCTION AND BUILDING [MULTI-PITCH COMMUNITY OF NATEMTSA] - 2,951.16 CONSTRUCTION OF THE MULTI-PITCH COMMUNITY OF NATEMTSA] | 2,951.16 |
| Total, Accrued | 2,951.16 |
| Payment | |
| 00.00.000.017 - 000 - 99.99.99.99.99 - [75.01.07] - 000.001 CONSTRUCTION AND BUILDING [COMMUNITY OF NATEMTSA MULTI-PURPOSE COURT]. | 316.20 |
| Total, Payment | 316.20 |

Note 8. Payment of the progress report 2 of the settlement of the Multicancha in the community of Natemtsa.

The following figure shows the second payment of the progress report 2 of the liquidation of the Multicancha with a total value of \$1,492.71, where the use of two accounts is observed, the account payable to public works and the contra account where the respective deposit is made to the Central Bank of Ecuador.

Table 6. Advance payment form 2

| | | | | |
|--|-----------------------|----------------------------|--|-------------------------|
| Date : 02/08/2021 | Seat No. : 302 | Type : Financial | Internal Doc: PAG-2021-AGO-00007 | Value : 1,492.71 |
| Beneficiary : 0190408590001 TACAVILO CONSTRUCTION COMPANY STATUS : APPROVED | | | | |
| Detail : Payment of the Voucher : GAS-2021-JUL-00017 0190408590001 CONSTRUCTORA TACAVILO [] PAYMENT OF THE PROGRESS REPORT 2 OF THE LIQUIDATION OF THE MULTI-PITCH IN THE COMMUNITY OF NATEMTZA. | | | | |
| AccountingSHOULD | | | HAVE | |
| 213.75 Accounts Payable Public Works | | | 1,492.71 | |
| 111.03 Central Bank of Ecuador Currency of Legal Tender | | | 1,492.71 | |
| Total, Accounting | | | 1,492.71 1,492.71 1,492.71 | |
| | | | BudgetEXECUTED | |
| Payment | | | | |
| 00.00.000.017 - 000 - 99.99.99.99.99 - [75.01.07] - 000.001 CONSTRUCTION AND BUILDING [| | | 1,492.71 CONSTRUCTION OF THE | |
| COMMUNITY OF NATEMTSA MULTI-PURPOSE COURT [1,492.71] | | | | |
| | | | Total, Payment | |
| | | | 1,492.71 | |

Note 9. The second payment of the progress sheet 2 of the liquidation of the construction of the work in the Natemtsa community.

Similarly, the third payment of the progress sheet 2 of the liquidation of the work is presented, where the accounts payable for public works are presented for a monetary value of \$1096.14 and the accounts payable for value added tax goods - Supplier 70% with \$136.82, and the contra account which is advances to contractors of works with \$1232.96.

Table 7. Advance payment form 2

| | | | | |
|--|-----------------------|----------------------------|--|-------------------------|
| Date: 02/08/2021 | Seat No. : 303 | Type : Financial | Internal Doc: PAG-2021-AGO-00008 | Value : 1,232.96 |
| Beneficiary : 0190408590001 TACAVILO CONSTRUCTION COMPANY STATUS : APPROVED | | | | |
| Detail : Payment of the Voucher : GAS-2021-JUL-00017 0190408590001 CONSTRUCTORA TACAVILO [] PAYMENT OF THE PROGRESS REPORT 2 OF THE LIQUIDATION OF THE MULTI-PITCH IN THE COMMUNITY OF NATEMTZA. | | | | |
| Accounting SHOULD | | | | HAVE |
| 213.75 Accounts Payable Public Works | | | | 1,096.14 |
| 213.81.03 Accounts Payable Value-Added Tax Goods - Supplier 70% | | | | 136.82 |
| 213.81.03 Accounts Payable Value-Added Tax Goods - Supplier | | | | 136.82 |
| 112.03 Advances to Construction Contractors | | | | 1,232.96 |

| | | | | |
|---|--------------------------|----------|-----------------------|-----------------|
| | Total, Accounting | 1,232.96 | 1,232.96 | 1,232.96 |
| | | | BudgetEXECUTED | |
| Payment | | | | |
| 00.00.000.017 - 000 - 99.99.99.99.99 - [75.01.07] - 000.001 CONSTRUCTIONS AND BUILDINGS [| | 1,096.14 | CONSTRUCTION OF THE | |
| MULTI-PITCH COMMUNITY OF NATEMTSA [1,096.14] | | | | |
| | | | Total, Payment | 1,096.14 |

Note 10. The third payment of the progress schedule 2 of the work.

In the following table 8 the tax return for the month of July is made, where the accounts payable of goods and services for investment are used with a value of \$853.40, the accounts payable of public works with \$46.1, also the advances of remunerations type A with a monetary value of \$135.71 and all this tax is deposited to the account of the Central Bank of Ecuador legal tender.

Table 8. Tax Return

| | | | | |
|--|--|----------------------------|----------------------|--------------------------|
| Date: 24/11/2021 | No. Seat : 480 | Type : Financial | Internal Doc: | Value : 1,035.22 |
| Beneficiary : <p style="text-align: center;">1760013210001 Internal Revenue Service SRI</p> <p style="text-align: right;">STATUS : APPROVED</p> | | | | |
| Detail : <p style="text-align: center;">[1760013210001 Servicio de Rentas Internas SRI] TAX RETURN FOR THE MONTH OF JULY 2021</p> <p>FORM 103</p> | | | | |
| Accounting | | SHOULD | HAVE | |
| 213.73 | Accounts Payable for Investment Goods and Services | | 853.40 | |
| 213.75 | Accounts Payable Public Works | 46.11 | | |
| 112.01.01 | Remuneration Advances Type "A" 135.71 | | 135.71 | |
| 111.03 | Banco Central del Ecuador Currency of Legal Tender | | | 1,035.22 |
| | Total Accounting | | 1,035.22 | 1,035.22 1,035.22 |
| | | | | Budget |
| | | | | EXECUTED |

Note 11. The following figure shows the tax return for the month of July.

Accounting plays a key role in the efficient management of financial resources, as evidenced by several recent studies.

Alrjoub et al. (2023) explore the impact of management accounting systems on financial performance, highlighting how quality costs can act as mediators in this relationship, suggesting the importance of accurate and efficient accounting in business decision making. On the other hand, Pérez-Espés, Cervera Oliver and Cea D'Ancona (2023) examine the effect of curricular practices in accounting on university students in Spain, highlighting the relevance of a solid accounting education for professional success. Furthermore, Llena-Macarulla, Moneva, Aranda-Usón, and Scarpellini (2023) address the importance of internal measurement in the circular economy from an environmental accounting perspective, highlighting how accounting can contribute to environmental sustainability through accurate measurement practices. Torres Garay (2023) proposes a training approach for public accounting students, highlighting the need for a solid education in international accounting to prepare future professionals. Finally, Nganga et al. (2023) reflect on the experiences of women doctoral students in accounting, highlighting the importance of balancing research with teaching and publishing for a successful academic career in accounting. Taken together, these studies evidence the critical relevance of accounting in diverse contexts, from business to education, highlighting its critical role in decision making and financial performance.

In this sense, government accounting is a crucial component in the management of public resources, as highlighted by several recent studies. The work of El-Toby, Kareem and Abd (2022) highlights the possibility of applying international accounting standards in the public sector, which could

improve transparency and efficiency in the Iraqi government accounting system. On the other hand, Tchatchoua Nya, Kouao and Tchakoute Tchuigoua (2023) explore the relationship between the quality of governance and the adoption of international accounting standards by microfinance institutions, highlighting the importance of a robust accounting framework in diverse financial environments. Likewise, Melo da Silva (2023) highlights the historical role of accounting in municipal administration, evidencing its continued relevance in the management of public resources over time. The research of Hernández García, Hernández García and Ramírez Flores (2023) stresses the importance of combining traditional and contemporary management accounting tools for effective decision making in the governmental sphere. In addition, Ortega Moreno, Galicia Haro, and Coria Páez (2023) posit that real cost accounting and social entrepreneurship are key elements for a new food system, showing how accounting can influence important public policies beyond direct finance. Taken together, these studies highlight the critical relevance of government accounting in the efficient and transparent management of public resources, both now and in the future.

Conclusions

This research has allowed to understand the relationship between governmental accounting and the Decentralized Autonomous Rural Parochial Governments, covering the codification and execution of each activity. This has been useful to evaluate the construction of a multi-purpose court in the community of Natemtsa, belonging to the parish of

Tayuza, during the period 2021, allowing to know the corresponding procedures and accounting. Through the study, the following conclusions have been obtained:

Government accounting is crucial for decision making in the management of public resources: Studies highlight the importance of accurate and effective accounting in the governmental sphere, showing how accounting systems can influence the efficient use of resources and transparency in public administration. Government accounting training is essential for public sector professionals: Research suggests that a strong background in government accounting is essential for the professional development of public servants, especially in an environment where accountability and efficiency in spending are priorities.

Government accounting can contribute to financial and social sustainability: Studies show how government accounting, by including aspects such as environmental accounting and monitoring the social impact of public programs, can play an important role in promoting sustainable and equitable public policies.

Harmonization of international accounting standards is essential in government accounting: The proposal for an international accounting approach in the public sector highlights the importance of aligning accounting principles with international standards to improve the comparability and efficiency of public resource management globally.

Diversity of roles in government accounting requires balance: Reflections on the experiences of government accounting

professionals underscore the importance of balancing financial management with social responsibility and efficiency in the delivery of public services, recognizing the complexity and diversity of roles in public administration.

References

- Alrjoub, A. M. S., Bataineh, A., Al-Qudah, L. A. M., Al-Othman, L. N., Alkarabsheh, F., & Aburisheh, K. E. (2023). The Impact of Quality Costs as a Mediator in the Relationship Between Management Accounting Systems and Financial Performance: the Case of Jordan. *International Journal of Professional Business Review*, 8(4), e01462. <https://doi.org/10.26668/businessreview/2023.v8i4.1462>.
- Arias, L. H. (2019). *Limits to the autonomy of Decentralized Autonomous Governments*. Quito: Creative Commons.
- Arvizu, C. R. (2018). *Contabilidad gubernamental y su información financiera*. Mexico: Mexican Institute of Public Accountants.
- Caballero Reyes, L. (2013). *Presupuesto Público*. Presupuesto Público: Lima .
- Caizabanda, P. (2014). Internal control in accounting procedures and financial information in the Agro Fertile Company of the city of Ambato.
- Cañar, T., Carrera, V., & Yagual, J. (2014). Incidence of the Accounting Processes in the adequate preparation of Financial Statements for the correct tax declaration in natural persons obliged to keep accounting.
- Castillo, M., & Morocho, H. (2015). *Contabilidad Gubernamental I*. Machala: UTMACH.

- Council for Citizen Participation and Social Control (2017). Presupuestos participativos para la construcción del presupuesto participativo en el marco del sistema de participación . Technical secretariat of participation and social control.
- El-Toby , B. H. M., Kareem, A. D., & Abd, W. H. (2022). The possibility of Applying International Accounting Standards in the Public Sector (IPSAS) in the Iraqi Government Accounting System: Exploratory Research for the Opinions of Accountants at the University of Al-Muthanna. *International Journal of Professional Business Review*, 7(2), e0461. <https://doi.org/10.26668/businessreview/2022.v7i2.461>
- OMEBA LEGAL ENCYCLOPEDIA (2007). OMEBA LEGAL ENCYCLOPEDIA. Editorial Bibliográfica Omeba.
- Management (September 23, 2013). "The Statement of Financial Position". "El Estado de Situación Financiera". Lima. Retrieved from <https://gestion.pe/tendencias/situacion-financiera-48772-noticia/>
- Hernández García, P., Hernández García, V. & Ramírez Flores, E. (2023). Traditional and contemporary tools of management accounting as a basis for decision making. *Recherches en Sciences de Gestion*, 156, 151-173. <https://doi.org/10.3917/resg.156.0151>.
- Jesse, F. F., Antonini, C., & Luque-Vilchez, M. (2023). A circularity accounting network: CO2 measurement along supply chains using machine learning: A circularity accounting network: CO2 measurement along supply chains using machine learning. *Revista de Contabilidad -*

- Spanish Accounting Review, 26(Special), 21-33.
<https://doi.org/10.6018/rcsar.564901>.
- Juste, C. A. (February 12, 2017). Financial asset pricing model (CAPM). Retrieved from <https://economipedia.com/definiciones/modelo-valoracion-activos-financieros-capm.html>
- Llena-Macarulla, F., Moneva, J. M., Aranda-Usón, A., & Scarpellini, S. (2023). Reporting measurements or measuring to report? Internal measurement of the Circular Economy from an environmental accounting perspective and its interrelationship: Reporting measurements or measuring for reporting? Internal measurement of the Circular Economy from an environmental accounting approach and its relationship. *Revista de Contabilidad - Spanish Accounting Review*, 26(2), 200-212. <https://doi.org/10.6018/rcsar.467751>
- Lopez, W. (2011). *Tratado de Contratación Pública, Teoría, Práctica Jurisprudencia*. Quito : Editorial Jurídica del Ecuador.
- Martínez Almagro, L. J., & Taillefer, L. (2023). Nominal countability processing in four anglophone patients with aphasia: The deficit in the use of uncountable nouns. *HUMAN REVIEW. International Humanities Review / Revista Internacional De Humanidades*, 19(2), 1-12. <https://doi.org/10.37467/revhuman.v19.4919>
- Martinez, E. (2018). *Financial statements public sector* . Quito.
- Melo da Silva, G. (2023). Writing, controlling and auditing. The account books of medieval Portuguese towns and cities: the case of Loulé. *Anuario De Estudios Medievales*, 53(2), 1027-1071. <https://doi.org/10.3989/aem.2023.53.2.18>.

- Ministry of Economy and Finance (2021). Public Sector Financial Statements. Quito, Pichincha, Ecuador. Retrieved from https://www.finanzas.gob.ec/wp-content/uploads/downloads/2022/06/CD-PUBLICACION_compressed.pdf
- Ministry of Economy and Finance (2022). *NORMATIVA DEL SISTEMA NACIONAL DE LAS FINANZAS PÚBLICAS*.
- Ministry of Finance (2016). *Normativa de Contabilidad Gubernamental*. Retrieved from https://www.finanzas.gob.ec/wp-content/uploads/downloads/2016/04/Anexo_Acuerdo-Ministerial-067-Normativa-de-Contabilidad-Gubernamental.pdf
- Nganga, C. S. N., Casa Nova, S. P. de C., Lima, J. P. R. de, & Silva, S. M. C. da. (2023). To publish or to research? To reproduce or to teach? Reflections on the experiences of women doctoral candidates in accounting. *Education Policy Analysis Archives*, 31. <https://doi.org/10.14507/epaa.31.7377>
- Orozco, J. (2015). Necesidad de reformar el artículo 279 del código orgánico integral penal ecuatoriano sobre la tipificación del delito de enriquecimiento ilícito. Loja.
- Ortega Moreno, I. C., Galicia Haro, E. F., & Coria Páez, A. L. (2023). True Cost Accounting and Social Entrepreneurship as Key Factors for a New Food System. *Mercados Y Negocios*, (49), 21-42. <https://doi.org/10.32870/myn.vi49.7692>
- Pérez-Espés, C., Cervera Oliver, M., & Cea D'Ancona, F. (2023). Impacto de las prácticas curriculares en contabilidad en los estudiantes universitarios: un estudio empírico en España: Impact of curricular internships in

- accounting on university students: an empirical study in Spain. *Revista de Contabilidad - Spanish Accounting Review*, 26(2), 213-228.
<https://doi.org/10.6018/rcsar.464441>
- Piza, I. A., Tello, M. O., & Rodríguez, J. C. (2020). Decentralized autonomous governments in Ecuador. *Iustitia Socialis. Revista Arbitrada de Ciencias Jurídicas*, 9.
- Riveros, R. M., Casallas, R. D., & Carvajal, S. G. (2018). INFORMATION ASSURANCE STANDARDS NIAS AND THE STATUTORY AUDIT IN COLOMBIA AS AN INSTRUMENT OF CORPORATE GROWTH. Bogota: Universidad la Gran Colombia Bogotá D.C.
- Salgado-García, J. A., Terán-Bustamante, A., & González-Zelaya, V. (2024). Digital transformation in management and accounting sciences: Research trends in Scopus . *Iberoamerican Journal of Science Measurement and Communication*, 4(1), 1-10.
<https://doi.org/10.47909/ijsmc.884>.
- Simaleza Muñoz , K. M. (2015). Propuesta del proceso presupuestario y contable del gobierno autónomo descentralizado parroquial de alluriquín, ubicada en la provincia de santo domingo de los tsáchilas. Quito: UNIVERSIDAD CENTRAL DEL ECUADOR. Obtenido de <http://www.dspace.uce.edu.ec/bitstream/25000/9016/1/T-UCE-0003-CA177-2015.pdf>
- Suárez, B. A., Ramírez, R. X., & Sánchez, M. A. (2020). Application of international financial reporting standards in Ecuadorian companies. *Dominio de las Ciencias*, 878-895.

- Tchatchoua Nya, M., Kouao, G. & Tchakoute Tchuigoua, H. (2023). Governance quality and international accounting standards adoption by microfinance institutions. *Recherches en Sciences de Gestion*, 159, 157-185. <https://doi.org/10.3917/resg.159.0157>
- Torres Garay, A. (2023). Formation of the public accounting student in the international accounting teaching process: A training proposal. *HUMAN REVIEW. International Humanities Review / Revista Internacional De Humanidades*, 16(4), 1-13. <https://doi.org/10.37467/revhuman.v12.4674>
- Valderrama, Y., Rivera, J., & Valecillos, Z. (2018). Quality Control Procedures Applied in the Audit of Financial Statements. *Sapienza Organizacional*, pp. 210-228.
- Villar, A. (2020). Importance of audit evidence and documentation for companies. Santa marta: Universidad Cooperativa De Colombia.

Influence of Marketing on the business growth of SanOdonto dental clinics

Marcos Eduardo Cantos Ochoa

Professor Lecturer at the Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca. PhD in Social Sciences. Mention: Management from the University of Zulia, Venezuela. Master in Integral Auditing from the Universidad Técnica Particular del Loja, Ecuador. Business Engineer from the Catholic University of Cuenca. E-mail: mecantoso@ucacue.edu.ec. <https://orcid.org/0000-0002-3340-5085>.

Nube Estefanía Venegas Sánchez

Professor at the Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca. Doctorate in Management Administration from the Universidad Benito Juárez, Puebla, Mexico. Master in Business Management from the Universidad Técnica Particular de Loja, Ecuador. Marketing Engineer from the Catholic University of Cuenca. E-mail: nvenegass@ucacue.edu.ec. <https://orcid.org/0000-0002-5398-1557>.

María del Pilar Cabrera Hermida

Professor at the Academic Unit of Economic and Business Sciences of the Catholic University of Cuenca. PhD candidate in Marketing Programme at the University of Valencia, Spain. Master in Digital Marketing and E-Commerce from the International University of La Rioja, Spain. Degree in Information Sciences and Social Communication from the Catholic University of Cuenca, Spain. Email: pcabrerah@ucacue.edu.ec. ORCID: <https://orcid.org/0000-0003-1536-490X>.

Santiago Andrés Moreano Granizo

Specialist in Orthodontics from the Catholic University of Cuenca, Ecuador. Dentist by the National University of Chimborazo, Ecuador. E-mail: sanodontomv@gmail.com. ORCID: 0000-0002-6296-0408.

Introduction

Social, economic, political and technological transformations have significantly influenced how people perceive, use and evaluate products and services, making consumers more demanding and transforming them from mere recipients of information into active participants who provide feedback and knowledge to the community (Cicero et al., 2024).

These transformations have modified the way in which organizations interact with their customers, adjusting their strategies to adapt to the new circumstances of the environment (Putri, et al., 2023). According to Kartikasari and Albari (2019) the effects of these elements are evident in how products and services are developed, promoted and distributed, as well as in the communication between brands and their audience. On the other hand, technological progression, society's mutating requirements and political changes have driven a continuous revision of marketing strategies, seeking to meet the demands and expectations of a constantly evolving market.

Marketing strategies play a fundamental role in business development by influencing how companies position themselves in the marketplace and relate to their customers. According to Kotler and Armstrong (2016), effective marketing involves identifying and satisfying the needs and wants of the target market through the creation,

communication, and delivery of superior value. Furthermore, Porter (1991) indicates that a sound marketing strategy can confer an entity a sustainable competitive advantage by differentiating its products or services from those of competitors.

To achieve this objective, Abhishek et al. (2023) argue that all companies should work on the development of several components within their internal marketing structure, which are fundamental to improve the company's competitiveness and profitability through the use of strategic techniques. In this regard, according to Mamani et al. (2024), the basic principles of marketing, which must be consciously managed using corporate resources, include price, product, distribution and communication. These elements can be adjusted both in the short and long term, according to the demands of the market and the company's objectives.

In this perspective, marketing strategies, according to Ilayda (2020) encompass a variety of effective goals and tactics, designed to enhance marketing and, therefore, company revenues. These plans are varied and should be executed according to the particular objectives of each organization.

In the dental practice environment, the dental practice must be considered a business and, therefore, must allocate a portion of its budget in planning to attract and retain customers. Nowadays, client management must be done

effectively in a way that perceives the professional as competent, capable and conveying trust (Sá de Lira and Mouzinho, 2018). According to Giraldo and Berbesi (2017) with the increased competition in the dental services market, it is necessary to use marketing tools that highlight dental clinics. Thus, marketing is one of the fastest growing resources available among health professionals, who use websites and social networks as means of communication, advertising and promotion.

From a marketing mix perspective, dental clinics must strive to communicate the benefits of providing personalized care tailored to the individual needs of each patient, so this technique becomes an effective channel to reach customers and improve both the frequency and depth of interactions with them. In this area, information and communication technologies (ICT) and their integration into marketing strategies has demonstrated the growing power of online communities to establish strong relationships between the brand and users (Hernandez, 2016).

In the specific situation of SanOdonto Dental Clinics, the main problem is the lack of a solid and clear marketing strategy, added to the challenges to stand out in a saturated and highly competitive market. This situation has led to limited visibility, which affects the company's ability to grow and compete effectively. It highlights the urgent need to implement

effective marketing strategies that go beyond promotion and advertising, also addressing a deep understanding of the market, the target audience and competitive differentiation.

The importance and relevance of the topic leads to the formulation of the following scientific question: What is the influence of marketing on the business growth of SanOdonto Dental Clinics? The main objective is to determine the influence of marketing on the business growth of SanOdonto Dental Clinics. It is hypothesized that effective implementation of marketing will have a positive impact on business growth by improving patient attraction, customer retention and market positioning.

The study gains significance by demonstrating a commitment to sustainable growth by addressing the complexities of marketing strategies. The goal is to not only solve the specific challenges of "SanOdonto Clinics," but also to drive positive change in the healthcare sector.

According to Calle (2020), the creation of a strategic marketing plan should establish the essential foundations for the efficient operation of this field, through concrete and accepted strategies. This aims to recognize and carry out the necessary actions to address emerging challenges and achieve future goals.

After addressing this initial introductory section, the theoretical foundations of the variables in question are established, followed by an explanation of the research methodology employed. Then, the significant results are presented, which will be compared later with previous research related to the topic, and finally the conclusions are presented.

Theoretical analysis

Marketing strategies play an essential role in the triumph of dental products and services (Lucietto et al., 2015). Such, strategies act as the dynamic link between the product and its consumers, having a significant impact on visibility, accessibility and overall success in the market (Zhao et al., 2017).

Effective marketing strategies according to Slade (2016) serve as beacons, capturing the attention of the target audience and delineating the product's value proposition, ensuring that it remains clear through its quality. Furthermore, according to Hennigs et al. (2012) they play an educational role by providing consumers with information about the uniqueness of the product, enhancing its perceived value. They are crucial for commercial success and for preserving a product or service in the global market (Conto et al., 2014).

Izquierdo et al., 2018 and Alvarez, 2016 describe marketing strategies as the set of decisions, research and activities carried out by an entity with the objective of establishing and maintaining comparative advantages in the long term. These strategies are fundamental to analyze and understand the market, identify the genuine needs of users, and guide the creation, execution, design and satisfaction of these needs. They also help to generate employment, increase sales and, therefore, improve business equity.

In today's complex business landscape, marketing strategies play a crucial role in achieving an organization's objectives. Before exploring the various tactics used, it is critical to understand the context in which they are applied, considering the changing dynamics of consumer preferences, technological innovations and market fluctuations.

In recent decades, there has been a significant shift in the power dynamics between companies and consumers. Consumers have gained greater influence due to their access to information and their ability to compare prices and even set their own. In the face of this transformation, companies must ensure the uniqueness and high quality of their products to maintain customer loyalty (Ferrell and Hartline, 2017).

In this perspective, Izquierdo et al. (2020) indicate that new firms employ marketing strategies with the purpose of consolidating their position in the market, increasing their sales through promotions targeting customers and consumers, and recruiting new salespeople in charge of achieving specific objectives. They aim to differentiate themselves from the competition by providing premium products and exceptional customer service.

Other companies achieve market positioning through secure methods involving the use of communication and advertising tools. Therefore, it is essential to develop services, establish a brand identity and use promotional strategies and offers in various media, highlighting especially in social networks (Kerin et al. (2018).

In this order of ideas, the marketing mix is used as a business tactic to achieve goals by combining different components. Introduced by E. Jerome McCarthy in 1960 it was part of a managerial approach that included consumer behavior analysis, market research, market segmentation and planning. Whereas, Phillip Kotler helped popularize this approach and spread the 4P model, which has been widely adopted by both academics and marketers (Keelson, 2012).

Abdul (2021) indicates that the well-known marketing mix has been applied since 1967, i.e. for over 53 years, in the form of the 4Ps (Product, Price, Place and Promotion). This set of controllable variables can be used by the company to influence buyer response and possibly help the company create a distinctive selling point, as well as a brand image to foster customer loyalty.

The elements of the marketing mix are interconnected and expressed through four components. The goal is to elicit a favorable response from the target market. This set of tactics is a controllable tool that the company employs together to obtain the desired reaction in its target market (Fernandez, 2015).

Figuerola et al. (2020) indicate that, the marketing mix is a highly effective strategy that combines tools and resources to help companies achieve their goals and make better decisions in the market. Its main purpose is to influence consumers' preferences, emotions and interests, motivating them to choose a specific product or service. This approach includes four variables or components: product, price, distribution and promotion. It is also known as the "commercial mix" or the "4P's", in reference to its Anglo-Saxon origin (price, product, place, promotion).

In the field of marketing and business growth, it is achieved through strategies that involve conducting market research

and product development, setting an appropriate price, choosing appropriate distribution channels and executing effective promotion of the product or service. It is crucial to understand consumer preferences, verify the product's satisfaction with their needs, know the prices charged by the competition, identify the best strategies to introduce the product to the market and determine the most effective way to reach customers. These strategies are fundamental for the success and sustainable development of a company (Estaún, 2023).

Business growth is an essential goal for many organizations. As companies seek to expand their reach, increase their revenues, and improve their market position, this growth becomes a strategic priority. In this essay, we will discuss the various aspects of business growth, from its drivers to the strategies that companies can use to achieve sustainable and successful growth (Garcia and Sumba, 2024).

According to Yoza et al. (2021) it can be driven by several factors, firstly, innovation plays a crucial role. Companies that develop innovative products or services can seize new market opportunities and gain a competitive advantage. Geographic expansion can also foster growth, allowing companies to access new markets and reach a broader customer base, and strategic alliances and mergers and acquisitions can provide

companies with new resources, technologies and capabilities, thus stimulating growth.

To achieve successful business growth, organizations must implement effective strategies, which may include developing a sound business plan that identifies growth opportunities, sets clear objectives, and determines the resources needed to achieve desired goals. Likewise, companies must be attentive to market trends and adapt to changes in the business environment to maintain their competitive advantage (Blázquez et al., 2006).

Cajahuanca et al. (2023) argue that business growth can present significant challenges, especially in terms of change management and resource allocation. Firms must be able to manage growth effectively, balancing expansion with operational stability. In addition, sustainable business growth requires careful risk management to ensure that companies can sustain themselves over the long term.

As can be seen in the preceding paragraphs, business development involves adapting to the demands of the environment or the entrepreneurial vision of management, committing to increase productive capacity through adjustments or acquisition of new resources; these actions generate transformations that support the modifications made. It involves expansion into new markets, which allows attracting and retaining higher quality employees, thus

becoming a source of competitive advantage (Dután and Ormaza, 2022; Aguilera and Puerto, 2018).

Business expansion analyzes whether management is willing to leverage its commercial, financial and technical opportunities in markets with high technological dynamism and, therefore, significant levels of uncertainty. This drives companies to at least match the ability to generate resources to carry out their investment strategies, marketing and acquisition of new production equipment, in order to preserve their competitive advantage over their most direct competitors and ensure their survival (Ormaza and Guerrero, 2021).

In making an analysis of the influence of marketing on business growth, Salazar et al. (2017) examine the importance of marketing in business management, focusing especially on digital marketing. They highlight the relevance of a well-defined strategy that includes specific actions to meet the expectations of customers, consumers or visitors, in order to maintain and improve market position and adapt to the environment. The process requires commitment, strategy and planning, involving all areas of the company. They conclude that an integrated marketing strategy that carefully manages online records and maintains customer satisfaction with relevant information can be successful with proper planning and execution.

Yépez et al. (2021) analyze the impact of marketing as a positioning strategy in MSMEs, using a documentary and descriptive research approach. The results show that the marketing mix is fundamental for the success of MSMEs, since it helps to highlight the acceptance of the product or service offered through an analysis of the 4c's: consumer, cost, convenience and communication. The various strategic combinations that emerge from this analysis generate long-term competitive advantages, leading to increased sales and profit generation. In conclusion, they state that it is essential to understand the weaknesses and strengths of the company in its value chain and in the competitive environment.

Finally, Hernandez (2016) in his study indicates that the expansion of information and communication technologies (ICT) and the Internet has generated a greater demand for health information from patients, which provides new opportunities through digital marketing, since the Internet offers dental clinics new ways to connect with patients and maintain direct and personalized communication beyond face-to-face interaction. This online communication improves the quality of service, which makes the patient feel more satisfied and closer to their dental clinic. It concludes that, in order to achieve these objectives of online presence and interaction, dental clinics need, in addition to the appropriate

use of new technologies, a strategy to guide their online marketing actions.

The development of this research work requires a quantitative approach, due to the fact that mathematical and statistical tools are used to examine the phenomenon under study, with the purpose of describing and understanding it from the numerical data that define it (Ali, et al., 2021). According to Hernández et al. (2014) the main objective of this perspective is to collect data, formulate hypotheses, identify variables and analyze results using statistical methods, with the purpose of inferring information based on the established premises.

An applied research design is used, specifically non-experimental, cross-sectional, descriptive and correlational, following the perspective of Hernández et al. (2014). This approach is chosen to define variables and compare them over time, without manipulating or intervening in them. The characteristics, profiles, sets or processes subject to analysis are collected in a free or grouped manner, and it is also aimed at understanding the relationship between the dimensions of the phenomenon under study. According to Bernal (2010), it is considered applied because the study has a limited duration and does not seek to create new theories.

For the collection of information, the survey technique was used and the questionnaire was used as an instrument; its design took into account the use of the Likert scale, which is an ordinal scale that measures the level of agreement of a person with a specific statement (Graus, 2020). In this scope, it was proposed to use the 5-point Likert scale for all defined variables, with options ranging from 1, denoting total disagreement, to 5, representing total agreement. See Table 1 for more details.

Table 1. *Qualitative-quantitative Likert Scale Scale scale*

| QUANTITATIVE VALUE | VALUE |
|-----------------------|----------------------------|
| 5 | QUALITATIVE |
| 4 | Strongly disagree |
| 3 | Disagree |
| 2 | Neither agree nor disagree |
| 1 | Agree |

Nota: En la tabla se refleja los valores cuantitativos y cualitativos de la escala de Likert aplicada.

The study population refers to 105 clients of the SanOdonto Dental Clinics. A non-probabilistic sampling by convenience was used, selecting intentionally the individuals from the population to be surveyed.

For the processing of the information collected, the statistical software SPSS (Statistical Package for the Social Sciences) was used to calculate Cronbach's Alpha coefficient and to evaluate the reliability of the instrument, as well as to perform correlation analysis. Finally, the relationship between variables and constructs is established by using the multiple linear regression model.

The next step consists of performing linear multiple regression tests to determine which marketing strategies have a significant influence on the growth of the company under study.

The results of the analysis on the "Influence of Marketing on the business growth of SanOdonto Dental Clinics". In this context, the linear correlation coefficient (R) is a measure that evaluates the strength of the relationship between two variables in a correlation analysis. In this case, the value of R is 0.877, indicating a significant positive relationship between the variables analyzed, suggesting that a change in one variable is associated with a change in the other in the same direction to a high degree.

On the other hand, the coefficient of determination $[(R)^2]$ is the square of the Pearson correlation coefficient and shows the proportion of the variability of the dependent variable that is explained by the linear regression model. In this case, the value of $[(R)^2]$ is 0.770, indicating that approximately

77% of the variability of the dependent variable can be explained by the linear regression model. This suggests that the model has a good ability to explain and predict the variability in the dependent variable based on the independent variables considered.

The results show that the proposed model explains about 77% of the variability in the dependent variable (Y) related to business growth, suggesting a significant model fit. They also indicate a strong linear relationship between the variables.

Based on the results obtained through the multiple linear regression model presented, an analysis of the significance of the study variables can be performed. The unstandardized and standardized coefficients, together with the t and Sig values, provide detailed information on the significance of each variable in the proposed regression model.

In this context, the high coefficient of the variable "Product (X1)" stands out, with a significant t value (5.285, $p = 0.000$), indicating a relevant influence on the dependent variable of economic growth. Similarly, "Plaza (X3)" (2.384, $p = 0.019$) and "Promotion (X4)" (2.431, $p = 0.017$), also present significant coefficients, with t and Sig. values denoting a statistically relevant influence on the dependent variable. These results support the importance of these variables in the multiple linear regression model and their ability to explain the variability in economic growth.

Table 4. *Hypothesis testing*

| Hypothesis | Description | T | Sig | Results |
|-------------------|---|----------|------------|----------------|
| H1 | Product: This element refers to the good or service, whether tangible or intangible, that is offered to satisfy the needs and desires of consumers. It includes aspects such as design, quality, packaging, branding and additional services that add value to the product. | 5,285 | ,000 | Accepted |
| H2 | Price: The price of the product is the amount of money customers must pay to acquire it. It is an essential component in the marketing strategy, since it affects the perception of the product's value, the company's profitability and its position in the market. | 1,852 | ,067 | Rejected |
| H3 | Place: Place refers to the distribution of the product, i.e., the channels and processes it goes through from its production until it reaches the final consumer. It includes elements such as logistics, | 2,384 | ,019 | Accepted |

| | | | | | |
|-----------|---|-----------|-------|------|----------|
| | points of sale, warehousing and the relationship with intermediaries. | | | | |
| H4 | Promotion: encompasses all the activities that the company carries out to publicize the product, increase its sales and communicate its value proposition to the target audience. This includes advertising, public relations, communication strategies and promotions. | Promotion | 2,431 | ,017 | Accepted |

Note: Own elaboration based on the research data.

According to the results shown in Table 4, it can be concluded that the variables Product (X1), Place (X3) and Promotion (X4) directly influence the economic growth of "SanOdonto Dental Clinics" (Y). This empirical evidence supports the conclusions of the study.

The findings of this research enrich the knowledge on a widely studied phenomenon with multiple previous contributions. In this study, it was hypothesized that effective marketing implementation would have a positive impact on business

growth. This hypothesis was confirmed by using the multiple linear regression model, where the results obtained indicate that the variables Product, Place and Promotion have a direct influence on the economic growth of "SanOdonto Dental Clinics". This suggests that the entity should focus on these areas to boost its development, since they are the elements of the marketing mix that have been shown to have the greatest impact according to the empirical evidence collected.

In this context, the current results coincide with the theories of Cusi, who in an empirical study carried out in the Maranura Poultry Farm, located in the Province of La Convención, Cusco-Peru, examines the relationship between the marketing mix and business growth. For this purpose, chi-square tests and Cramer's V test were used. The results showed a strong or moderate association between the components of the marketing mix (product, price, place and promotion) and business success, highlighting the importance of these elements for business development. The study concludes by emphasizing the significant role of promotion as a crucial factor for poultry progress.

On the other hand, Núñez's findings highlight that marketing tactics, focused on advertising and product promotion, allow the company to position itself in the consumer's mind. He concludes that there is a significant correlation between the

variables of marketing strategies and sales, given that the values of Pearson's coefficient exceed 0.60, highlighting the importance of implementing effective marketing strategies to achieve business success and economic growth.

Herrera et al., faced with the lack of knowledge about the tools and the correct application of marketing, propose the identification of appropriate marketing strategies for the business growth of the Dr. De La Rosa Comprehensive Dental Clinic. The results reflect that marketing, if properly employed, allows the company to position itself in the market and achieve a successful repositioning. With this in mind, it is sought that the company strives to constantly update and reinforce its advertising content, so that it is recognized not only in the locality where it operates, but also in nearby localities, targeting the right market segment, with designs and advertising adapted to the needs, which will help strengthen the company's communication and image with customers. Likewise, this will reinforce the proper promotion of the services and specialties offered by the clinic's medical staff, in order to significantly increase the number of clients.

Conclusions

In attention to the stated objective: to determine the influence of marketing on the business growth of SanOdonto Dental Clinics, identifying the dimensions that have a significant influence on this relationship. From the literature

review, it is highlighted that when studying the marketing mix, it is possible to do it through four dimensions: product, place, price and promotion. Theoretical evidence has been found on the effect of this marketing strategy on business growth.

Regarding the assessment of the instrument and its reliability, it is indicated as relevant according to the principles of Cronbach's alpha coefficient and the multiple linear regression coefficient. After establishing a good fit in the model, the positive and significant relationship of marketing on business growth is confirmed; however, it is observed that the marketing mix dimension (X2 price) does not have a significant effect on the studied variable.

The hypothesis analysis reveals that the variables Product (X1), Place (X3) and Promotion (X4) have a direct impact on the Business Growth (Y) of SanOdonto Clinics. On the other hand, the variable Price (X2) is discarded as it does not show statistical significance in the proposed model.

The results of the study provide valuable information for the managers of the SanOdonto Clinics, suggesting improvements or strengthening of marketing strategies to positively boost their business growth. To achieve this purpose, it is recommended to manage these strategies through a comprehensive marketing approach, which implies a coherent and coordinated management of all its activities,

with the aim of creating a unified customer experience and achieving a more effective impact on the market.

Reference

- Abdul, M. (2021). The Relationship between E- Marketing Mix Strategy and Integrated Marketing Communication: A Conceptual Framework. *International Journal of Economics and Management Systems*, 6, 167-184. <http://www.iaras.org/iaras/journals/ijems>.
- Abhishek , B., Nirma , J., Achint, N., Vijay, P., Amit, S., & Charles, J. (2023). Investigating the revised international marketing strategies during. *Journal of Business Research*, 158, 2-13. <https://www.sciencedirect.com/science/article/pii/S0148296323000206?via%3Dihub>.
- Aguilera, A., & Puerto, D. (2018). Crecimiento empresarial basado en la Responsabilidad Social. *Pensamiento y Gestión*, 32, 1-26.
- Ali, F., Koseoglu, M., Okumus, F., Putra, E., Yildiz, M., & Dogan, I. (2021). Is lodging research suffering from methods bias? An assessment of published research during 1990-2016. *Journal of Hospitality and Tourism Technology*, 12(3), 423-438, 423-438.
- Álvarez, L. (2016). *Plan de marketing empresarial*. Paraninfo.
- Bernal, C. (2010). *Metodología de la investigación*. Bogotá: Pearson Educación.
- Blázquez, F., Dorta, J., & Verona, M. (2006). Factores del crecimiento empresarial. Especial referencia a las pequeñas y medianas empresas. *INNOVAR. Revista de*

- Ciencias Administrativas y Sociales*, 16(28), 43-56.
<https://www.redalyc.org/pdf/818/81802804.pdf>.
- Cajahuanca, V., Meneses, B., & Carmen, E. (2023). Marketing mix y el crecimiento empresarial de la empresa Tambo en San Juan de Lurigancho, 2022. *Salud, Ciencia y Tecnología - Serie de Conferencias 2023*; 2:463., <https://doi.org/10.56294/sctconf2023463>.
- Calle, J. (2020). *Propuesta de un plan estratégico para el desarrollo competitivo de microempresas de artesanía en jorga de la ciudad de Cuenca: Caso Dideforj*. [Tesis de maestría, Universidad Politécnica Salesiana]: Repositorio:
<https://dspace.ups.edu.ec/bitstream/123456789/19634/1/UPS-CT008918.pdf>.
- Cicero, E., Ferasso, M., Vasconcelos, S., Fortes, P., Júnior, O., & Assunção, M. (2024). Student attraction and marketing strategies in a technical national institute: a Brazilian case study. *RGSA – Revista de Gestão Social e Ambiental*, 18(8), 1-16. DOI: <https://doi.org/10.24857/rgsa.v18n8-063>.
- Conto, F., Vrontis, D., Fiore, M., & Thrassou, A. (2014). Strengthening regional identities and culture through wine industry cross-border collaboration. *British Food Journal*, 116(11), 1788-1807.
- Cusi, I. (2021). *Marketing mix y su incidencia en el crecimiento empresarial en la Avícola Maranura en la provincia de La Convención, Cusco, 2021*. [Tesis de maestría, Universidad César Vallejo]: Repositorio UVC. <https://repositorio.ucv.edu.pe/handle/20.500.12692/71098>.

- Dután, A., & Ormaza, J. (2022). Estrategias de crecimiento empresarial para la empresa Roads Networks de la ciudad de Cuenca. *Revista Científica FIPCAEC*, 7(1), 36-55.
- Estaún, M. (14 de noviembre de 2023). *Qué es el Marketing Mix y sus variables: las 9P's del marketing*. Obtenido de <https://www.iebschool.com/blog/marketing-mix-marketing-digital/#:~:text=Por%20lo%20tanto%2C%20el%20Marketing,el%20producto%20en%20el>
- Fernández, V. (2015). Marketing mix de servicios de información: valor e importancia de la P de producto. *Bibliotecas anales de investigación*, 11, 64-78.
- Ferrell, O., & Hartline, M. (2017). *Estrategias de marketing*. México: Cengage Learning.
- Figueroa, M., Toala, S., & Mónica, Q. (2020). El Marketing Mix y su incidencia en el posicionamiento comercial de las Pymes. *Polo del Conocimiento*, 5(12), 309-324.
- García, F., & Sumba, R. (2024). Estrategias de crecimiento empresarial para el posicionamiento: estudio de un caso de microempresa en Ecuador. *Sapienza: International Journal of Interdisciplinary Studies*, 5(2), 1-13. <https://doi.org/10.51798/sijis.v5i2.759>.
- Giraldo, A., & Berbesi, D. (2017). Key factors in the perception of the quality of dental services provided by undergraduate students. *Revista Facultad de Odontología Universidad de Antioquia*, 28(2), 311-326. <https://revistas.udea.edu.co/index.php/odont/article/view/26107>.
- Graus, M. (2020). Escala estadística y software para evaluar coherencia didáctica en procesos de enseñanza-

- aprendizaje de Matemáticas. *Didasc@ lia: Didáctica y Educación*, 11(1), 140-165.
- Hennigs, N., Wiedmann, K., & Klarmann, C. (2012). Consumer Value Perception of Luxury Goods: A Cross-Cultural and Cross-Industry Comparison. *SpringerLink*, https://link.springer.com/chapter/10.1007/978-3-8349-4399-6_5.
- Hernández, A. (2016). El marketing digital en la clínica dental. *RCOE*, 21(2), <https://rcoe.es/articulos/39-el-marketing-digital-en-la-clinica-dental.pdf>.
- Hernández, R., Fernández, C., & Baptista, P. (2014). *Metodología de la investigación*. México: McGraw-Hill.
- Herrera, A., López, P., Atlahua, A., & Delgado, D. (2021). Comunicación y fidelización de clientes por medio de un plan de marketing para una clínica dental. *Digital Publisher*, 6(6), 90-102.
- Ilayda, I. (2020). The relevance of international marketing strategy to emerging-market exporting firms: from a systematic review towards a conceptual framework. *International Marketing Review*, 38(2), 279-302. <https://www.ingentaconnect.com/content/mcb/036/2020/00000038/00000002/art00001>.
- Izquierdo, A., Viteri, D., Baque, L., & Zambrano, S. (2020). Estrategias de marketing para la comercialización de productos biodegradables de aseo y limpieza de la empresa Quibisa. *Revista Universidad y Sociedad*, 12(4), 399-406.
- Izquierdo, A., Zambrano, M., Albarracín, J., & Jalón, E. (2018). *Marketing para jóvenes*. Editorial Jurídica del Ecuador.
- Kartikasari, A., & Albari, A. (2019). The Influence of Product Quality, Service Quality and Price on Customer

- Satisfaction and Loyalty. *Asian Journal of Entrepreneurship and Family Business*, 3(1), 49-64. Retrieved from <https://perwiraindonesia.com/ajefb/index.php/jurnalAJEFB/article/view/36>.
- Keelson, S. (2012). The Evolution of the Marketing Concepts: Theoretically Different Roads Leading to Practically Same Destination. *Online Journal of Social Sciences Research*, 1(2), 35-41. <http://www.onlineresearchjournals.org/JSS>.
- Kerin, R., Hartley, S., & Rudelius, W. (2018). *Marketing*. México: McGraw-Hill.
- Kotler, P., & Armstrong, G. (2016). *Marketing*. México: Pearson Educación.
- Lucietto, D., Sagaz, S., Zasso, F., & Freddo, S. (2015). Marketing for health: concepts, possibilities and trends. *Tecnological Magazine*, 3(2), 30-51.
- Mamani, D., Calisaya, L., Candia, A., & Tejada, M. (2024). Estrategias de marketing internacional en empresas exportadoras en Perú: una revisión sistemática. *New Trends in Qualitative Research*, 20(1), 2-14. <https://publi.ludomedia.org/index.php/ntqr/article/view/943>.
- Núñez, D. (2020). *El Marketing Estratégico en el proceso de ventas de la empresa de licores "CESAR LAC Cia. Ltda."*. [Tesis de maestría, Universidad Técnica de Ambato]: Repositorio UTA. <https://repositorio.uta.edu.ec/handle/123456789/25356>.
- Ormaza, M., & Guerrero, M. (2021). Gestión de calidad y crecimiento empresarial: Análisis bibliométrico. *Revista*

- Venezolana de Gerencia, 26(93), 318-333.
DOI:10.37960/rvg.v26i93.34986.
- Porter, M. (1991). *Estrategia competitiva: Técnicas para el análisis de los sectores industriales y de la competencia*. México: Compañía Editorial Continental.
- Putri, O., Putri, S., & Fahlevi, M. (2023). Marketing Mix Elements on Customer Service Satisfaction at Coffee Shops in Jakarta. *E3S Web of Conferences*, 448,
- Sá de Lira, A., & Mouzinho, B. (2018). Digital marketing in dentistry and ethical implications. *Brazilian Dental Science*, 237-246.
<https://bds.ict.unesp.br/index.php/cob/article/view/1524>.
- Salazar, A., Paucar, L., & Borja, Y. (2017). El marketing digital y su influencia en la administración empresarial. *Dominio de las Ciencias*, 3(4), 1161-1171.
- Slade, C. (2016). *Creating a brand identity: A guide for designers*. Hachette UK.: Laurence King Publishing.
- Yépez, G., Quimis, N., & Sumba, R. (2021). El marketing mix como estrategia de posicionamiento en las MIPYMES ecuatorianas. *Polo del Conocimiento*, 6(3), 2045-2060.
- Yoza, X., Villafuerte, R., & Parrales, M. (2021). Crecimiento empresarial: estrategia de desarrollo del mercado en el sector mipymes. *Revista Publicando*, 8(31), 82-95.
<https://revistapublicando.org/revista/index.php/crv/article/view/2236>.
- Zhao, E., Fisher, G., Lounsbury, M., & Miller, D. (2017). Optimal distinctiveness: Broadening the interface between institutional theory and strategic management. *Strategic Management Journal*, 38(1), 93-113.

Continuous Improvement through ISO 9001: Analysis in Modern Organizations

Ana Alexandra López-Jara

Catholic University of Cuenca, alopezj@ucacue.edu.ec
ORCID: 0000-0001-6905-9025

Jovina Alejandra Jaramillo Quezada

Catholic University of Cuenca, jovina.jaramillo@ucacue.edu.ec
ORCID: 0009-0000-5976-0520

Judith Cristina Pesantez Rodríguez

Catholic University of Cuenca, jcpesantezr@ucacue.edu.ec
ORCID: 0000-0002-9058-6695

Ernesto Bolívar Rizzo-Orellana

Catholic University of Cuenca, ernesto.rizzo@ucacue.edu.ec
ORCID: 0009-0006-4040-5995

Introduction

Nowadays, professional accountants are of utmost value in contributing to the field of quality auditing as they bring specialized skills and knowledge to protect the integrity and efficiency of the business process. They verify regulatory and accounting compliance with applicable rules and regulations, both at the accounting level. This is essential to avoid legal sanctions and maintain the integrity of financial and operational data. They have the essential ability to verify the accuracy of accounting records, identify possible errors or irregularities, and ensure that the information presented is reliable for decision making. The rationale for undertaking the function is the need to provide modern organizations with a

deeper understanding of how these clauses can effectively contribute to their continuous improvement processes. By addressing this gap in the existing literature, it is hoped that the findings of this study will provide practical and strategic guidance for companies seeking to optimize their quality management practices. In addition, by specifically analyzing clauses 4 and 5, it is intended to provide specific knowledge that will enable organizations to improve the implementation of the standard and strengthen their continuous improvement initiatives, in line with the challenges and opportunities of the contemporary business environment. For this research work, the objective is defined to analyze emerging technologies, cultural impact of the organization and suppliers and supply chain on quality auditing. Also an in-depth analysis of clauses 4 and 5 of ISO 9001, with the purpose of understanding its application and its impact on continuous improvement practices in modern organizations.

In this sense, continuous improvement is a fundamental pillar of quality management in modern organizations, and ISO 9001 stands as a global standard that facilitates this process. Through an in-depth analysis, several researches demonstrate how the implementation of ISO 9001 can positively transform organizational practices, improving operational efficiency and customer satisfaction. Aumüller and Coetzer (2020) analyze the industry perspective on animal welfare in the GLOBALG.A.P. standard and highlight how the integration of

quality standards such as ISO 9001 into assurance systems can significantly improve global management and compliance. This approach not only ensures quality, but also strengthens consumer confidence in the products and services offered.

The impact of ISO 9001 on continuous improvement and business competitiveness in various industries

Arribas Díaz and Martínez-Mediano (2017) study the application of ISO 9001 quality management systems in educational centers, revealing that their implementation contributes to greater efficiency in administrative and pedagogical processes. ISO 9001 facilitates the creation of a structured environment that fosters continuous improvement, positively impacting educational outcomes and student and staff satisfaction. In the coal supply chain sector, Samaranayake et al. (2024) apply lean and quality improvement methods to improve operational performance. Their study demonstrates that the integration of ISO 9001 principles can optimize logistics processes, reduce costs and increase efficiency. This integration is crucial to meet market challenges and maintain competitiveness. Pio et al. (2024) compare complaint management between traditional and digital banks, highlighting the benefits of using management systems for continuous improvement. The research shows that banks that implement ISO 9001 can manage complaints

more effectively, improving customer satisfaction and building long-term customer loyalty.

Alshahrani and Husain (2024) explore the effectiveness of ISO 9001 implementation on the performance of SMEs in emerging economies. The results indicate that SMEs that adopt this standard experience significant improvements in their operational and financial performance. ISO 9001 provides a structure that facilitates process optimization and adaptation to market changes.

Ullah et al. (2024) investigate the influence of corporate social responsibility (CSR) on impulse buying and find that companies that integrate CSR practices with ISO 9001 can positively influence consumer behavior. Aligning quality with CSR not only improves company image, but also promotes greater customer loyalty. Dell'Atti et al. (2024) present the first experience of PDTA process certification in emergency medical services according to ISO 22301:2019 requirements. This research highlights how the integration of ISO 9001 with other management standards can improve business continuity and emergency response, ensuring quality and efficiency in critical situations.

Fernández Sarmiento et al. (2024) address systems integration through the "Integrated Use of Management Standards" methodology, showing how the combination of ISO 9001 with other standards can enhance operational

efficiency and continuous improvement in organizations. This integrated approach enables more coherent and effective management of resources and processes. Skalli et al. (2024) use the Best Worst method to select Lean Six Sigma 4.0 projects, highlighting the importance of decision making based on quality and efficiency. The implementation of ISO 9001 in these projects ensures a solid structure to achieve operational excellence.

In conclusion, the implementation of ISO 9001 in modern organizations is essential for continuous improvement and process optimization. Several studies show that this global standard facilitates the creation of a structured environment that promotes efficiency, customer satisfaction and adaptation to market demands. The integration of ISO 9001 with other standards and management practices strengthens the ability of organizations to face challenges and remain competitive in a dynamic and globalized environment.

Against this background, quality management has become essential for today's business environment, characterized by competitiveness, globalization and the growing demand for products and services that meet exceptional standards.

In this context, ISO 9001 has established itself as an international standard for ensuring the quality of organizational processes. In pursuit of continuous improvement, current perspectives on quality management

have focused on clauses 6 and 7 of ISO 9001, which cover important aspects related to the planning and support needed to achieve and maintain desired quality standards. Clause 6 generally focuses on planning and is governed by the strategic component that helps organizations define their objectives and identify risks and opportunities, where this proactive approach not only helps them meet regulatory requirements, but also helps them anticipate challenges and seize opportunities in a dynamic and changing business environment.

Clause 7, on the other hand, is an important factor in ensuring the effective development of a planned and support-oriented process. Here we discuss issues related to resources, human capabilities, organizational awareness and knowledge management, factors that work synergistically to support the effective implementation of a quality strategy. Studying, clauses 6 and 7 of ISO 9001 includes a detailed analysis of how organizations can link objectives to processes and resources to foster an organizational culture based on continual improvement, this integrated approach places your organization at the forefront of excellence in quality management, not only meeting regulatory requirements, but also ensuring operational efficiency and customer satisfaction. In this context, we carefully examine the current perspectives arising from its actual interpretation and application and highlight its impact on the development of

modern quality management. The research adopted a qualitative approach to conduct an in-depth analysis of continuous improvement in the context of ISO 9001, focusing specifically on clauses 4 and 5. The qualitative phase was based on a comprehensive review of existing literature on the implementation of the standard and continuous improvement practices in modern organizations. This literature review provided a solid theoretical basis and helped to identify trends, challenges and previous approaches in the field of study. It also provided insight into the significance of the result in the table expressions. The present study was based on documentary research, where several articles were collected and analyzed, such as: books, degree theses and others through online platforms and libraries such as: Redalyc, Scielo, Dialnet and Google Scholar allowing to obtain more knowledge than expected. In the bibliographic review of each of the experiences of the authors mentioned above, allowed to analyze the ISO 9001 Standards and even more of clauses 6 and 7.

Evolution and Implementation of ISO 9001 Standards in Quality Management and Auditing

The first version of the ISO norms appeared in 1987 as standards defining a quality management system. Since then, these standards have been revised through versions in 1994, 2000, 2008 and recently by the 2015 version. It is the European educational institutions in the 1990s, followed by

those in the United States and Asia, that initiated their implementation in the context of education, encountering great difficulties given their manufacturing-oriented approach (Fontalvo & Hoz, 2018, p. 36)..

The requirements for a quality management system (QMS), applies to any organization that needs to demonstrate its ability to deliver products that meet customer requirements and standards. This standard aims to improve customer satisfaction and applies to all organizations, regardless of their type or size the company is adopted by industrial and manufacturing sectors around the world (Perez, 2017). As established in the ISO 9000 Standard (ISO TC/176, 2015a), the QMS can be defined as a system whose function is to define the policy that the organization will follow and the goals it will set for obtaining quality.¹ Given this, Méndez, Jaramillo and Serrano (2006) argue that the QMS consists of a way of structuring and organizing operations to direct and ensure the proper functioning of the organization, to make it more profitable, competitive and adaptable to new and changing market situations. Thus, the elements of the QMS have the mission to achieve a positive impact on the performance of the entire organization. According to ISO 9001 (2015), a QMS is implemented when that "needs to demonstrate its ability to consistently provide products and services that meet the customer's applicable legal and

regulatory requirements, and aims to increase customer satisfaction (Reyes Chacón et al., 2021, p. 219)..

"The management of an organization through a Total Quality System requires prior knowledge of the current levels of quality of management and results in a company." (Robledillo Colmenares & Velázquez López, 2013, p. 305). The audit is a systematic, independent and documented process to obtain audit evidence and evaluate it objectively, in order to determine the extent to which the audit criteria are met, according to the ISO 9000:2005 NC. Meanwhile, this same standard conceptualizes that the audit criteria are the set of policies, procedures or requirements used as a reference. (Viera Valencia & Garcia Giraldo, 2019, p. 1)..

The quality control procedures have a fundamental role in the development of the audit of financial statements, they represent the set of activities that the auditor and his team must develop in order to ensure that the audit has been conducted according to the established professional requirements, these are required in the audit activity by the International Standards on Auditing issued by the International Federation of Accountants, as well as, by the International Standards on Quality Control ISQC 1, promulgated by the referred professional organization. (Valderrama, Rivera, & Valecillos, 2018, p. 211).. The audit process in a quality management system is a merely important

part not only in terms of realization, but also should influence the recommendations for improvement that are detected for the improvement of organizational processes and, therefore, the improvement of organizations in terms of homogenization of processes according to what is analyzed in them (Sotelo Asef, 2018, p. 8). Risk identification is nothing more than identifying the sources, causes and consequences that can bring the materialization of an inherent risk, either in the development of the production of a product, provision of a service or in the activities of the organization, which in turn can cause the non-compliance with the strategic and operational objectives established (Doria Parra et al., 2019, p. 129).

Risk management is a set of controls that can guide an institution's objectives by identifying opportunities to better perform its functions or increase stakeholder confidence and satisfaction. It can be considered as the implementation of strategies and policies to be followed to reduce the adverse consequences that may be caused by risks, thus adding value to goods, products or services. Similarly, risk management is one of the most innovative elements to be considered in the strategic direction and strengthening of internal control, where man, as the most important asset, is responsible for its identification, treatment, revision and permanent monitoring. (Guerrero Margarita & Medina Alberto, 2020, p. 2)

Today, audit histories have been updated thanks to the digital era. The profession has undergone a significant change thanks to the digital era, which has allowed us to process and analyze large volumes of data with greater accuracy. In addition, technological innovation has not only improved the quality and depth of audits, but has also accelerated the process, allowing us to focus on more strategic and advisory aspects. This has increased the transparency and traceability of audits, which increases confidence in the results and enables more effective decision making for the company. (Legalnet, 2023)

Therefore, data science has penetrated into all areas of human life, driving the application of digital technologies, Big Data, artificial intelligence, blockchain, ABCD data analysis, learning, chatbots and drones, among others, to guide how it satisfies the company making decisions on quality system implemented with its objectives to achieve standards and ensure its maintenance is correct. (Balbi, 2022). However, it allows companies to generate insights and results from a wide range of data an impressive speed, regardless of the amount of data involved. Moreover, Big Data not only benefits companies, but is also used by government entities and even science and research to obtain information relevant to their activities.(Miles Armijos, 2021, p. 17)

Influence of Organizational Culture on the Perception and Management of Quality

Organizational culture plays a fundamental role in the perception and management of quality within a company. First, culture defines the norms, values and beliefs shared by the members of the organization, which directly influences how quality is perceived and the expectations related to it. A culture that values excellence and continuous improvement will tend to prioritize quality in all business activities and processes. In addition, organizational culture determines how quality issues are addressed and how improvement initiatives are managed. In a culture that fosters transparency and accountability, quality issues are identified quickly and addressed proactively, before they become major problems. On the other hand, in a culture where quality is seen as an obstacle or the sole responsibility of the quality department, problems are likely to be ignored or dealt with superficially. Culture also influences how quality standards are established and maintained throughout the organization. In a culture where teamwork and collaboration are valued, clear quality standards are more likely to be set and the commitment of all employees to meet them is encouraged. Conversely, in a culture where internal competition and individual interests predominate, quality standards may be compromised for the sake of other organizational goals. Organizational culture has a significant influence on the perception and management of quality in a company. Thus, it defines (Rincón Rodríguez &

Aldana Bautista, 2021). "the group's shared perception of values, beliefs, principles and norms that influence aspects of work life and determine decision making."(p. 7).

In this sense, management is based on international technical standards that allow to control various aspects of the activities of an organization in the quality of its product or service, giving cause environmental impacts, safety and health of workers, social commitment or knowledge management.(Rincón Rodríguez & Aldana Bautista, 2021).. Through the culture of organizations according to (Charón Durive, 2007)expresses

It is one of the components of managerial behavior that has the greatest impact on a company, although it is common, it is the starting point, especially in companies that strive for excellence. For this reason, it is considered one of the comparative advantages of the organization, and a pillar for change and continuous improvement. Culture is a key factor not only in human resource management but also in technological development.(p. 5)

In addition, as the benefits of organizational culture meet the quality of success and the organization has adapted to the business lifestyle due to the needs of customers. Organizational culture is an invaluable asset to any company as it provides a number of benefits that positively impact its

long-term performance and success. Below are some of the key benefits of a strong and positive organizational culture:

Improved Work Climate: A positive organizational culture creates a favorable work environment, where employees feel valued, motivated and engaged. This leads to a positive work climate, where camaraderie, collaboration and mutual respect prevail.

Talent Attraction and Retention: A strong, positive organizational culture acts as a magnet for talent. Companies with a reputation for having a positive work culture are more attractive to job-seeking professionals and are more successful in retaining their most talented employees.

- **Increased Productivity:** An organizational culture that fosters efficiency, innovation and teamwork tends to increase employee productivity. When the company's values and objectives are aligned with those of employees, they feel more committed and motivated to achieve organizational goals.
- **Greater Adaptability to Change:** Companies with an organizational culture that is flexible and open to change are better able to adapt to new circumstances and challenges in the business environment. Employees are more willing to accept and embrace change when they are part of a culture that values innovation and continuous improvement.

- **Fostering Creativity and Innovation:** A culture that promotes creativity and experimentation provides an environment conducive to the generation of new ideas and innovations. Employees are more inspired and motivated to think creatively and come up with innovative solutions to problems.

A strong, positive organizational culture brings with it a number of benefits ranging from improved work climate and productivity to attracting and retaining talent, adaptability to change, and fostering creativity and innovation. These benefits not only contribute to a company's short-term success, but also position it for sustainable and lasting growth in the future.

Table 1 *Benefits of organizational culture*

| Benefits | Features |
|-------------------------------|---|
| Defining identity | It highlights the personality and its purpose of existence through the projection of both internal and external event, the perception of warmth and customer. |
| Promotes the company's values | They define how the members of the organization will act and how they should continue to effectively and strategically support the values and commitments of all. |

Motivates employees

Defining the organization's culture makes employees feel an active part of the organization and motivates them to perform well, thus contributing to the achievement of goals and objectives.

Leadership

Help managers develop interpersonal skills based on business objectives.

Source:(Jaque Puca, 2023)

However, the concept of culture has been extensively developed by anthropology, which is now making its way into other fields such as psychology and sociology. Business organizations are increasingly described under the general term organizational, entrepreneurial or corporate culture.(Lopez, 2013, p. 100)

Fostering a culture of quality in an organization involves taking strategic measures to promote values, behaviors and practices focused on perfection and improvement. Also, in the moments of now if entrepreneurs seek excellence and continuous improvement for their companies want to foster a culture of quality in the organization these are the pillars that keep in the company:

- They need to understand the culture of the organization and take steps to reinforce it or try to move forward or take action.

- Strategy is the result of thinking deeply about the long-term future of the company.
- Depending on the chosen strategy, the organization acts as a formal arc to determine the achievement of the chosen goals.

According to (Gonzalez Gonzalez et al., 2000, p. 102)organizational culture is a system of shared and important symbols that emerge from the history of procurement and procurement management, its socio-cultural context and its contingencies. In addition, important symbols are expressed in the form of myths, ideologies and principles and are translated into various cultural languages.

Evaluation of the effectiveness of quality audits in the supply chain

Evaluating the effectiveness of quality audits in the supply chain is a critical and evolving aspect of today's business landscape. Not only are these audits fundamental to ensuring the quality and optimal performance of products and services throughout the chain, but they also play a crucial role in risk management, regulatory compliance and continuous improvement. First, quality audits provide an invaluable tool for verifying compliance with the standards and specifications set by both the company and its customers. The systematic and objective evaluation of suppliers' processes and practices allows the identification of possible deviations and areas for

improvement that could impact the quality of the final product. In addition, these audits act as a proactive quality control mechanism, allowing potential problems to be addressed before they become significant problems.

In addition to ensuring product quality, quality audits in the supply chain are essential to ensure compliance with applicable standards and regulations in different industries and regions. Companies operating in highly regulated industries, such as pharmaceuticals or automotive, rely heavily on these audits to demonstrate compliance with legal requirements and avoid potential regulatory sanctions. Another key aspect of the effectiveness of quality audits is their ability to detect and mitigate potential risks in the supply chain. From quality problems in raw materials to failures in manufacturing processes, these audits provide a detailed view of potential weaknesses in the chain and allow corrective and preventive measures to be implemented to mitigate these risks before they affect the quality of the final product. In addition to their risk control and mitigation function, quality audits are also a powerful tool for driving continuous improvement and innovation in the supply chain. By identifying opportunities for optimization and efficiency in supply processes, these audits foster a culture of continuous improvement among suppliers and promote the adoption of best practices and innovative technologies throughout the chain. Effective evaluation of quality audits in the supply chain

is essential to ensure quality, compliance and efficiency in supply processes. These audits not only provide a comprehensive view of supplier quality and performance, but also enable companies to make informed and proactive decisions to improve the quality of the products and services they offer to their customers.

Table 2 *Supply chain*

| Key activities | Support activities |
|---|---|
| <p>1. Customer service standards and marketing cooperation:</p> <p>a) Determine the customer needs and requirements for customer service logistics.</p> <p>b) Determine the customer's response to your service.</p> | <p>1. Storage:</p> <p>a) Determination of spaces.</p> <p>b) Stock distribution.</p> <p>c) Configuration of the warehouse.</p> <p>d) Placement of inventories</p> |
| <p>2. Transportation:</p> <p>a) Selection of transportation service.</p> <p>b) Freight consolidation.</p> <p>c) Conveyor routes.</p> <p>d) Vehicle programming.</p> | <p>Material handling:</p> <p>a) Equipment selection.</p> <p>b) Equipment replacement policies.</p> <p>c) Procedures for raising orders.</p> <p>d) Warehousing and stock recovery.</p> |

e) Equipment selection.

f) Complaint processing.

g) Tariff audits.

Inventory management:

a) Storage policies for raw materials and finished goods.

b) Estimated short-term sales.

c) Product mix in the supply centers.

d) Number, size and location of storage points.

3. Purchasing:

a) Selection of the source of supply.

b) Right time to buy.

c) Quantities to be purchased.

4. Information flows and order processing:

a) Sales order-inventory interface procedures.

b) Methods of transmitting order information.

c) Ordering rules.

4. Protective packaging designed for:

a) Management.

b) Storage.

c) Protection against loss and damage.

Cooperation with production and operations for:

a) Specify additional quantities.

6. Maintenance of information:

a) Collection, storage and handling of information.

b) Data analysis.

b) Production time sequence and performance. c) Control procedures.

c) Programming of supplies for production and operations.

Source: (Campos Portugal, Pompilio Alexis Cerrud Álvarez, Franklin González Tejedor, Mavis Beli Oxdalia Rodríguez, 2023, p. 7211).

At the same time, evaluating the effectiveness of quality audits in the supply chain is a critical process to ensure that products or services meet established standards and fulfill customer expectations. The following table shows the supply chain for each area:

Table 3. *Perception of each supply chain function area*

| Area | Criteria for good inventory management |
|--------------|---|
| Sales | High levels to ensure availability |
| Distribution | High levels for increased utilization of distribution resources |
| Shopping | Bulk sizing on large purchases to achieve price reductions to ensure departmental efficiency. |
| Finance | Low levels for the benefit of working capital. |

Address They see IG as a provider of information at any time resulting in statistical work and data collection that is sometimes unstructured given the rush.

Production a) Large lots to reduce production cost as a practice.
b) They tend to have high inventories to anticipate urgent orders, interruptions and changes in demand.

Source:(Balanzategui García, Rosalina Ivonne Vega Flor, Jessy Gabriela López Naranjo, 2022).

By virtue of this, (Manrique Nugent, Teves Quispe, Taco Llave, & Flores Morales, 2019, pág. 1138) state that it is interesting and necessary to study supply chain as the necessary structure to achieve the development and efficiency of the production and distribution of goods and services in any economy, in this sense to know and understand what the supply chain means, knowing what resources are necessary. It is how much they need and know the current use of the organization's resources. As for, the supply chain includes all parties involved directly or indirectly in meeting customer needs. It includes manufacturers, suppliers, drivers, sellers, vendors and even the customers themselves. In any organization, it includes functions such as product development, marketing, operations, distribution, finance and customer service, all of which contribute to receiving and satisfying customer requests. (Manrique Nugent, Teves Quispe, Taco Llave, & Flores Morales, 2019)

Development of best practices to ensure the quality of suppliers' products or services

In recent years, achieving efficiency and competitiveness has become a crucial need for companies operating in a constantly changing environment, which significantly impacts their operations. Supplier management is becoming increasingly important at a global level to ensure the good performance of companies. In the case of Cuba, where resources are limited and it is required to explore various alternatives to meet the demands of increasingly demanding customers, supplier management becomes an unavoidable necessity.(Vilmaris Torres et al., 2021).. The development of best practices to ensure quality in supplier products or services involves following a systematic approach. For this reason, it is mentioned (Peña Florez, Luis Alfonso Rodríguez Rojas, 2018)."organizations today must select suppliers in an effective way to give a timely result to customer needs in this way to ensure their competitiveness"(p. 251)".

Currently, "there are many evaluation techniques used in the supplier selection process, but there is no consensus on which one is better than another or under what circumstances they should be used" (Ojeda et al., 2020).(Ojeda et al., 2020). Every company needs resources to function. Purchasing management is a set of activities carried out in the company to satisfy this need in the most efficient way. The process of acquiring goods, production inputs, assets for the operation

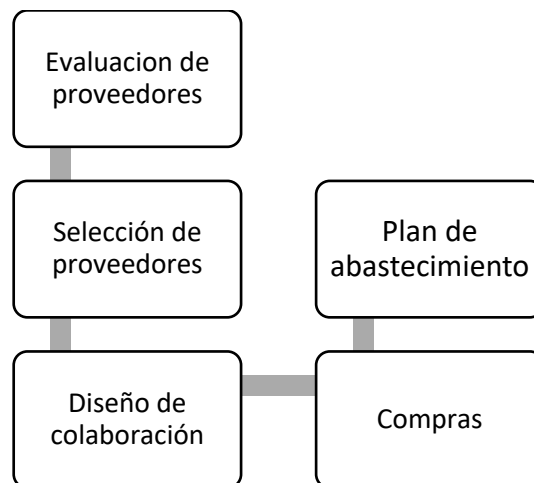
of the company.(Ojeda et al., 2020).. The development of best practices to ensure quality in products or services from suppliers is a crucial aspect of efficient supply chain management. As companies seek to maximize quality and efficiency in all stages of their operations, collaboration with reliable suppliers and implementation of sound quality standards become imperative for long-term success. In this extensive text, we will explore in detail several key strategies and considerations for the development and effective implementation of quality best practices in supplier management. First, it is essential to establish clear and defined quality criteria for the products or services expected from suppliers. These criteria must be specific, measurable and aligned with the needs and expectations of the end customer. By defining these standards, companies can ensure a clear and transparent understanding of quality expectations both internally and among their suppliers. Selecting reliable suppliers is another crucial aspect in the process of ensuring quality in the supply chain. Technical capability, industry experience, quality track record and ability to meet established requirements are factors to consider when evaluating and selecting suppliers. In addition, it is important to conduct periodic audits and evaluations of suppliers to ensure their continued suitability and commitment to quality. Once suppliers have been selected, it is essential to establish a collaborative relationship and open communication with them. Close collaboration allows you to share information

about quality expectations and requirements, as well as work together to solve problems and seek opportunities for continuous improvement. This collaborative relationship can contribute significantly to improving quality and efficiency throughout the supply chain.

Implementing effective quality management systems is another key aspect of ensuring quality in suppliers' products or services. Quality management systems, such as ISO 9001, provide a structured framework for quality assurance and continuous improvement at all stages of the production or service delivery process. By aligning processes and practices with international quality standards, companies can improve consistency and efficiency in the delivery of high quality products and services. Continuous monitoring and tracking of supplier performance is critical to ensuring quality in the supply chain. This can include conducting periodic audits, collecting performance data and customer feedback. By regularly evaluating supplier performance, companies can identify areas for improvement and take corrective action in a timely manner to ensure quality and customer satisfaction. In addition to performance monitoring, it is important to provide training and development to suppliers on quality-related issues. This may include training in high quality manufacturing or service delivery practices, as well as skill development in quality management and problem solving. By investing in supplier capability development, companies can improve

their performance and contribute to continuous improvement throughout the supply chain. Developing best practices to ensure quality in supplier products or services is a multifaceted process that requires a comprehensive and collaborative approach. From establishing clear quality criteria to selecting and collaborating with reliable suppliers, implementing effective quality management systems and continuously monitoring performance, each step is critical to ensuring a strong and reliable supply chain. By adopting these key strategies and considerations, companies can improve the quality of their products and services, meet customer expectations and maintain a competitive advantage in the marketplace.

Figure 1 . Strategic activities related to suppliers



Source:(Torrijos, 2018)

The following is an analysis of clauses 4 and 5 of ISO 9001:2015, The analysis of clauses 4 and 5 of ISO 9001:2015 is fundamental to understanding and evaluating quality management in an organization. These clauses establish requirements related to organizational context and leadership, two essential aspects for the establishment of an effective quality management system oriented towards continuous improvement. Clause 4 addresses the context of the organization, which involves understanding both the internal and external environment in which the organization operates, as well as the needs and expectations of stakeholders. Clause 5, on the other hand, focuses on leadership and top management's commitment to the quality management system, highlighting the importance of effective leadership in establishing a culture of quality throughout the organization. In this introduction, we will explore in detail the key requirements and principles set out in clauses 4 and 5 of ISO 9001:2015, as well as their impact on quality management and continual improvement within an organization.

Table 4 Analysis of Clauses 4 and 5 of ISO 9001:2015: Fundamentals for Continuous Improvement and Business Competitiveness.

| ISO 9001:2015 CLAUSE | DEFINITION |
|-------------------------|--|
| 4.1 Context analysis | <p>The organization should establish both external and internal issues that are relevant to its purpose and strategic direction, and that may affect its ability to achieve the intended results of its Quality Management System.</p> <ul style="list-style-type: none"> • Risk matrix • SWOT • Strategic planning |
| 4.2 Stakeholders | <p>Because of its potential effect on the organization's ability to regularly provide products and services that meet applicable customer and</p> <ul style="list-style-type: none"> • Management review with customers, suppliers |

regulatory requirements.

| | | |
|--|--|--|
| 4.3 Quality management | The organization should finalize the boundaries and applicability of the quality management system to establish its scope. | <ul style="list-style-type: none">• Scope of the Quality System |
| 4.4 Quality management system and its processes | The organization shall establish, implement, maintain and continually improve a quality management system. | <ul style="list-style-type: none">• Process map• Planning |
| 5.1.1 General | Top management must demonstrate leadership and commitment to the quality management system. | <ul style="list-style-type: none">• Institutional philosophy (mission, vision, values, objectives) |
| 5.1.2 Focus on the client | Senior management must demonstrate leadership and commitment and | <ul style="list-style-type: none">• Customer requirements• Quality Policy |

commitment to customer focus.

| | | |
|--|--|---|
| 5.2.1 Establishment of the quality policy | Top management shall establish, implement and maintain a quality policy. | <ul style="list-style-type: none"> • Quality policy plan • Quality objectives |
| 5.3 Roles, responsibilities and authorities in the organization | Top management should ensure that responsibilities and authorities for relevant roles are assigned, communicated and understood throughout the organization. | <ul style="list-style-type: none"> • Responsibility matrix |

Note: Own elaboration

The table provides a detailed description of clauses 4 and 5 of ISO 9001:2015, which address critical aspects such as context analysis, quality management, leadership and customer focus within a quality management system. Each of these clauses and suggested evidence for implementation will be discussed in depth below. Clause 4.1 focuses on the analysis of the organizational context. The organization should identify and understand both external and internal

issues that are relevant to its purpose and strategic direction. Suggested evidence includes the development of a risk matrix, a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and strategic planning.

On the other hand, clause 4.2 addresses stakeholder management. The organization shall identify relevant interested parties and understand their potential impact on the organization's ability to meet customer and regulatory requirements. Suggested evidence includes management reviews involving customers and suppliers. Clause 4.3 refers to quality management and the establishment of the scope of the quality management system. The organization shall define the boundaries and applicability of the quality management system to establish its scope. Suggested evidence includes documentation of the scope of the quality system. Clause 4.4 also addresses the quality management system and its processes. The organization shall establish, implement, maintain and continually improve a quality management system. Suggested evidence includes the development of a process map and detailed plans. As for the clauses in section 5, they focus on leadership and customer focus. Clause 5.1 highlights the importance of top management in demonstrating leadership and commitment to the quality management system. Suggested evidence includes documentation of the institutional philosophy and strategic objectives.

Clause 5.2 focuses on customer focus and the importance of top management in demonstrating leadership and commitment to this aspect. Suggested evidence includes documentation of customer requirements and quality policy. Finally, clause 5.3 addresses roles, responsibilities and authorities in the organization. Top management shall ensure that relevant responsibilities and authorities are assigned, communicated and understood throughout the organization. Suggested evidence includes the development of a responsibility matrix. A detailed analysis of clauses 6 and 7 of ISO 9001:2015 will follow. These clauses, fundamental in the framework of quality management, address key aspects such as strategic planning and the necessary support for the effective implementation of quality management systems. Through this analysis, the importance of these elements in the continuous improvement of organizations and their contribution to the achievement of outstanding standards in quality management will be explored.

Table 5. Analysis of Clauses 6 and 7 of the ISO 9001:2015 Standard

| ISO 9001:2015 CLAUSE | DEFINITION |
|---|---|
| 6.1. Actions to address risks and opportunities | <p data-bbox="708 688 976 1010">Actions taken to address risks and opportunities should be commensurate with their potential impact on the suitability of products and services.</p> <p data-bbox="1008 688 1448 890">1. The organization must evaluate the effectiveness of the actions 2. The organization must ensure quality management</p> |
| 6.2. Quality objectives and planning for their achievement | <p data-bbox="708 1073 976 1352">The organization shall establish quality objectives for the relevant functions, levels and processes required by the quality management system.</p> <p data-bbox="1008 1073 1448 1226">1. The organization must maintain documented information 2. The organization must maintain quality objectives</p> |
| 6.3. Change planning | <p data-bbox="708 1415 976 1736">When an organization determines that changes to its quality management system are needed, those changes should be implemented in a planned manner.</p> <p data-bbox="1008 1415 1448 1568">1. The organization must manage a quality system 2. The organization must constantly plan its activities.</p> |

7.1. Resources

The organization shall identify and provide the necessary resources to establish, implement, maintain and continually improve its quality management system.

1. The organization must manage resources for the quality management system.
2. The organization must maintain effective personnel

7.2. Competence

Applicable measures include, for example, training, orientation or replacement of currently employed personnel or hiring a competent person.

1. The organization must maintain personnel control.
2. The organization must maintain control of its competence.

7.3. Awareness

The organization must ensure that those who perform under its control knows its quality policy.

1. The organization must ensure that its personnel have a quality policy.
2. The organization must ensure that its personnel have improved performance.

7.4. Communication

The organization must define the

1. The organization must be communicative with its staff about the information that will be imparted.

internal and external communications related to its quality management system.

| | | |
|---|--|---|
| <p>7.5. Documented information</p> | <p>The amount of information documented about the quality management system may vary from one organization to another.</p> | <p>1. The organization must maintain documented information 2. The organization must maintain up-to-date information.</p> |
|---|--|---|

The table provides an overview of clauses 6 and 7 of ISO 9001:2015, which address key aspects related to risk management, planning, human resources and communication in the context of a quality management system. Each of these clauses and suggested evidence for their implementation will be discussed in detail below. Clause 6.1 focuses on actions to address risks and opportunities. It emphasizes the importance of taking actions commensurate with the potential impact of risks and opportunities on the suitability of products and services. To evidence compliance with this clause, the organization should evaluate the

effectiveness of actions taken and ensure effective quality management.

Regarding clause 6.2 on quality objectives and their planning, the need to establish specific and measurable objectives for relevant functions, levels and processes is emphasized. Suggested evidence includes maintaining documented information on quality objectives and ensuring their maintenance. Clause 6.3 addresses the planning of changes to the quality management system. Changes are required to be implemented in a planned manner, which implies ongoing management of the quality system and effective planning of activities.

On the other hand, clause 7 focuses on human resources and competence. Clause 7.1 establishes the need to identify and provide the necessary resources for the quality management system, as well as to maintain an effective staff. The organization shall adequately manage resources and ensure the competence of personnel through measures such as training or recruitment of competent personnel, as suggested in clause 7.2.

Clause 7.3 highlights the importance of staff awareness of the organization's quality policy. Suggested evidence includes ensuring that staff are aware of the quality policy and noting improvements in their performance. Finally, clauses 7.4 and 7.5 refer to communication and documented information,

respectively. The organization must define and maintain internal and external communications related to the quality management system, as well as keep documented information up to date and accessible for consultation. clauses 6 and 7 of ISO 9001:2015 establish fundamental requirements for quality and human resources management in an organization. Compliance with these clauses ensures effective management of risks and opportunities, as well as the competence and awareness of personnel in relation to quality and the organization's objectives.

The implementation of quality management systems (QMS) based on this standard promotes an organizational culture focused on efficiency and customer satisfaction, crucial factors in today's competitive environment. Fernández Sarmiento et al. (2024) highlight the integration of systems through the "Integrated Use of Management Standards" methodology, which allows organizations to harmonize various norms and standards, thus enhancing the effectiveness of QMSs. This approach not only facilitates regulatory compliance, but also improves consistency and operational efficiency by eliminating redundancies and leveraging synergies between different management systems. In the educational context, Arjona-Granados et al. (2022) analyze how quality management systems influence educational quality in public higher education institutions in Mexico. Their study reveals that the implementation of ISO

9001 in these environments not only improves administrative and academic processes, but also fosters a culture of continuous improvement that positively impacts the educational experience and student learning outcomes.

On the other hand, Alvarado Peña et al. (2022) validate an instrument on quality management in university research centers in Venezuela, highlighting the importance of adapting ISO 9001 principles to specific contexts to maximize their effectiveness. Validation of these instruments is crucial to ensure that QMSs are applicable and beneficial in different types of organizations and sectors, allowing accurate assessment and real continuous improvement. Martínez Fernández and Barrera Algarín (2021) address the strengths and weaknesses of QMSs implemented in senior centers in Spain, highlighting that, although ISO 9001 can strengthen structure and processes, its success depends largely on the commitment of senior management and staff. This study underlines the need for participatory implementation and constant evaluation to overcome weaknesses and maximize the benefits of QMSs. In the same vein, Cáceres-Gelvez et al. (2020) focus on the construction sector, presenting a methodological approach to QMS design. Their research shows that, through the implementation of specific tools, construction companies can significantly improve the quality of their projects, reducing errors and costs, and increasing customer satisfaction.

Finally, Arias-Rodriguez et al. (2020) analyze compliance with the responsible management approach from the perspective of QMS and environmental management systems. Their study evidences that the integration of ISO 9001 with other management systems, such as environmental, allows organizations not only to improve the quality of their products and services, but also to adopt sustainable practices that contribute to corporate social responsibility. ISO 9001 and the quality management systems derived from it play a crucial role in the continuous improvement of modern organizations. Effective implementation of these systems enables organizations not only to meet regulatory requirements, but also to optimize their processes, improve customer satisfaction and adopt sustainable practices. These benefits are critical in an increasingly competitive and demanding business environment, where quality and efficiency are critical to success and long-term sustainability.

Conclusions

The implementation of ISO 9001 significantly improves operational efficiency in various industries by standardizing processes and ensuring compliance with regulations. This standard facilitates the integration of multiple management systems, as evidenced in the agricultural industry (Aumüller and Coetzer, 2020) and in educational centers (Arribas Díaz and Martínez-Mediano, 2017).

Organizations that adopt ISO 9001 can better manage customer complaints and expectations, resulting in higher customer

satisfaction and loyalty. Studies on complaint management in traditional and digital banks (Pio et al., 2024) confirm that quality management systems improve responsiveness and customer service.

The application of ISO 9001 along with lean and continuous improvement methodologies enables process optimization and operational cost reduction, as observed in the coal supply chain sector (Samaranayake et al., 2024). This approach ensures that organizations operate more efficiently and competitively.

Small and medium-sized enterprises (SMEs) in emerging economies experience significant improvements in their operational and financial performance by adopting ISO 9001. Alshahrani and Husain (2024) show that this standard provides a necessary structure for process optimization and market adaptation, which is crucial for their growth and sustainability.

The integration of corporate social responsibility (CSR) practices with ISO 9001-based quality management systems can positively influence consumer behavior, promoting impulse purchases and brand loyalty (Ullah et al., 2024). This combination not only improves the company's image, but also aligns quality with social and environmental values.

In summary, ISO 9001 is a vital tool for continuous improvement in modern organizations, improving operational efficiency, customer satisfaction, process optimization, SME performance and CSR integration. These benefits enable organizations to remain

competitive and sustainable in a globalized and demanding environment.

The integration of technologies such as artificial intelligence, machine learning and blockchain in quality audits, as mentioned in the text, not only improves operational efficiency, but also enables real-time detection of anomalies and risks. This demonstrates the importance of adopting innovative tools to strengthen quality management systems and ensure compliance and optimal process performance.

Clause 6 of ISO 9001 highlights the importance of proactive anticipation and management of risks and opportunities. By focusing on strategic planning and the implementation of concrete operational actions, this clause promotes continuous improvement in organizations by proactively identifying and addressing challenges, which strengthens the company's capacity to adapt and resilience to changes in the environment.

References

- Alshahrani, M.A. and Husain, K.S. (2024), "The effectiveness of the implementation of ISO 9001 on SMEs performance: the case of an emerging economy", *International Journal of Quality & Reliability Management*, Vol. 41 No. 1, pp. 84-106. <https://doi.org/10.1108/IJQRM-08-2022-0233>
- Alvarado Peña, L., Rosas Amadeo, A., Rafael Sánchez, A., & Gonzáles Llontop, R. (2022). Validation of an instrument on quality management in University Research Centers in Venezuela. *Revista De Ciencias Sociales*, 28(1), 386-407. <https://doi.org/10.31876/rcs.v28i1.37697>

- Arias-Rodríguez, D., Rosado-Gómez, A., & Rodríguez-Castilla, M. (2020). Analysis of compliance with the responsible management approach from the perspective of quality and environmental management systems. *AiBi Revista De Investigación, Administración E Ingeniería*, 8(S1), 24-31. <https://doi.org/10.15649/2346030X.717>.
- Arjona-Granados, M. del P., López Lira-Arjona, A. and Maldonado-Mesta E. A. (2022). Quality management systems and educational quality in public institutions of Higher Education in Mexico. *Retos. Revista de Ciencias de la Administración y Economía*, 12(24), pp. 268-283. <https://doi.org/10.17163/ret.n24.2022.05>
- Arribas Díaz J. A. and Martínez-Mediano C. (2017). Analysis and assessment of the implementation of ISO 9001 quality management systems and their incidence in educational centers. *Revista Complutense de Educación*, 28(4), 1137-1154. <https://doi.org/10.5209/RCED.51616>.
- Aumüller R.K.;COETZER E.. Animal welfare in GLOBALG.A.P.'s integrated farm assurance standard for livestock: an industry perspective and example of a private and globally acting quality assurance system. *Scientific & Technical Review*. 2020 04 1; 39 (1): pp. 223-233. doi: <https://doi.org/10.20506/rst.39.1.3075>.
- Balanzategui García, Rosalina Ivonne Vega Flor, Jessy Gabriela López Naranjo, A. L. (2022). Supply Chain of Goods and Services in Industrial Companies Cadeia de Suprimentos de Bens e Serviços em Empresas Industriais. 7(1), 978-997. <https://doi.org/10.23857/pc.v7i1.3523>.

- Balbi, D. D. (December 20, 2022). Auditing in the blockchain: challenges and opportunities for auditors. Blockchain Arbitration & Commerce Society. Retrieved from <https://bacsociety.com/auditoria-en-la-blockchain-desafios-y-oportunidades-para-los-audidores/>
- Cáceres-Gelvez, S., Acevedo-Páez, J. C., Bohorquez-Chacón, L. F., & Rodríguez-Galezo, L. (2020). Implementation of tools for the design of quality management systems: Methodological approach in a case applied to the construction sector. *AiBi Journal Of Research, Management And Engineering*, 8(S1), 43-53. <https://doi.org/10.15649/2346030X.1018>
- Campos Portugal, Pompilio Alexis Cerrud Álvarez, Franklin González Tejedor, Mavis Beli Oxdalia Rodríguez, B. (2023). Supply chain management and its importance in companies , as part of the strategy in new business models Supply chain management and its importance in companies , as part of the strategy in new bufile:///C:/Users/DELL/. 7, 7203-7219. file:///C:/Users/DELL/Downloads/6709-Article text-28285-1-10-20230706 (1).pdf.
- Charón Durive, L. (2007). IMPORTANCE OF ORGANIZATIONAL CULTURE FOR THE DEVELOPMENT OF THE QUALITY MANAGEMENT SYSTEM. 87-95.
- Dell'Atti, L., Papa, R., Incicchitti, L., Zanni, M. K., Zampa, A., & Caporossi, M. (2024). Business continuity plan in the management and operations of hospitals: First experience to certify the PDTA processes with the requirements defined by ISO 22301:2019 in emergency medical services. *Journal of Emergency Management*, 22(1), 45-52. <https://doi.org/10.5055/jem.0791>.

- Doria Parra, A., Lopez Benavides, L., Bonilla Ferrer, M., & Parra Cera, G. (2019). Methodology for the implementation of risk management in a quality management system. *SIGNOS - Investigación En Sistemas de Gestión*, 12(1), 123-135. <https://doi.org/10.15332/24631140.5424>.
- Fernández Sarmiento, J. S., Cipagauta Esquivel, E. C., Wilches Torres, A., & Fonseca Zapata, A. I. (2024). Systems Integration through "Integrated Use of Management Standards" Methodology. *Revista De Ciencias Sociales*, 30(1), 154-165. <https://doi.org/10.31876/rcs.v30i1.41644>
- Fernández Sarmiento, J. S., Cipagauta Esquivel, E. C., Wilches Torres, A., & Fonseca Zapata, A. I. (2024). Systems Integration through "Integrated Use of Management Standards" Methodology. *Revista De Ciencias Sociales*, 30(1), 154-165. <https://doi.org/10.31876/rcs.v30i1.41644>
- Fontalvo, T. J., & Hoz, E. J. D. La. (2018). Design of a Quality Management System ISO 9001:2015 in a Colombian University. *Formacion Universitaria*, 11(1), 35-44. <https://doi.org/10.4067/S0718-50062018000100035>.
- Fontalvo, T., & De la Hoz, E. (2018). Design and Implementation of an ISO 9001:2015 Quality Management System in a Colombian University. *Formación Universitaria*, 35-44.
- González González, A., González González, A., Michelena, E., & Michelena, E. (2000). THE CULTURE OF THE ORGANIZATION IN TOTAL QUALITY MANAGEMENT. *Ensaio e Ciência: Ciências Biológicas*. *Ensaio e Ciência: Ciências Biológicas*, 4(3), 99-114. <https://www.redalyc.org/pdf/260/26040307.pdf>

- Guerrero Margarita & Medina Alberto (2020). Risk management procedure as decision support. *Redalyc*, XLI(1), e4101-e4101.
- Jaque Puca, D. G. (2023). Strategies of Organizational Culture in the Quality Management System of Industrial Companies. 5, 853–873. file:///C:/Users/DELL/Downloads/2060-Artículo-15951-1-10-20230902.pdf
- Legalnet (December 1, 2023). The use of technology in audits. Retrieved from <https://auditoria-audidores.com/articulos/articulo-auditoria-el-uso-de-la-tecnolog-a-en-las-auditor-as/>
- López, M. (2013). Organizational culture as a tool for internal management and adaptation to the environment. A multiple case study in Murcian companies. Thesis, 1118. López Felipe María Teresa
- Manrique Nugent, M. A., Teves Quispe, J., Taco Llave, A. M., & Flores Morales, J. A. (2019). Supply chain management: a look from a theoretical perspective. *Revista Venezuela de Gerencia*, 24(88), 1136-1146. Retrieved from <https://www.redalyc.org/journal/290/29062051009/html/>
- Martínez Fernández, Rocío, Barrera Algarín, Evaristo. Strengths and weaknesses of quality management systems implemented in senior centers in Spain *Cultura de los Cuidados*. 2021, 25(61): 268-286. <https://doi.org/10.14198/cuid.2021.61.17>. URI: <http://hdl.handle.net/10045/120117>. DOI: 10.14198/cuid.2021.61.17. ISSN: 1138-1728.
- Miles Armijos, I. M. (2021). IMPACT AND ANALYSIS OF THE IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN THE AUDIT OF INFORMATION SERVICES COMPANIES IN

ECUADOR (RISK RATING COMPANIES) IN THE NEAR FUTURE. 1-43.

Ojeda, V. A., Victor, N. B. J., & Sisalema Naranjo, Allan Ramiro Ramos alfonso, Y. (2020). Selection of suppliers, success factor in the management of purchases of the restoration product restoration selection of suppliers, success factor in the management of purchases of the restoration product. 1(2), 59-70.

Peña Florez, Luis Alfonso Rodríguez Rojas, Y. L. (2018). Evaluation and Selection of Providers Procedure Based on the Hierarchical Analysis Process and a Mixed Integer / Linear Programming Evaluation and Selection of Providers Procedure Based on Mixed Integer Linear. 23, 230–251. <https://doi.org/https://doi.org/10.14483/23448393.13316>

Perez (2017). Faculty of Engineering Faculty of Engineering. Ucv, 358.

Pio, P.G.C., Sigahi, T., Rampasso, I.S., Satolo, E.G., Serafim, M.P., Quelhas, O.L.G., Leal Filho, W. and Anholon, R. (2024), "Complaint management: comparison between traditional and digital banks and the benefits of using management systems for improvement", *International Journal of Productivity and Performance Management*, Vol. 73 No. 4, pp. 1050-1070. <https://doi.org/10.1108/IJPPM-08-2022-0430>

Redondo, R., Llopart, X., & Duran, D. (1996). Performance Auditing. Limitations of Internal Control, *Transcription of the International Auditing Guide*, 1-181.

Reyes Chacón, D. A., Cadena López, A., & Rivera González, G. (2021). The Quality Management System and its relationship

- with innovation. *Inter Disciplina*, 10(26), 217.
<https://doi.org/10.22201/ceiich.24485705e.2022.26.80975>.
- Rincón Rodríguez, O. O., & Aldana Bautista, L. (2021). Organizational culture and its relationship with management systems: A literature review. *SIGNOS - Investigación En Sistemas de Gestión*, 13(2), 1-26.
<https://doi.org/10.15332/24631140.6675>
- Robledillo Colmenares, A., & Velázquez López, D. (2013). Introduction to Total Quality Management Systems: EFQM Excellence model and Self-Assessment. *Medicina y Seguridad Del Trabajo*, 59(232), 302-309.
<https://doi.org/10.4321/s0465-546x2013000300002>.
- Samaranayake, P., McLean, M.W. and Weerabahu, S.K. (2024), "Application of lean and quality improvement methods for improving operational performance in coal supply chains: a case study", *International Journal of Quality & Reliability Management*, Vol. 41 No. 6, pp. 1594-1622.
<https://doi.org/10.1108/IJQRM-04-2023-0138>
- Skalli, D., Cherrafi, A., Charkaoui, A., Chiarini, A., Elbaz, J., & Hamani, N. (2024). Selecting a winning Lean Six Sigma 4.0 project: Best Worst Method based decision making approach. *Total Quality Management & Business Excellence*, 35(5-6), 503-528.
<https://doi.org.vpn.ucacue.edu.ec/10.1080/14783363.2024.2315427>.
- Sotelo Asef, J. G. (2018). La planeación de la auditoría en un sistema de gestión de calidad tomando como base la norma ISO 19011:2011 / ISO 19001:2011 standard planning of the audit in a system of quality management on the basis of standard ISO 19011:2011. *RIDE Revista Iberoamericana Para*

- La Investigación y El Desarrollo Educativo, 8(16), 97-129.
<https://doi.org/10.23913/ride.v8i16.329>
- Torrijos, M. G. (2018). The selection of suppliers, a key element in procurement management.
<https://core.ac.uk/download/pdf/160244468.pdf>
- Ullah, S., Jianjun, Z., Saif, S., Hayat, K. and Ali, S. (2024), "The influence of corporate social responsibility on impulse buying", Management Decision, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/MD-07-2023-1238>
- Valderrama, Y., Rivera, J., & Valecillos, Z. (2018). Quality Control Procedures Applied in the Audit of Financial Statements. Sapienza Organizational, 210-228.
- Viera Valencia, L. F., & Garcia Giraldo, D. (2019). Angewandte Chemie International Edition, 6(11), 951-952., 2.
- Vilmaris Torres, A., Cannavacciuolo, M. R. G., Hernández, H. M., & Zaragoza, L. L. (2021). Evaluation in supplier ' s behavior in University of Holguín Evaluation in supplier ' s behavior in University of Holguín. 6(1), 54-63.

Impact of Artificial Intelligence on the Accounting Profession

Ramón-Poma, Glenda Maricela

Catholic University of Cuenca, gramon@ucacue.edu.ec

ORCID: 0000- 0002-6833-9129

Macias-Cabrera, Alba Guadalupe

Catholic University of Cuenca, alba.macias.98@est.ucacue.edu.ec

ORCID: 0009- 0002-6531-1857

Astudillo-Arias Pedro Yamil

Catholic University of Cuenca, pastudillo@ucacue.edu.ec

ORCID: 0000-0003-4639-0318

Andrade-Pesantez Daniel Jacobo

Catholic University of Cuenca, dandradep@ucacue.edu.ec

ORCID: 0000-0003-0586-4038

Introduction

The chartered accountant plays a crucial role in organizations by ensuring proper financial management and contributing significantly to business success and growth. Currently, knowledge about artificial intelligence (AI) and its efficient use in the accounting and auditing environment of entities is still limited. Szedlak et al. (2021), states that the main barrier preventing most entities from implementing artificial intelligence is precisely the lack of knowledge, missing out on the benefits of improvement in the financial sphere.

Askary et al. (2018), states that after the COVID-19 pandemic, a rapid advance in the technological revolution has been observed, transforming knowledge and generating disruptive

changes in the accounting profession, the vast majority of entities have access to *software* that optimize the exchange of information in real time, therefore it is essential that the accounting professional adapts to these new technologies and adopts a change approach.

Li and Zheng (2018), highlight that most jobs, such as production and sales, are likely to be performed by robots in the next 20 years. One of the groups that will be affected by AI are accounting professionals.

Stancheva (2018), mentions that advances in AI will allow automated systems to replace accountants in some routine tasks due to their efficiency, however, this will not imply a substantial increase in unemployment if accountants acquire new skills and competencies related to their changing role in the organization. The key factor will be to accept the technological challenges, adapt and collaborate effectively with AI, as this technology will never completely replace human intelligence, especially in more creative work tasks, therefore, education plays a crucial role in preparing accountants for this new accounting environment.

In this sense, the objective of the research lies in to analyze how artificial intelligence influences the role of the chartered accountant at the Catholic University of Cuenca , which is linked to the research question: Does artificial intelligence impact the role of the chartered accountant?

To this end, subchapters have been structured to cover a wide range of essential topics. First, the key fundamentals of artificial intelligence are described, providing a solid understanding of its basic principles, algorithms and underlying technologies. This initial section lays the foundation necessary to appreciate the more advanced applications of AI.

Next, the implication of artificial intelligence in improving accounting and auditing processes is explored. This subchapter details how AI can optimize various accounting tasks, from automating data entry to detecting financial fraud through advanced data analytics. It also discusses the benefits of AI in auditing, such as the ability to perform continuous audits in real time and to analyze large volumes of data more accurately and quickly than traditional methods. Finally, the practical implication of artificial intelligence in these fields is addressed. This subchapter provides concrete examples and case studies that illustrate how companies and institutions are implementing AI solutions to improve the efficiency and effectiveness of their accounting and auditing operations. It also discusses the challenges and ethical considerations associated with AI adoption, as well as best practices for integrating these technologies effectively and responsibly.

Key fundamentals of artificial intelligence

The key foundations of artificial intelligence (AI) are based on a combination of disciplines and technologies that enable machines to simulate human learning and decision-making capabilities. At its core, AI is underpinned by machine learning algorithms, which enable systems to improve their

performance through experience and data analysis. These algorithms can be classified into several categories, including supervised, unsupervised and reinforcement learning, each with specific applications and techniques. In addition, AI incorporates concepts of natural language processing (NLP), which enable machines to understand and generate human language, and computer vision, which endows systems with the ability to interpret and act on visual information (Marr, 2018).

The combination of these elements has led to significant developments in areas such as robotics, expert systems, and deep neural networks, which mimic the structure and functioning of the human brain to solve complex problems more efficiently. These fundamentals provide the theoretical and practical foundation on which advanced applications of AI are built in various fields, including accounting and auditing (Russell & Norvig, 2021).

The study of artificial intelligence emerges during the twentieth century, where some authors begin to develop computer systems and programs capable of performing tasks that demand human skills such as learning, reasoning and decision making, emerging as a response to the search to replicate human intelligence in machines and computational systems (Moreno-Carriles, 2018); (Gorriz, et al, 2020).

Turing (1950), developed his Turing test, with the purpose of evaluating the intelligence of a machine and exploring the possibility that machines could think and reason like human beings. On the other hand, McCarthy et al. (1955), whose

contributions proposed themes and ideas that machines could come to have the ability to simulate human intelligence, giving rise to the term artificial intelligence.

Askary et al. (2018) argues, that AI is a combination of software and hardware to solve complex business problems in a similar way to human intelligence, i.e., it uses expert systems and applies AI instead of human intelligence, generating a great impact on top management decision making, as it provides more accurate information and analyzes a large amount of data.

Almonacid and Coronel (2020) mention that AI refers to the computerized technological capacity or ability to solve complex and explicit problems through the use of algorithms, which identify and delimit the data or characteristics of the problem and the potential results that can be projected by the algorithm.

Chukwudi et al. (2018) in their analysis exposes, that expert systems are AI programs that were developed in the 1980s and have the ability to acquire a level of knowledge and experience similar to a human expert of a specific area for decision making and above all are easy to implement.

Muñoz (2014), highlights that AI is capable of imitating human behavior by adapting to change and learning, allowing the creation of intelligent devices that automate processes efficiently, helping to make accurate decisions in complicated situations and manage large volumes of information, optimizing resources.

Purdy and Daugherty (2016), assert that the ability to learn quickly and the broad scale of work are key features of AI, without yet reaching the level of learning depth of humans can perform tasks that would be impossible for individuals, thinking of AI as a combination of capital and labor, highlights its ability to complement and enhance skills.

Aguirre et al. (2021), for their part, mention that artificial intelligence can be very useful in the recognition of structures in images, where, if correctly designed, it can surpass the recognition performed by humans.

Artificial intelligence as an improvement in accounting and auditing processes

The incorporation of AI technical tools can be beneficial to the field of finance, as this technology allows automating tasks and improving analysis capabilities compared to old methods that become obsolete, it is important to keep in mind that AI has its limitations and may not be suitable to carry out certain tasks (Mohammad et al., 2020).

For Chukwudi et al. (2018), the implementation of AI in the field of accounting has an extensive past, dating back more than 25 years, but it is mainly executed in the fields of financial reporting and auditing, which today, has generated concern among accountants about whether their skills and knowledge will remain relevant in the near future, as AI may replace some tasks that were previously performed by accountants. For their part, Mohammad et al. (2020) point out that despite continued

advances in computerized accounting systems, many of them are still used primarily as simple paper-based transaction records or calculators. This limits their ability to facilitate decision making. An alternative to overcome this limitation is the incorporation of artificial intelligence (AI) in accounting information systems, with the objective of developing a system capable of working and reacting like a human, performing tasks such as problem solving, planning, among others.

Li and Zheng (2018), reveal that artificial intelligence has a major impact on the accounting profession, as the automation of accounting processes and the sharing of accounting services will lead to a transformation in the accountant's role. With accounting information systems replacing some traditional functions, accountants will need to focus more on data analysis and accounting management at a more professional level. Otherwise, there could be a reduction in accounting staff and an urgent need to acquire new skills to adapt to this change.

Chukwudi et al. (2018) highlight that the evolution of accounting software and the application of artificial intelligence have profoundly transformed accounting systems. Research has confirmed that this technology has had a positive impact on the performance of accounting operations, including increased speed, improved reporting both internally and externally, reduced paper usage, greater efficiency, and an improved data-driven system. Also, Askary et al. (2018) state that AI in accounting offers several benefits, such as automating tasks, generating reliable financial information,

simplifying complex accounting and auditing cases, and providing clear and accurate information for decision making.

For Molina and Fernandez (2018), AI in accounting ensures accurate and relevant information, while management information systems enable effective control, however, each company must evaluate and adapt the information systems according to its own internal and external needs

The role of chartered accountant includes different facets where he/she works as a freelance in his/her profession or as a private employee of an organization, working under a relationship of dependence, both perspectives are essential for the proper performance of a business organization (Grisanti, 2014).

Artificial intelligence speeds up the analysis of large volumes of financial information and identifies patterns, trends and reduces human errors in recording and accounting calculations, which helps accountants to make informed decisions and detect possible fraud. For Morán (2020), the implementation of digital innovation in organizations has a positive impact on the results of companies, since it allows greater efficiency in the business model.

Ukpong et al. (2019) assert that artificial intelligence has also had a positive impact on auditing by introducing a hybrid set of technologies that transform processes and procedures in the field. The advent of computers already brought about a radical change, and with AI, auditing is expected to become more proactive and beneficial in the workplace.

Mohammad et al. (2020) mentions that decisions based and supported on data sets and variables can be faster and more efficient, but there are situations where human intervention and judgment are necessary, however, the combination of technology and human skills can lead to better results for the organization.

Accountants with technological skills and communication abilities are highly valued for their competitiveness and their ability to contribute to the development and execution of business strategies in an environment of constant technological evolution. Fernandez (2021), asserts that accountants must update and adopt a more globalized perspective to meet the needs of today's business world. It is essential that the profession adapts to the new world order, providing new professionals with training that broadens their horizons and moves them away from an exclusive focus on figures without context. Otherwise, obvious problems will arise in the short term. On the other hand, Mohammad et al. (2020) corroborate that, as technological globalization advances, automation in accounting could gradually replace some tasks performed by humans. Although computers are faster and more accurate in certain aspects, it is important to note that the role of the professional accountant will continue to be relevant for analyzing information and making strategic decisions.

AI-supported systematization in accounting provides numerous benefits, such as time savings, cost reduction, and

increased focus on strategic activities. In addition, AI is essential for coping with changes in the accounting environment and meeting market demands, promoting economic growth (Peng et al., 2023). The implementation of AI in companies improves both accounting activities and decision making, offering a competitive advantage. Also, the automation of data entry in accounting reduces the need for manual data entry and minimizes errors thanks to optical character recognition. Based on the above, the research hypothesis is to determine how the implementation of artificial intelligence affects the performance and responsibilities of the chartered accountant?. The results reveal the product of careful data collection and evaluation, offering valuable insights that provide clarity on essential aspects of the subject under investigation.

Table 1, Control variables

| | Genre | | Employee | | | Age | | |
|---------------|-------|--------|----------|----|---------|-----------------|----|--------|
| Female | 42 | 72,41% | Private | 40 | 68,97% | 21-30 years | 53 | 91,38% |
| Male | 16 | 27,59% | Public | 18 | 31,03% | 31-40 years old | 5 | 8,62% |
| | 58 | 100,0% | | 58 | 100,00% | | 58 | 100,0% |

Prepared by: The authors

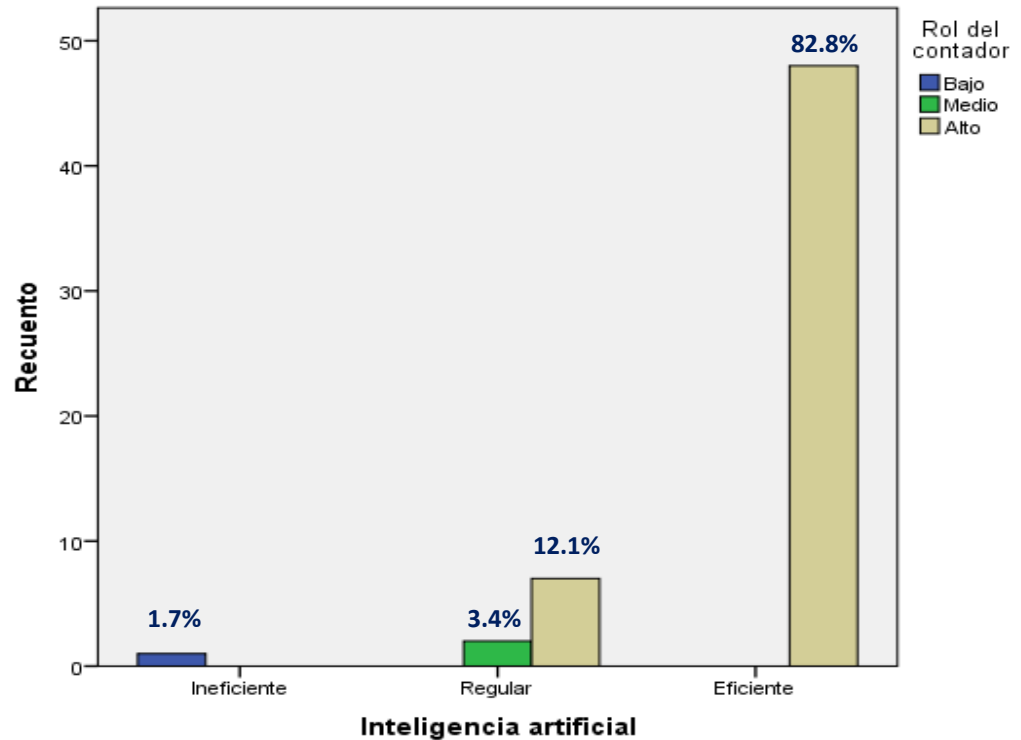
According to the data obtained, 72.41% are female and 27.59% are male; 68.97% are private employees, while 31.03% work in the public sector and with respect to age, 91.38% are between 21-30 years old and 8.62% are between 31-40 years old.

Table 2. *Artificial intelligence vs. the role of the accountant*

| | | Accountant's role | | | Total | |
|--------------------------------|-------------|-------------------|--------|-------|--------|-------|
| | | Under | Medium | High | | |
| Artificial intelligence | Inefficient | Count | 1 | 0 | 0 | 1 |
| | | of total | 1,7% | 0,0% | 0,0% | 1,7% |
| | Regular | Count | 0 | 2 | 7 | 9 |
| | | of total | 0,0% | 3,4% | 12,1% | 15,5% |
| | Efficient | Count | 0 | 0 | 48 | 48 |
| | | of total | 0,0% | 0,0% | 82,8% | 82,8% |
| Total | Count | 1 | 2 | 55 | 58 | |
| | of total | 1,7% | 3,4% | 94,8% | 100,0% | |

Prepared by: The authors

Figure 1. Artificial intelligence vs. the role of the accountant



In Table 2 and Figure 1, a sample of 58 professionals in the accounting field was examined. It was noted that 1.7% (1 person) of the participants observed that artificial intelligence was inefficient, coinciding with the same percentage assigned to the accountant's role, classified as low. Likewise, 15.5% (9 people) evaluated AI as regular, while 3.4% (2 people) assigned a medium level to the accountant's role, and 12.1% (7 people) indicated that they perceived it as high. On the other hand, 82.8% (48 people) considered artificial intelligence to be effective, compared to 82.8% (48 people) who considered the accountant's role to be high.

Based on these results and with the objective of answering the research question posed, the following general hypothesis is formulated: Intelligence has an impact on the role of the CPA at the Catholic University of Cuenca.

To test this general hypothesis, the following operational hypotheses are established:

Ho: Artificial intelligence does not affect the role of the auditor accountant of the Universidad Católica de Cuenca.

Ha: Artificial intelligence has an impact on the role of the accountant auditor of the Universidad Católica de Cuenca.

Table 3. *Chi-square tests*

| | Value | Gl | Asymptotic sign (bilateral) |
|------------------------------|---------------------|----|-----------------------------|
| Pearson's Chi-square | 69,248 ^a | 4 | ,000 |
| Likelihood ratio | 17,897 | 4 | ,001 |
| Linear by linear association | 25,066 | 1 | ,000 |
| N of valid cases | 58 | | |

Prepared by: The authors

Table 3 shows the result of the Chi-square test analysis, revealing that the value obtained is 69.248, with a bilateral significance level of 0.000. Therefore, the null hypothesis is rejected in favor of the alternative hypothesis, indicating the

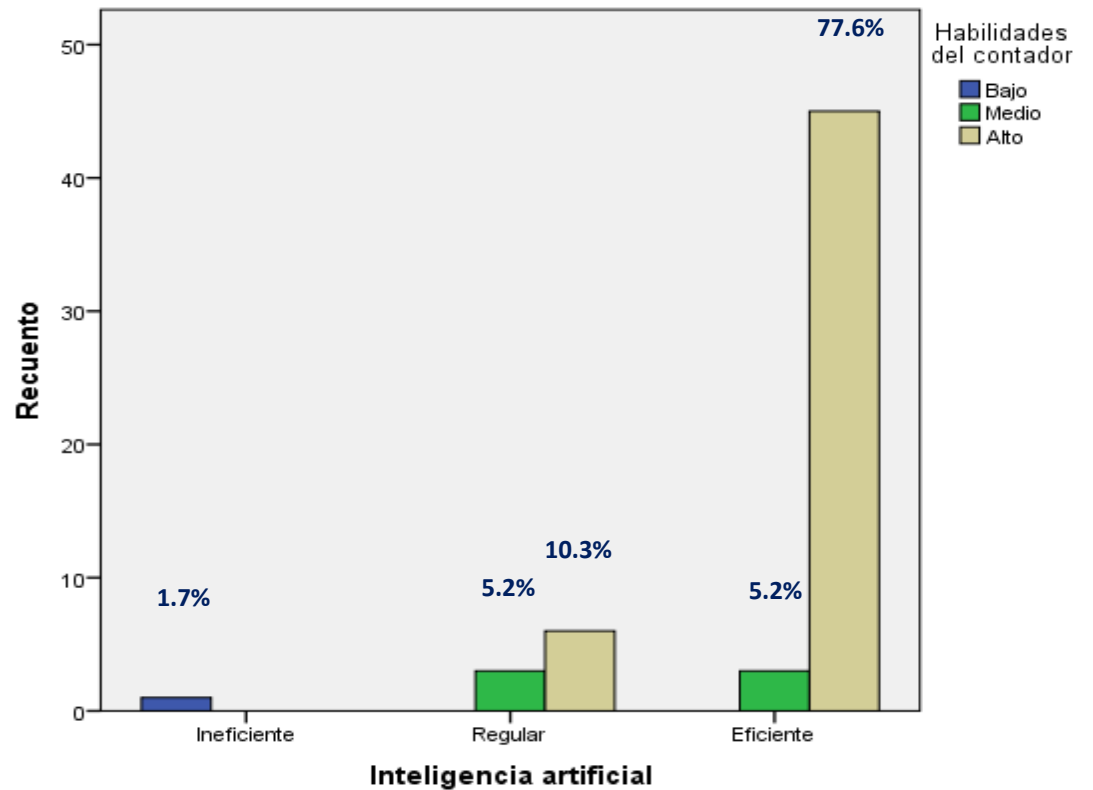
presence of a relationship between artificial intelligence and the role of the CPA at the Catholic University of Cuenca.

Table 4. *Artificial intelligence and the skills of the chartered accountant*

| | | Accountant skills | | | Total | |
|-------------------------|-------------|-------------------|--------|-------|--------|-------|
| | | Under | Medium | High | | |
| Artificial intelligence | Inefficient | Count | 1 | 0 | 0 | 1 |
| | | of total | 1,7% | 0,0% | 0,0% | 1,7% |
| | Regular | Count | 0 | 3 | 6 | 9 |
| | | of total | 0,0% | 5,2% | 10,3% | 15,5% |
| | Efficient | Count | 0 | 3 | 45 | 48 |
| | | of total | 0,0% | 5,2% | 77,6% | 82,8% |
| Total | Count | 1 | 6 | 51 | 58 | |
| | of total | 1,7% | 10,3% | 87,9% | 100,0% | |

Prepared by: The authors

Figure 2. Artificial intelligence and the skills of the chartered accountant



Prepared by: The authors

The results extracted from Table 4 and Figure 2 reveal that 1.7% (1 person) evaluated artificial intelligence as inefficient in the skills associated with the role of the chartered accountant rated low in the same range 1.7% (1). In contrast, 15.5% (9) perceived artificial intelligence at a regular level, reporting a medium level with 5.2% (3) and high at 10.3% (6) in terms of

the skills of the chartered accountant. Finally, 82.8% (48) categorized artificial intelligence as efficient for the skills of the chartered accountant reported as medium at 5.2% (3) and 77.6% (45) associated it as a high level.

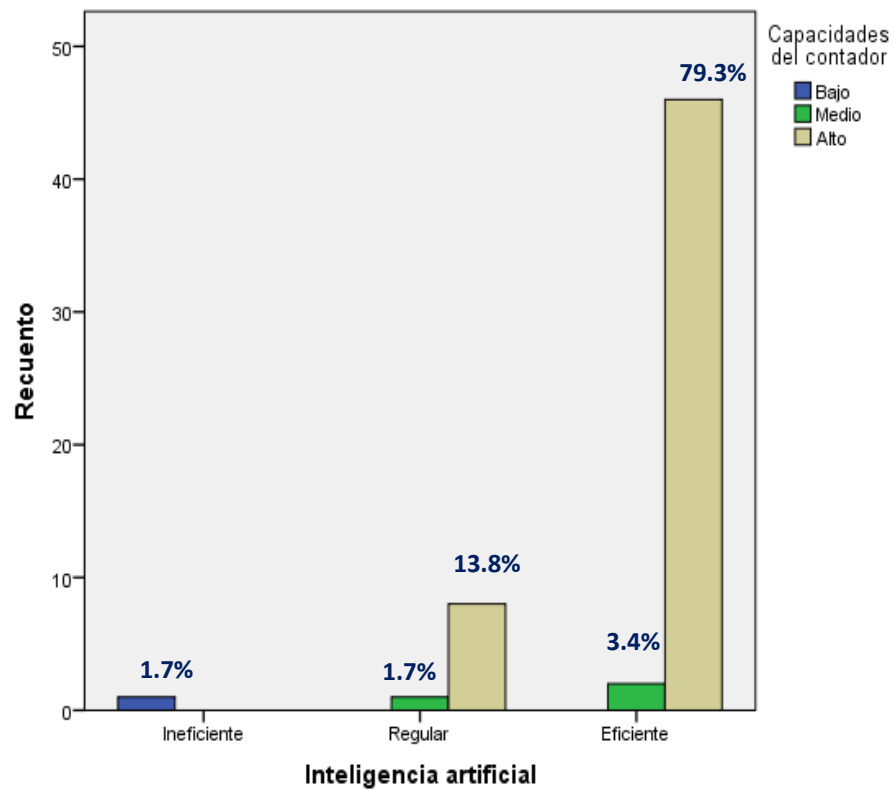
In summary, in the opinion of the respondents, artificial intelligence has the potential (82.8%) to significantly change and improve the effectiveness and efficiency of the chartered accountant (87.9%) by speeding up both the analysis of financial statements and the preparation of audit reports, thus strengthening the control of financial information. Its ability to process large amounts of data quickly is beneficial for keeping abreast of regulatory changes. The presence of artificial intelligence frees the chartered accountant from routine tasks, allowing them to focus on strategic aspects and decision making.

Table 5. *Artificial intelligence and the capabilities of the chartered accountant*

| | | Meter capabilities | | | Total | |
|--------------------------------|-------------|--------------------|--------|-------|--------|-------|
| | | Under | Medium | High | | |
| Artificial intelligence | Inefficient | Count | 1 | 0 | 0 | 1 |
| | | of total | 1,7% | 0,0% | 0,0% | 1,7% |
| | Regular | Count | 0 | 1 | 8 | 9 |
| | | of total | 0,0% | 1,7% | 13,8% | 15,5% |
| | Efficient | Count | 0 | 2 | 46 | 48 |
| | | of total | 0,0% | 3,4% | 79,3% | 82,8% |
| Total | Count | 1 | 3 | 54 | 58 | |
| | of total | 1,7% | 5,2% | 93,1% | 100,0% | |

Prepared by: The authors

Figure 3. Artificial intelligence and the capabilities of the chartered accountant



Prepared by: The authors

The results obtained from Table 5 and Figure 3 indicate that 1.7% (1 person) evaluated artificial intelligence as inefficient, linking it to the skills of the chartered accountant as low in the same percentage. On the other hand, 15.5% (9 people) perceived artificial intelligence at a regular level in relation to

the skills of the chartered accountant rated as medium 1.7% (1) and high in 13.8%. Finally, 82.8% (48 people) considered artificial intelligence to be efficient for the skills of the chartered accountant, which within this group was rated as medium by 3.4%, medium and high by 79.3%.

In summary, artificial intelligence 82.8% plays a crucial role in the competencies of the chartered accountant, 93.1% to strengthen ethical compliance and ensure the integrity of financial information, improve their participation in financial planning through predictive analytics, generating positive impacts on profitability and organizational growth, transparency and confidence in financial information are improved thanks to the contribution of AI in auditing, increasing the accuracy and reliability of reports.

With the intention of evaluating artificial intelligence in relation to the various facets of the chartered accountant's role, including skills and capabilities, the following hypotheses are put forward:

Ho: Artificial intelligence does not affect the skills and competencies of the CPA of the Universidad Católica de Cuenca.

Ha: Artificial intelligence has an impact on the skills and competencies of the CPA of the Universidad Católica de Cuenca.

Table 6. Chi-square tests for specific hypotheses

| Dimensions | Pearson's square | Chi- | Asymptotic sign (bilateral) |
|--------------|---------------------|------|-----------------------------|
| Skills | 64,006 ^a | | ,000 |
| Competencies | 58,746 ^a | | ,000 |

Prepared by: The authors

Table 6 shows the Chi-square test analysis for the specific hypotheses. In this analysis, it is observed that the level of statistical significance for the dimensions examined is 0.000. As a result, the null hypothesis is rejected in favor of the alternative hypothesis, indicating that there is a significant relationship between artificial intelligence and the skills and competencies of the CPA of the Catholic University of Cuenca.

Table 7. Linear correlation coefficient (R) y (R²)

| Summary of the model | | | | |
|----------------------|-------------------|----------|----------------|--------------------------------|
| Model | R | R square | R tight square | Standard error of the estimate |
| 1 | ,663 ^a | ,440 | ,430 | ,23931 |

a. Predictor variables: (Constant), Artificial intelligence

Prepared by: Authors.

The results in Table 7 reveal a Pearson's linear correlation coefficient (R) of 0.663 and a coefficient of determination (R²) of 0.440. These values indicate that the proposed model explains 44% of the variability in the dependent variable (Y)

counter role. A higher value of these coefficients suggests a better model fit.

Practical implications

When applying the Chi-square test, a value of 69.248 is obtained with a significance level of 0.000, which leads to the rejection of the null hypothesis in favor of the alternative hypothesis. This confirms that there is a relationship between artificial intelligence and the role of the CPA at the Catholic University of Cuenca. When testing each dimension of the dependent variable (role of the accountant) with the independent variable (artificial intelligence) empirically, it is evident that skills (64.006th) and competencies (58.746th), each with a value of (0.000), show a statistical significance lower than $p\text{-value} < 0.05$. This indicates that there is an influence of artificial intelligence on the skills and competencies of the CPA of the Catholic University of Cuenca.

Chi-square tests support the assertion that artificial intelligence, with a potential of 82.8%, can significantly transform the effectiveness of the chartered accountant (87.9%). This impact is evidenced by the acceleration of financial statement analysis and audit reporting, strengthening the control of financial information. The ability to process large volumes of data quickly proves advantageous in adapting to regulatory changes. In addition, artificial intelligence frees the chartered accountant from routine tasks, allowing him or her to focus on strategic aspects and decision making. According to the linear correlation test, it is concluded that the proposed model covers 44% of the variability in the dependent variable (Y), which in this case is the role of the chartered accountant.

In other words, an increase in the value of this variable suggests an improvement in the adequacy of this model.

In this scenario, findings such as those of García et al. (2021) stand out, posing challenges for public accountants and highlighting the need to integrate information technologies to boost competitiveness and contribute to economic growth. Although artificial intelligence transforms accounting work, it is essential not to ignore previous knowledge and to find a balance between the quantitative and the qualitative. The evolution of the accounting function is moving towards analytical financial reporting, highlighting the relevance of effective communication and informed decision making.

The results reveal the fundamental contribution of artificial intelligence (AI), which represents 82.8% in the competencies of the chartered accountant (93.1%). It focuses on strengthening ethics and preserving financial integrity, as pointed out by Toloza and López (2023), who underline its significant influence on the work of the CPA. AI changes the nature of accounting responsibilities by automating routine processes. Although this automation allows accountants to focus on more strategic analyses, it poses ethical challenges, such as maintaining confidentiality and fairness in the handling of sensitive data. It highlights the importance of possessing technological skills and a thorough understanding of the ethical implications for effective interaction between accountants and AI.

The study by Herrera et al. (2021), focuses on the essential competencies for the CPA of the future, emphasizing the importance of analytical and decision-making skills developed through technologies of the fourth industrial revolution, such as *Big Data*, *Artificial Intelligence* and *Blockchain*. The research indicates that AI enables the accountant of the future to interact with these technologies throughout their work, analyze data, develop holistic thinking and make informed decisions.

Conclusions

The integration of artificial intelligence in the accounting and auditing field represents a fundamental change in the role of the accountant auditor, freeing him from monotonous and routine tasks to focus on strategic and decision-making aspects.

The adoption of artificial intelligence at the Catholic University of Cuenca during the year 2023 has proven to be significant, with results confirming a direct relationship between this technology and the functions of the CPA.

While artificial intelligence offers promising opportunities to improve efficiency and accuracy in financial reporting, it also poses ethical challenges, such as preserving confidentiality and fairness in the handling of sensitive data.

To achieve an effective integration of artificial intelligence in the work of the chartered accountant, it is crucial that accounting professionals acquire technological skills and develop a deep understanding of the ethical implications

associated with its use. This will enable a more effective interaction between accountants and artificial intelligence, ensuring responsible and ethical management of financial information.

The research findings highlight the profound transformation in the role of the chartered accountant driven by artificial intelligence (AI), which offers remarkable opportunities, but requires adaptation in terms of skills, ethics and technological understanding. In this process of evolution of the accounting function, the importance of balancing traditional skills with new technological and analytical competencies to ensure successful and efficient integration is emphasized.

Finally, it is recommended that chartered accountants embark on a process of continuing education in artificial intelligence to keep up to date with the latest technological advances. It is crucial to acquire specific technical skills in the handling of AI tools and platforms, including the ability to apply algorithms and predictive analytics in the audit context. Before incorporating artificial intelligence solutions, it is essential to conduct a detailed evaluation to select those that meet the audit needs and adhere to ethical and security standards.

References

- Aguirre, D., Carballo, D., González, D., and Gigirey, D. (2021). Artificial intelligence applied to medical imaging. *Journal of Imaging*, 24(2), 09-20. <https://sriuy.org.uy/ojs/index.php/Rdi/article/view/94>.
- Almonacid, J. and Coronel, Y. (2020). Applicability of artificial intelligence and blockchain technology in private

- contract law. *Revista De Derecho Privado*, 38, 119-142.
<https://doi.org/10.18601/01234366.N38.05>
- Askary, S., Abu-Ghazaleh, N., & Tahat, Y. (2018). Artificial intelligence and reliability of accounting information. Springer International Publishing, 11195, 315-324.
https://doi.org/10.1007/978-3-030-02131-3_28.
- Chukwudi, O., Echefu, S., Boniface, U., & Victoria, C. (2018). Effect of artificial intelligence on the performance of accounting operations among accounting firms in south east nigeria. *Asian Journal of Economics, Business and Accounting*, 7(2), 1-11.
<https://doi.org/10.9734/AJEBA/2018/41641>
- Fernández, H. (2021). Will the accounting profession disappear because of technology? Contemporary myths and realities. *Actualidad Contable Caras*, 24 (42), 113-124. DOI: <https://doi.org/10.53766/ACCON/2021.42.04>
- García, F., Salazar, E., and Orozco, A. (2021). *The use of artificial intelligence by the public accountant in Antioquian organizations*. [Degree thesis, Universidad de Antioquia]. UDEA Repository.
<https://bibliotecadigital.udea.edu.co/handle/10495/21509>.
- Grisanti, A. (2014). Liability of the public accountant in the independent practice of his profession. *Actualidad Contable Faces*, 17(29), 18-48.
<https://www.redalyc.org/articulo.oa?id=25732868003>
- Górriz, J., Ramírez, J., Ortiz A., Martínez-Murcia, F., Suckling, J., Leming, Y.,-Álvarez-Sánchez, J., Bologna, G., Bonomini, P., Casado, F., Charte, D., Charte F., Contreras, R., Cuesta-Infante, A., Duro, R., Fernández-Caballero, A., Fernández-Jover, E., Gómez-Vilda, P.,

- Graña, M., Herrera, F., Iglesias, R., Lekova, A., López-Rubio, J., Martínez-Tomás, R. (2020). Artificial intelligence within the interplay between natural and artificial computation: Advances in data science, trends and applications. *Neurocomputing*, 410, 237-270. <https://doi.org/10.1016/j.neucom.2020.05.078>.
- Herrera, S., Acevedo, B., and Londoño, D. (2021). *The competencies for the work of the public accountant in the Urabá region in the framework of the fourth industrial revolution*. [Degree thesis, Universidad de Antioquia]. UDEA Repository. <https://bibliotecadigital.udea.edu.co/handle/10495/24189>.
- Li, Z. & Zheng, L. (2018). The impact of artificial intelligence with accounting. Atlantis Press, 813-816. <https://doi.org/10.2991/icsshe-18.2018.203>.
- Marr, B. (2018). *Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems*. Wiley.
- McCarthy, J., Minsky, M., Rochester, N., & Shannon, C. (1955). A proposal for the dartmouth summer research project on artificial intelligence. Stanford university, Computer Science Department. USA. <http://jmc.stanford.edu/articles/dartmouth/dartmouth.pdf>
- Mohammad, S., Hamad, A., Borgi. H., Jue, P., Sial, M., & Alhadidi, A. (2020). How artificial intelligence changes the future of accounting industry. *International Journal of Economics and Business Administration*, 8(3), 478-488.
- Molina, F. and Fernández, L. (2018). Artificial intelligence in the accounting field. *Contributions to Economics*

- Journal. 16(3)
<https://dialnet.unirioja.es/servlet/articulo?codigo=9038488>
- Morán, M. (2020). The audit approach in the environment of the digital age and artificial intelligence. *La Junta Journal*, 3(2), 15-41.
<https://doi.org/10.53641/junta.v3i2.54>.
- Moreno-Carriles, R. M. (2018). Big data, but what is it? *Angiology*, 70(5), 191-194.
<https://doi.org/10.1016/j.angio.2018.05.001>
- Muñoz, C. (2014). Artificial intelligence and accounting. Fuzzy logic and knowledge representation. *Lúmina*, (15), 146-172.
- Peng, Y., Ahmad, S., Ahmad, A. Y., Al Shaikh, M., Daoud, M., & Alhamdi, F. (2023). Riding the waves of artificial intelligence in advancing accounting and its implications for sustainable development goals. *Sustainability*, 15(19), 14165. <https://doi.org/10.3390/su151914165>.
- Purdy, M. and Daugherty, P. (2016). Artificial intelligence, the future of growth. *Accenture Institute for High Performance*.
- Russell, S., & Norvig, P. (2021). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.
- Stancheva-Todorova, E. (2018). How artificial intelligence is challenging accounting profession. *Journal of International Scientific Publications" Economy & Business*, 12, 126-141.
- Szedlak, C., Leyendecker, B., Reinemann, H., Kschischo, M., & Pötters, P. (2021). Risks and benefits of artificial intelligence in small-and-medium sized enterprises. In *Proceedings of the International Conference on*

Industrial Engineering and Operations Management (pp. 195-205).

- Tolozá, D., and López, Y. (2023). *The impacts of artificial intelligence on the role of the public accountant*. [Undergraduate thesis, Universidad Cooperativa de Colombia]. UCC Repository. <https://repository.ucc.edu.co/items/83d17309-c6a9-4c7d-bebb-d708f0159ed2>
- Turing, A. (1950). Computing machinery and intelligence, *Mind*, LIX (236), 433-460, <https://doi.org/10.1093/mind/LIX.236.433>
- Ukpong, E., Udoh, I., & Essien, I. (2019). Artificial Intelligence: Opportunities, Issues and Applications in Banking, Accounting, and Auditing in Nigeria. *Asian Journal of Economics, Business and Accounting*, 10(1), 1-6. <https://doi.org/10.9734/ajeba/2019/v10i130099>

Impact and factors of emerging technologies on innovation management in SMEs

José Luis Pita-Espinoza

Universidad de San Martín de Porres - Peru
jpitae@usmp.pe
<https://orcid.org/0000-0003-3662-2349>

Manuel Antonio Diaz-Paredes

Universidad de San Martín de Porres - Peru
mdiazp@usmp.pe
<https://orcid.org/0000-0003-1244-9991>

Wilder Martín Vásquez-Murillo

Universidad de San Martín de Porres - Peru
wvasquezm@usmp.pe
<https://orcid.org/0009-0003-5410-9298>

Lily Fanny Zapata-Revoredo

Universidad de San Martín de Porres - Peru
lzapatar@usmp.pe
<https://orcid.org/0000-0001-6429-7999>

Introduction

Innovation management in small and medium-sized enterprises (SMEs) is a key factor for their growth and competitiveness in an increasingly globalized and technological environment. Innovation refers to the process of generating, developing and applying creative ideas to improve products, services or processes (Schumpeter, 2013). On the other hand, technology is defined as the set of knowledge and techniques that are applied in an orderly

manner for the design and construction of objects, systems or environments that seek to solve problems and improve the quality of life (Tidd & Bessant, 2021). In recent decades, technology has undergone rapid advancement, transforming the way companies operate and compete. SMEs, which represent a large part of the business fabric in many countries (OECD, 2017), have not been oblivious to these changes. However, the adoption and effective use of technologies to manage innovation in these types of companies remains a challenge.

The research problem lies in the need to better understand how technology impacts innovation management processes in SMEs, identifying both the benefits and the challenges they face. Several studies have approached this topic from different perspectives, analyzing the use of specific technological tools, the factors that influence technology adoption or the impact on the innovative performance of firms (Neirotti & Raguseo, 2017; Parida et al., 2019)

The main objective of this research is to analyze and understand the impact of technology on innovation management in SMEs. It seeks to identify the innovation management practices and strategies that are most effective in the context of SMEs and to explore how technology can be optimally used to drive business innovation in this business segment.

The justification for this study lies in the relevance of the topic for the academic and business community. On the one hand, it will contribute to broaden the knowledge on the relationship between technology and innovation in the context of SMEs, identifying areas for future research. On the other hand, it will provide valuable information for SME managers and entrepreneurs to make informed decisions on the adoption and use of technologies to manage innovation in their companies.

The present study contributes significantly to the existing academic corpus. This work provides a deeper and more specific understanding of how SMEs can harness the potential of technology to drive business innovation by providing a detailed analysis of the impact of technology on these processes. This research can inform and guide entrepreneurs, managers, and decision makers in SMEs by providing useful information and practical suggestions for improving their innovation processes and maximizing the return on their technology investments.

Impact of technology on innovation management in SMEs.

In today's digital age, information technology (IT) is crucial to the long-term success of all organizations, especially SMEs. IT adoption is essential to increase a company's innovation capabilities, providing workers and staff with the necessary tools and communication channels to work efficiently. IT not

only increases productivity, but also helps coordinate various activities within the company. Several studies have shown that IT adoption significantly influences a company's innovation capabilities. Therefore, using IT to improve a firm's innovation capabilities is critical (Ahmad et al., 2023).

The impact of technology on SME management encompasses several key aspects. First, it improves operational efficiency by enabling companies to optimize their internal processes, automate tasks and improve efficiency in operations management, leading to higher productivity and profitability. In addition, it facilitates open innovation, promoting collaboration with external partners and access to external knowledge, as well as the co-creation of innovative solutions through digital platforms and collaborative tools. This approach not only fosters innovation, but also enables companies to adapt quickly to market demands, improving their competitiveness (Appio et al., 2024).

In terms of market competitiveness, the adoption of technology enables companies to offer more innovative, customized products and services tailored to market demands, helping them to differentiate themselves from the competition and attract new customers. Technology has a positive impact on business management, which is manifested in optimizing operations, fostering innovation, facilitating

data-driven decision-making and generating new business models.

Digital transformation in SMEs requires a holistic understanding of the various factors that contribute to its successful implementation, including change management, workforce training and the development of an agile mindset. Technology influences aspects such as organizational change management, employee skills development and organizational culture. SMEs face financial, material and human resource constraints, but identifying the optimal mix of digital technologies and training a skilled workforce are essential to overcome these challenges. In addition, the willingness of managers to implement innovations and the alignment between digital capabilities and the overall transformation vision are crucial (Awotunde et al., 2021; Islam et al., 2023).

The adoption of digital technologies impacts the ability of SMEs to access and integrate technologies into their organizational processes from an open innovation perspective. This impact is observed in areas such as organizational change management, employee skills and capabilities development, organizational culture and mindset, and resource management. The implementation of digital technologies enables SMEs to expand their market and reach, improve their competitiveness and overall performance,

increase operational efficiency, and provide a better customer experience (Woods et al., 2022).

IT capabilities positively influence the ability of SMEs to respond to changes, such as the challenges that arose during the coronavirus crisis. These capabilities enable companies to be more flexible, efficiently manage internal activities, make quick and accurate decisions, and obtain information and knowledge from external sources. Knowledge management (KM) acts as an essential mediator between IT capabilities and the responsiveness of SMEs, improving their ability to adapt to change and respond effectively to challenges (Azyabi, 2021).

In the wine sector in Southern Italy, digitalization and technological innovation are crucial aspects for family-owned SMEs, impacting both the purpose and the culture of the business. Although digital transformation processes in these companies are still rare, research in innovation and entrepreneurship is essential to improve their competitive advantage and resilience to economic crises. Digital technologies have the potential to drive more inclusive and sustainable growth by fostering innovation, generating efficiencies and improving services in companies (Costa et al., 2023).

In the context of manufacturing SMEs in Mexico, the adoption of information and communication technologies (ICT) has a

significant influence on marketing innovation and business performance. Technology facilitates the implementation of innovative marketing strategies, improving competitiveness and business performance. Technological capability is essential for the development of innovative strategies and for driving organizational success and competitive advantage (Cuevas-Vargas et al., 2021).

Technology also affects the intellectual agility of employees, positively influencing innovation in micro and small businesses. Entrepreneurial leadership acts as a key mediator in the relationship between intellectual agility and business innovation. The ability of leaders to be forward-looking and foster community building influences the innovativeness of firms (Dabić et al., 2021).

Technological innovation has a positive and significant effect on SME performance. Technological innovation activities such as product, process and marketing innovation improve SME growth, retention and leverage. Technology adoption and development are key factors that enable SMEs to leverage their intangible resources to improve their performance. Business technology can have economic, social, and environmental benefits, such as increased efficiency and productivity, increased revenue, and new job creation, highlighting its importance in improving business performance (Ekayani et al., 2023).

The implementation of two-sided digital platforms can improve the efficiency and safety of sourcing processes, environmental performance and strategic business benefits. Supply network capabilities, such as flexibility and seamless partnerships, positively influence the adoption of digital platforms. Perceptions of benefits and barriers, such as high adoption costs and adoption fatigue, affect firms' intention to implement digital platforms in their sourcing processes (Marzi et al., 2023).

Technology, represented by IT capabilities, plays a crucial role in improving the ability of businesses to adapt to change and respond effectively to challenges, such as those encountered during the COVID-19 pandemic. Digital transformation enables SMEs to improve their operational efficiency, create a better experience for their customers and increase their ability to adapt to market changes. The implementation of digital technology in SMEs can open up possibilities for innovation, expand their market share, and improve their competitiveness and overall performance (Selamet Riadi et al., 2023).

Business leadership also plays a crucial role in the success of digital transformation. During uncertain economic situations, such as the COVID-19 pandemic, small businesses that manage to survive and thrive do so through a variety of innovations and actions, including digital transformation. Entrepreneurial leadership has a positive effect on business

success and corporate digital transformation, positively affecting business success and promoting pervasive changes in business operations through the use of digital technology (Chaniago, 2023).

During the COVID-19 pandemic, the adoption of digital technologies had a positive and significant effect on microenterprise performance. The use of digital technologies strengthens the positive effects of family and community support on microenterprise entrepreneurship, improving operational efficiency, market access and market share. Digitalization can stimulate innovation in products, services and business models in MSMEs, contributing to an increase in their revenues and market share (Salehi et al., 2022; Surahman et al., 2023).

In conclusion, digital technology has a significant and positive impact on the performance of SMEs, especially during the COVID-19 pandemic. The digital capability and digital orientation of SMEs influence their digital transformation and digital innovation, positively impacting their performance. Technology and innovation are essential to business management, enabling SMEs to improve their innovative performance by leveraging resources and knowledge available outside the firm through networking and inter-firm collaboration. IT fosters higher business performance, improving efficiency, productivity, revenue and job creation,

highlighting its importance in improving business performance.

Emerging technologies in the innovation management processes in SMEs.

In today's business environment, characterized by rapid technological progress and intensified global competition, SMEs must adopt emerging technologies to remain relevant and competitive. These technologies not only facilitate operational improvement, but also enable innovation in products, processes and business models. This chapter explores emerging technologies used in innovation management processes in SMEs, and analyzes their implications on competitive strategy, organizational culture, business structure, and customer interactions (Nghah et al., 2022).

One of the most relevant emerging technologies is the Industrial Internet of Things (IIoT). This technology connects machines and industrial devices through the internet, enabling real-time data collection and analysis. The IIoT improves operational efficiency and facilitates informed decision-making, enabling SMEs to monitor and optimize their production processes, reduce costs and increase the quality of their products. Another key technology is horizontal and vertical systems integration, which connects production processes with other systems inside and outside the

organization. Horizontal integration connects systems and processes along the value chain, while vertical integration connects different hierarchical levels within the company. This synergy improves coordination and operational efficiency, facilitating innovation and new product development (Appio et al., 2024).

Big Data and data analytics are also essential technologies for innovation management. They make it possible to handle large volumes of information and extract valuable insights for strategic decision making. SMEs can use these technologies to identify market trends, optimize operations and customize offers for customers. Data analysis has become an essential tool for driving innovation and improving competitiveness (Van Tonder et al., 2023).

Autonomous robots represent another significant emerging technology. These machines can perform tasks without human intervention, automating repetitive and dangerous processes, increasing efficiency and reducing errors. Autonomous robotics allows companies to innovate in their production processes and free up human resources for more strategic and creative tasks (Awotunde et al., 2021).

Machine learning and artificial intelligence (AI) are technologies that enable machines to learn and make decisions based on data. These technologies are essential for intelligent automation and personalization of products and

services. SMEs can use AI and machine learning to improve operational efficiency, develop innovative products, and enhance customer experience (Awotunde et al., 2021; Van Tonder et al., 2023).

Digital transformation, driven by these and other technologies, implies a review of companies' competitive strategy. The adoption of emerging technologies enables SMEs to develop new capabilities and compete in global markets. Companies that adopt these technologies can respond more quickly to market demands, offer innovative products and services, and improve their competitive positioning (Islam et al., 2023). In addition, the integration of emerging technologies requires changes in organizational culture and structure. SMEs must foster a culture of innovation and collaboration, where employees are willing to adopt new technologies and processes. Organizational restructuring is necessary to facilitate the implementation of these technologies and maximize their impact (Červinka & Novák, 2022).

Digital transformation also impacts business processes and customer interactions. Digital technologies improve operational efficiency, automate processes and enable better knowledge management. In terms of customer interaction, these technologies make it possible to offer personalized services and improve customer satisfaction. E-commerce,

digital marketplaces and online marketing are examples of how SMEs can use digital technologies to improve their relationship with customers (Chaniago, 2023).

ICT plays a crucial role in business management, especially in the context of SMEs. Knowledge management is essential for acquiring and maintaining a sustainable competitive advantage. ICT facilitates the collection, production and acquisition of knowledge, as well as its alignment with business strategy. SMEs can use ICTs to reduce response times, reduce costs and improve product quality (Cuevas-Vargas et al., 2021).

The adoption of emerging technologies also includes sustainable approaches such as eco-innovation, green supply chain management and the circular economy. These practices not only improve environmental sustainability, but also increase the performance and competitiveness of SMEs. Technologies such as Big Data drive more efficient and sustainable supply chains, which is crucial for manufacturing organizations (Bag et al., 2022).

Enterprise social networks (ESNs) are platforms that promote internal collaboration and innovation. The adoption of ESNs enables companies to improve communication and collaboration among employees, build communities of practice, and foster creativity and innovation. These technologies are especially useful for facilitating interaction

between different operational and strategic levels within the organization (Caron-Fasan et al., 2020). Advanced communication technologies, such as online collaboration platforms, videoconferencing tools, and cloud-based project management systems, are essential for innovation management. These tools facilitate internal and external communication, team collaboration and coordination of innovative activities. The adoption of these technologies enables SMEs to improve their responsiveness and adaptability to changes in the business environment (Costa et al., 2023).

Digitalization is a key component of innovation management processes. SMEs that adopt digital technologies can improve their operational efficiency, internal and external communication, and strategic decision making. Digitization is key to driving innovation and improving business performance. Big Data enables SMEs to collect and analyze large volumes of data to gain valuable insights, identify trends and opportunities for improvement. The use of Big Data facilitates informed, data-driven decision making, which is crucial for innovation and competitiveness (Costa et al., 2023; Mahmood & Mubarik, 2020).

E-commerce and digital marketplaces are emerging technologies that enable SMEs to access new markets and customers. These platforms facilitate the sale of products and

services online, improve operational efficiency, and increase the company's visibility in the global marketplace (Islam et al., 2023). The adoption of technologies that enable remote working has been critical during the COVID-19 pandemic. SMEs that have implemented these technologies have been able to adapt to changing conditions in the business environment and improve their performance. Remote working facilitates business continuity and operational flexibility (Marzi et al., 2023).

Emerging technologies play a crucial role in innovation management in SMEs, improving operational efficiency, facilitating open innovation and increasing competitiveness. Digital transformation, driven by technologies such as the Industrial Internet of Things, artificial intelligence and Big Data, enables SMEs to adapt to the changing environment and remain competitive in a constantly evolving market. The adoption of these technologies is essential for SMEs to innovate and grow in an uncertain economic environment.

Factors influencing the impact of technology on innovation management in SMEs.

Innovation management in SMEs is deeply influenced by several technology-related factors. The adoption and use of ICTs, as well as the development and adoption of new technologies, are fundamental elements that have an impact on innovation capacity and business performance. Ahmad et

al. (2023) emphasize that these technologies facilitate process reengineering and the adoption of new business models, contributing significantly to sustainable performance and market-driven innovation.

A company's digital capabilities, both exploitative and exploratory, are crucial. The former refer to the ability to redesign existing processes using current technologies, while the latter involve the adoption of new models, resources and knowledge. These capabilities strengthen the relationship between innovative business models and sustainable performance (Van Tonder et al., 2023). In addition, the adoption of digitization strategies and digital transformation, which includes the redesign of components, processes, culture and strategies, have a positive impact on innovation and business performance.

Another important aspect is the position of SMEs in the value chain. Marketing networks led by large firms, other SMEs or intermediaries have a differential impact on marketing performance depending on the position of the SME. Technological absorptive capacity, which is the ability to recognize, assimilate and apply external knowledge, is also critical to a firm's innovative performance (Woods et al., 2022).

Digital leadership and intellectual agility of employees are factors that also influence innovation. The ability of employees to adapt quickly and develop innovative solutions, along with

entrepreneurial leadership that mobilizes efforts and motivates an engaged community, are essential for business innovation (Dabić et al., 2021). Companies must continuously improve the efficiency of their processes and remain innovative to compete in a globalized market.

Human and structural capital within a company plays an important role in the adoption of new technologies. The knowledge, skills and intellectual agility of employees, as well as an adequate organizational infrastructure, facilitate the adoption of new technologies and improve innovation management (Ekayani et al., 2023). Digital transformation opens up opportunities for innovation by combining traditional business schemes with digital technology, expanding the market and improving the competitiveness and overall performance of SMEs.

Technological absorptive capacity and intellectual capital are essential for SMEs to balance innovation and market exploitation in the context of the fourth industrial revolution. Although SMEs face resource and funding constraints, digital transformation enables significant improvements in operational efficiency, customer experience, and the ability to adapt to market changes (Mahmood & Mubarik, 2020).

Owner-managers' perception of the availability of formal credit also influences the relationship between technology acquisition and innovation activities. A negative perception

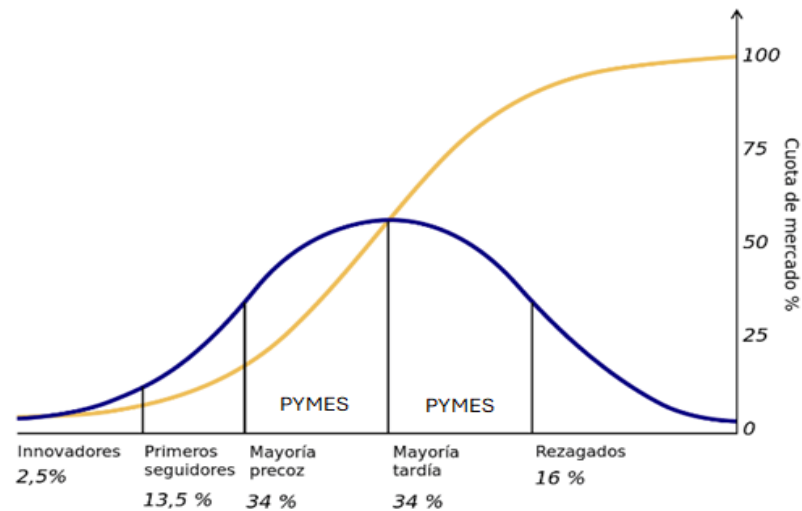
can negatively affect this relationship, while adequate innovativeness is necessary for technology acquisition to have a positive impact (Mallinguh et al., 2020).

The size and age of firms also influence their ability to innovate. Larger and older firms tend to occupy more central positions in marketing networks, which gives them greater opportunities to access external resources and knowledge, benefiting their innovative performance. In addition, managerial orientation towards external collaboration and networking influences the firm's position in the network and, consequently, its ability to innovate (Woods et al., 2022).

The adaptive capacity of organizations is another crucial factor. Flexibility and organizational learning capacity are essential to maximize the positive impact of technology on innovation management (Costa et al., 2023).

According to Rogers (1983), the adoption of ideas, behaviors, products and services does not occur simultaneously among all people. Based on this premise and considering some of the limitations inherent to SMEs, we can classify them as early majority (34%) and late majority (34%), according to Rogers' theory. This classification is due to their tendency to resist change and to take considerable time to adapt to innovations.

Figure 1. Percentage of segments adapted to Innovation



Note: Adapted from Diffusion of innovations, by Rogers, E. M., 1983.

Marketing innovation, facilitated by the adoption of emerging technologies, also positively impacts business performance, improving the ability of firms to reach customers and differentiate themselves in the marketplace (Cuevas-Vargas et al., 2021).

A firm's intellectual capital, including human, structural and relational capital, plays a fundamental role in technological innovation. Technological absorptive capacity enables firms to identify, assimilate and exploit technological knowledge from the external environment, which is crucial to maintain the

balance between innovation and market exploitation in the fourth industrial revolution (Mahmood & Mubarik, 2020).

Digital transformation, although challenging due to limited resources and funding, opens up significant opportunities for innovation. It enables SMEs to combine traditional business schemes with digital technology, expand their market share, and improve their competitiveness and overall performance (Awotunde et al., 2021; Busola Oluwafemi et al., 2020; Islam et al., 2023).

Financial literacy of entrepreneurs is also crucial to promote innovation within SMEs. However, digitization presents challenges such as data security issues, shortages of skilled labor and associated high costs. The digital divide can exacerbate disparities among SMEs, placing those that cannot take advantage of digital technologies at a disadvantage (Rosyidiana & Narsa, 2024).

Finally, a company's ability to integrate Industry 4.0 technologies into its existing processes is critical. Organizational agility, strategic flexibility and environmental dynamism positively influence the implementation of these technologies, while competitive industry forces can affect the adoption of digital platforms and innovation management (Marrucci et al., 2023).

Technology adoption and management in SMEs is a complex process influenced by multiple factors. From the use of ICT and digital capabilities to the position in the value chain and entrepreneurial leadership, all these elements contribute to the ability of SMEs to innovate and remain competitive in a globalized environment. Digital transformation and continuous innovation are essential for sustainable business success and improved market performance.

Conclusions

This research shows that technology has a significant impact on innovation management in SMEs, improving their operational efficiency, competitiveness and ability to respond to changes in the environment. Emerging technologies, such as the Industrial Internet of Things (IIoT), Big Data and artificial intelligence, are essential tools that enable SMEs to optimize their processes, reduce costs and offer innovative products and services.

The open innovation approach is fostered by the adoption of digital technologies, which not only facilitate internal innovation, but also promote external collaboration and access to knowledge and resources outside the company. This study makes more significant the importance of a well-established digital strategy and the integration of emerging technologies to increase competitiveness and business performance in a globalized market.

In addition, it has been identified that the success of digital transformation depends on internal elements, such as digital leadership, intellectual agility of employees and organizational culture. Managers must be willing to implement innovations and align digital capabilities with the company's strategic vision to overcome the challenges of digitization.

The research also highlights that investment in emerging technologies and staff training can generate significant benefits, such as increased productivity, improved product and service quality, and market expansion, despite the resource constraints faced by many SMEs. These technologies are also crucial for business resilience, enabling SMEs to adapt quickly to crises such as the COVID-19 pandemic and remain operational even under adverse conditions.

The findings of this study offer useful guidance for SME managers and entrepreneurs in terms of practical implications. SMEs can improve their innovative performance, ensure their long-term sustainability, and maximize the return on their technology investments by adopting a digital transformation strategy and fostering a culture of innovation. This research found that SMEs need a holistic approach that combines the adoption of emerging technologies with the development of organizational capabilities and effective leadership to drive innovation and growth.

Last but not least, this study provides an in-depth understanding of the impact of new technologies on innovation management in SMEs, identifying both advantages and disadvantages. With this in-depth understanding, more effective strategies for innovation management and technology integration can be created, which will promote a more adaptive and competitive business environment. Therefore, it supports academic progress and provides practical tools to enhance the competitiveness and sustainable growth of SMEs in an ever-changing technological landscape.

References

- Ahmad, I., Thurasamy, R., Shahzad, A., Ullah, M. I., Hussain, A., & Ansari, H. W. A. (2023). COVID-19 impact on dairy sector: The mediating role of knowledge sharing and trust on innovation capability. *South African Journal of Economic and Management Sciences*, 26(1). <https://doi.org/10.4102/sajems.v26i1.4591>.
- Appio, F. P., Cacciato, E., Cesaroni, F., Crupi, A., & Marozzo, V. (2024). Open innovation at the digital frontier: Unraveling the paradoxes and roadmaps for SMEs' successful digital transformation. *European Journal of Innovation Management*, 27(9), 223-247. <https://doi.org/10.1108/EJIM-04-2023-0343>.
- Awotunde, J. B., Ogundokun, R. O., Adeniyi, E. A., Misra, S., & Ajamu, G. J. (2021). The Adoption and Utilization of

- Electronic Business in Response to the Global Economy During COVID-19: *International Journal of Business Analytics*, 9(1), 1-20.
<https://doi.org/10.4018/IJBAN.288518>
- Azyabi, N. (2021). How do information technology and knowledge management affect SMEs' responsiveness to the coronavirus crisis? *Business Informatics*, 15(2), 75-90.
<https://doi.org/10.17323/2587-814X.2021.2.75.90>
- Bag, S., Dhamija, P., Bryde, D. J., & Singh, R. K. (2022). Effect of eco-innovation on green supply chain management, circular economy capability, and performance of small and medium enterprises. *Journal of Business Research*, 141, 60-72.
<https://doi.org/10.1016/j.jbusres.2021.12.011>.
- Busola Oluwafemi, T., Mitchelmore, S., & Nikolopoulos, K. (2020). Leading innovation: Empirical evidence for ambidextrous leadership from UK high-tech SMEs. *Journal of Business Research*, 119, 195-208.
<https://doi.org/10.1016/j.jbusres.2019.10.035>.
- Caron-Fasan, M.-L., Lesca, N., Perea, C., & Beyrouthy, S. (2020). Adoption of enterprise social networking: Revisiting the IT innovation adoption model of Hameed et al. *Journal of Engineering and Technology Management*, 56, 101572.
<https://doi.org/10.1016/j.jengtecman.2020.101572>
- Červinka, T., & Novák, P. (2022). The Influence of COVID-19 Pandemic on Digital Transformation Process and

- Strategic Management in a SMEs in the Czech Republic. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*, 30(2). <https://doi.org/10.46585/sp30021568>.
- Chaniago, H. (2023). Investigation of Entrepreneurial Leadership and Digital Transformation: Achieving Business Success in Uncertain Economic Conditions. *Journal of Technology Management & Innovation*, 18(2), 18-27. <https://doi.org/10.4067/S0718-27242023000200018>.
- Costa, A., Presenza, A., & Abbate, T. (2023). Digital transformation in family-owned winery SMEs: An exploratory analysis in the South-Italian context. *European Journal of Innovation Management*, 26(7), 527-551. <https://doi.org/10.1108/EJIM-02-2023-0108>.
- Cuevas-Vargas, H., Fernandez-Escobedo, R., Cortes-Palacios, H. A., & Ramirez-Lemus, L. (2021). The Relation Between Adoption of Information and Communication Technologies and Marketing Innovation as a Key Strategy to Improve Business Performance. *Journal of Competitiveness*, 13(2), 23-40. <https://doi.org/10.7441/joc.2021.02.02>
- Dabić, M., Stojčić, N., Simić, M., Potocan, V., Slavković, M., & Nedelko, Z. (2021). Intellectual agility and innovation in micro and small businesses: The mediating role of entrepreneurial leadership. *Journal of Business*

- Research*, 123, 683-695.
<https://doi.org/10.1016/j.jbusres.2020.10.013>.
- Ekayani, N. N. N. S., Purbawangsa, I. B. A., Artini, L. G. S., & Rahyuda, H. (2023). The mediating effect of technology innovation on intellectual capital performance: Evidence from Indonesian SMEs. *Uncertain Supply Chain Management*, 11(4), 1821-1830.
<https://doi.org/10.5267/j.uscm.2023.6.009>.
- Islam, A. A. A. A., Trinugroho, I., & Suryanto. (2023). SMES' FLIGHT TO DIGITAL AND GREEN ECONOMY: EVIDENCE FROM INDONESIA. *International Journal of Business and Society*, 24(1), 362-379.
<https://doi.org/10.33736/ijbs.5622.2023>.
- Mahmood, T., & Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change*, 160, 120248.
<https://doi.org/10.1016/j.techfore.2020.120248>.
- Mallinguh, E., Wasike, C., & Zoltan, Z. (2020). Technology Acquisition and SMEs Performance, the Role of Innovation, Export and the Perception of Owner-Managers. *Journal of Risk and Financial Management*, 13(11), 258. <https://doi.org/10.3390/jrfm13110258>
- Marrucci, A., Rialti, R., & Balzano, M. (2023). Exploring paths underlying Industry 4.0 implementation in manufacturing SMEs: A fuzzy-set qualitative comparative analysis.

- Management Decision*. <https://doi.org/10.1108/MD-05-2022-0644>
- Marzi, G., Marrucci, A., Vianelli, D., & Ciappei, C. (2023). B2B digital platform adoption by SMEs and large firms: Pathways and pitfalls. *Industrial Marketing Management*, 114, 80-93. <https://doi.org/10.1016/j.indmarman.2023.08.002>.
- Neirotti, P., & Raguseo, E. (2017). On the contingent value of IT-based capabilities for the competitive advantage of SMEs: Mechanisms and empirical evidence. *Information & Management*, 54(2), 139-153. <https://doi.org/10.1016/j.im.2016.05.004>
- Ngah, R., Azman, N., & Muhammad, K. (2022). The Impact of Innovation, Organizational, Technological Capital on Innovation Performance of SMEs: The Mediating Effect of Innovative Intelligence. *International Journal of Business and Society*, 23(1), 427-443. <https://doi.org/10.33736/ijbs.4623.2022>.
- OECD (2017). *Small, Medium, Strong. Trends in SME Performance and Business Conditions*. OECD. <https://doi.org/10.1787/9789264275683-en>
- Parida, V., Sjödin, D., & Reim, W. (2019). Reviewing Literature on Digitalization, Business Model Innovation, and Sustainable Industry: Past Achievements and Future Promises. *Sustainability*, 11(2), 391. <https://doi.org/10.3390/su11020391>.

- Rogers, E. M. (1983). *Diffusion of innovations* (3. ed). Free Press. <https://teddykw2.wordpress.com/wp-content/uploads/2012/07/everett-m-rogers-diffusion-of-innovations.pdf>
- Rosyidiana, R. N., & Narsa, I. M. (2024). Micro, small, and medium-sized enterprises (MSMEs) during the post-pandemic economic recovery period: Digitalization, literation, innovation, and its impact on financial performance. *Cogent Business & Management*, 11(1), 2342488. <https://doi.org/10.1080/23311975.2024.2342488>.
- Salehi, F., Shapira, P., & Zolkiewski, J. (2022). Commercialization networks in emerging technologies: The case of UK nanotechnology small and midsize enterprises. *The Journal of Technology Transfer*. <https://doi.org/10.1007/s10961-022-09923-3>
- Schumpeter, J. A. (2013). *Capitalism, Socialism and Democracy* (5.^a ed.). Routledge. <https://doi.org/10.4324/9780203202050>
- Selamet Riadi, S., Hapsari, P., Wahyu Budiman, P., Anwar, K., & Yudaruddin, R. (2023). The impact of knowledge management on SMES' performance during the COVID-19 pandemic: Assessing the significance of digital variables. *Knowledge and Performance Management*, 7(1), 76-90. [https://doi.org/10.21511/kpm.07\(1\).2023.06](https://doi.org/10.21511/kpm.07(1).2023.06).

- Surahman, Shee, H., Fitriani, Z., Sasmoko Adi, A., & Yudaruddin, R. (2023). The effect of digital transformation and innovation on SMEs' performance in times of COVID-19. *Problems and Perspectives in Management*, 21(4), 84-100. [https://doi.org/10.21511/ppm.21\(4\).2023.07](https://doi.org/10.21511/ppm.21(4).2023.07).
- Tidd, J., & Bessant, J. R. (2021). *Managing innovation: Integrating technological, market and organizational change* (Seventh edition). Wiley. https://books.google.com.pe/books/about/Managing_Innovation.html?id=5w4LEAAAQBAJ&redir_esc=y
- Van Tonder, C., Bossink, B., Schachtebeck, C., & Nieuwenhuizen, C. (2023). The effect of digitally-driven business model innovation on business performance. *Journal of Small Business & Entrepreneurship*, 1-34. <https://doi.org/10.1080/08276331.2023.2239039>.
- Woods, J., Galbraith, B., & Hewitt-Dundas, N. (2022). Network Centrality and Open Innovation: A Social Network Analysis of an SME Manufacturing Cluster. *IEEE Transactions on Engineering Management*, 69(2), 351-364. <https://doi.org/10.1109/TEM.2019.2934765>

**Study of the production, import and export of
intermediate inputs of Ecuador's manufacturing sector
and its effect on the Ecuadorian incorporated product
(PEI)**

Econ. Jorge García Regalado, PhD.

Docente-investigador, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
jgarcia@uagraria.edu.ec
<https://orcid.org/0000-0001-7966-2311>

Ing. Rina Bucaram Leverone, PhD.

Docente-investigador, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
rbucaram@uagraria.edu.ec
<https://orcid.org/0000-0003-4456-7095>

Econ. Víctor Quinde Rosales MSc

Docente-investigador, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
vquinde@uagraria.edu.ec
<https://orcid.org/0000-0001-9617-8054>

Introduction

In Ecuador, the national productive matrix has not been developed; therefore, there is no study of the true value added of the products manufactured in the country, even for those of entirely national manufacture and imported components. The existing methodology for statistical studies does not allow identifying the amount of Ecuadorian product incorporated in the productive processes developed within the country, mainly for the manufacturing industry sector of

goods such as vehicles, televisions, cell phones, processed food, non-metallic products and others, being an issue that involves the economic development of Ecuador within the framework of the national policy. In the country, the importance of companies maintaining a high level of incorporated Ecuadorian product should be considered an object of analysis, which will result in an improvement of the economy, which can be used as a policy instrument and to establish a baseline reference to establish different productive objectives in the Ecuadorian manufacturing sector.

The purpose of this point is to answer how dependent the manufacturing sector is on imported inputs and, by analyzing the selected variables, how these impact on the lack of development of this sector, which leads us to question or ask: Is industrialization by substitution efficient? Does large-scale importation limit internal development? If so, what alternatives are proposed?

For this purpose, the following sections identify different postulates, from different visions of endogenous development theories, changes in productive matrices and possible measurement methodologies used by different countries.

The aim of this section is to show how numerous theories have identified the problems of large-scale imports and how different authors opt for industrialization by substitution.

Some authors state that countries tend to counteract productive and competitive limitations with trade agreements, import tariffs and subsidies, in order to counteract a negative trade balance and ensure a significant share of national production (Huerta, 2017). (Huerta, 2017).

For this reason, in the case of Ecuador, some tariffs were implemented to prevent the exponential growth of imports and to strengthen the domestic market. However, since Ecuador is a developing country, it does not have a developed domestic market that can supply materials or intermediate inputs to these sectors, which tend to import highly technological parts.

Fernandez and Gavilanes (2017) argue that the technological intensity of imports does not explain differences in productivity, given that mostly developing countries use foreign technology inexpertly due to the lack of absorptive capacity and its emerging nature.

Likewise, Kokko et al. (2001) mention that the productivity evidenced in Uruguay is positively given by the presence of old machining centers, which substitute imports, this undoubtedly increases the probability that local companies will export.

Lall (2010) describes recent manufacturing export patterns in developing countries by technology level, arguing that export

structures, being path-dependent and difficult to change, tend to have implications for local sector development and growth.

This describes the Ecuadorian case and its not possible industrial evolution, which, on the other hand, the previous author mentions that Asia has developed in a short time due to the important role of manufacturing and its low technological dependence, as well as the strategies to achieve competitiveness.

The growth of the Ecuadorian economy has depended to a very high degree on the country's capacity to import the capital goods and inputs necessary for the development of its productive sectors (Fedesarrollo, 1972).

Due to the fragile internal system of industries in developing countries that have been identified, the idea of the economic theory of the import substitution model of industrialization (ISI) was adopted by different Latin American countries based on the premise of the ECLAC model (Hobbs, et al., 1998).

The Latin American countries had two relevant conditions for adhering to the doctrine proposed by the ECLAC model, which the author (Hobbs, 2001) mentions as follows:

- The existence of an elastic supply in the industrial structure.

- That the growth effect linked to the new strategy will overcome the depressive effect of the contraction of export activities.

There are different economic schools that proposed different theories within the framework of import substitution, one of which was the developmentalist theory, which lacked historical support, focused on mercantilism and linked to a country's internal commercialization, leaving aside international negotiation relations (Fulton and Holmlund 1999; Pearce, 1997).

In effect, the thinking behind this theory was inward growth, since they promoted the theory that Latin America's backwardness was due to its total dependence on imports of intermediate inputs and was only characterized by exporting primary products without a process of industrialization.

During the 1960s, ECLAC's vision, while becoming a formula for public intervention that underlay the dualistic vision of the coexistence of traditional and modern sectors, was harshly criticized because it mythologized the influence of feudalism on underdevelopment, ignoring that it is a historical product of the capitalist expansion of the appropriation of surpluses by minorities (Fearne, 1998). (Fearne, 1998)(Fearne, 1998); leaving aside the asymmetrical relations between countries and ignoring class relations within national economies (Green and Dos Samos, 1992); furthermore, this criticism extended to

the scant analysis of the systems of domination and social forces for the transformation of the countries of the region (Obschatko, 1997).

Import substitution is a development strategy that can benefit the growth of the domestic market, where the driving force is the expansion of local industry and the state plays a crucial role through indicative planning, the construction of state-owned industries in key sectors, the allocation of credit and the astute application of temporary protectionist policies in the foreign trade sector (North and Barcena, 1993).

Economic models of production

The economic theory of production deals precisely with this particular issue and its objective is to provide the entrepreneur or manager with the necessary information for the company to efficiently organize its production process, efficiently using those limited and costly productive factors and thus maximizing the profits or benefits of the owners (Vargas, 2014).

Within the theory, production is based on the productive forces and the relations of production, which is how Karl Marx's model was born. The economic model outlined by Marx points to production as the central axis and the starting point of the economic process (Enriquez, 2017).

"In development theories, the manufacturing industry-productive sector-is of vital importance for the development of countries, since the stagnation or internal and external growth of the economic sector depends on these industries" (Gómez, 2011).

Production and negotiation is a tool of great importance and indispensable in foreign trade, for this reason, it is necessary to know the processes of international negotiation so that there is an orderly economy where the balance between the supply and use of goods is productive through the implementation of the input-output matrix modeling. It can be used to study various topics, such as the composition of added value, price analysis, and calculating import requirements (Hurtado and Martínez, 2017).

Technique Panel data

In this excerpt, different authors are mentioned using panel data techniques, which have been used in order to respond to different aspects of a research.

"Panel data are those that arise from the observation of the same cross-section or cross-section with N individuals over time" (Sancho and Serrano, 2004). On the other hand, for Gutierrez (2008), the reason for using the panel data technique is because it takes advantage of the information provided by the cross-sectional variability and the estimation of the parameters in a response function by exploiting the

information of an independent variable. The panel data technique is used in different fields; thus, in the work carried out by Arboleda and Alonso (2016), an econometric model was estimated to determine the effect of marketing actions on sales of personal care products in Colombia. A linear model with panel data and a limited database was used to structure the study. Two tests were used in this study: fixed effects and random effects. In their findings they observed that the fixed effects test was the most suitable due to the estimates, significance and a high r-squared.

Methodological process

For the percentage of Ecuadorian Product Incorporated in national production, a statistical analysis was made by manufacturing sector using the International Standard Industrial Classification (ISIC at 2 digits), i.e. the random selection was used to group companies with the same characteristics and productive activity.

Table 1. *Generalized model*

| Variables | Description |
|--------------|--|
| y_{it} | Percentage of PEI in a given product. |
| x_{it} | Independent variables: imported and local intermediate products. |
| β_{li} | Vector of parameters or coefficients of elasticity |
| v_{it} | Vector panel errors |

Note. Prepared by the authors 2022.

In the first instance, the necessary variables were established, be they investments in productive resources, in order to collect information on the levels of raw material imports of the sectors under study, framed within a methodological framework of using the "Panel Data" technique. The technique is framed within the regression analysis, included in the set of multivariate tools destined to the analysis of the dependence between variables, all of them measured (endogenous and exogenous) preferably on a strictly quantitative scale. The idea is to represent by means of the following equation, the relationship of variables mentioned above, which would be expressed as follows:

$$y_{it} = \eta_{it} + \beta_{1i}x_{1it} + \beta_{2i}x_{2it} + \dots + \beta_{ki}x_{kit} + v_{it} \quad (1)$$

$$y_{it} = X_{it}^T \beta_{it} + u_{it}$$

$$i=1, \dots, N; t=1, \dots, T$$

$$\hat{\beta} = \frac{\sum_i \Delta X_i \Omega^{-1} \Delta Y_i}{\sum_i \Delta X_i \Omega^{-1} \Delta X_i} \quad (2)$$

Table 2. *Simplified equation*

| Variables | Description |
|--------------|---|
| ΔX_i | Differentiated coefficient matrix (Independent variables: imported and local intermediate products) |
| ΔY_i | Differentiated coefficient matrix (Percentage of PEI in a given product). |

Note. Prepared by the authors 2022.

For this study, access was gained to the databases of the Super Intendencia de compañía (SUPERCIAS), Ministerio de Producción (MIPRO) and Servicio Nacional de Aduana del Ecuador (SENAE), which allowed structuring a representative sample (size and significance) of the manufacturing sector, in order to measure the contribution of these in the sectorial Gross Value Added, equation (3) would represent the expression of the sectorial relations with their respective parameters, therefore, it would be the formula of the PEI.

$$\begin{bmatrix} y_{i1} \\ y_{i2} \\ \Delta y_{i2} \end{bmatrix} = \begin{bmatrix} x_{i1} \\ x_{i2} \\ \Delta x_{i2} \end{bmatrix} \beta + \begin{bmatrix} 0 \\ 0 \\ \Delta x_{i2} \end{bmatrix} \alpha + \begin{bmatrix} v_{i1} \\ v_{i2} \\ v_{i3} \end{bmatrix} \quad (3)$$

$$i = 1, \dots, N$$

Table 3. Equations in matrix form

| Variables | Description |
|-----------|---------------------------------|
| y_i | IEP Participation |
| X_i | Panels of independent variables |
| v_{it} | Vector panel errors |

Note. Prepared by the authors 2022.

For the respective estimates, a ranking was developed, identifying the inconsistencies of the possible estimators, starting from the most basic estimation by ordinary least squares, then differentiating and balancing the corresponding panel. The respective table shows the potential estimates with their differences and problems.

Table 4. Model of different tests.

| Model | Formula | Problems |
|----------------------------------|---|---|
| MCO | $y_{it} = a_{it} + \alpha k_{it} + \beta l_{it} + \gamma m_{it} + \theta p_{it} + \varepsilon_{it}$ | Parameters are not consistent (Endogeneity) |
| Fixed Effects: First Differences | $\Delta y_{it} = \alpha \Delta k_{it} + \beta \Delta l_{it} + \gamma \Delta m_{it} + \theta \Delta p_{it} + \Delta \varepsilon_{it}$ | Correlation between productivity and inputs Often, excessively low estimates are obtained for capital Constant error over time (very strong assumption) |
| Fixed Effects: Intragroup | $y_{it} - \bar{y}_i = \alpha(k_{it} - \bar{k}_i) + \beta(l_{it} - \bar{l}_i) + \gamma(m_{it} - \bar{m}_i) + \theta(p_{it} - \bar{p}_i) + (u_{it} - \bar{u}_i)$ | Often, excessively low estimates are obtained for capital |
| Random Effects | $y_{it} - \lambda \bar{y}_i = \beta_0(1 - \lambda) + \alpha(k_{it} - \lambda \bar{k}_i) + \beta(l_{it} - \lambda \bar{l}_i) + \gamma(m_{it} - \lambda \bar{m}_i) + \theta(p_{it} - \lambda \bar{p}_i) + (\varepsilon_{it} - \lambda \bar{\varepsilon}_i)$ | Individual effects are correlated with the regressors (productive factors) the estimator is inconsistent. |
| GMM: Arellano and Bond | $\Delta y_{it} = \Delta \beta_0 y_{i,t-1} + \Delta \beta_1 x_{it} + \Delta \beta_2 w_{it} + \Delta e_{it} \text{ if } g=1$ | Small overestimate of capital and intermediate inputs |
| Levinsohn and Petrin | $\rho_t(k_{it}, m_{it}, p_{it}) = a_{it} + \alpha k_{it} + \gamma m_{it} + \theta p_{it} + \mu_{it}(k_{it}, m_{it}, p_{it})$ | Parametric model that seeks to solve all problems |

Note. Prepared by the authors 2022.

Analysis of the Motorcycle manufacturing sector (ISIC 30) using the Arellano-Bond correction

When estimating the respective equation, by POLS, FE, RE, FGLS and PCSE; the last two methods are used to correct possible autocorrelation and heteroscedasticity problems in the OLS estimations. Table 5 shows the econometric results of the degree of materialization and participation of intermediate domestic goods, using a non-scalar equation. We show the estimates of five different econometric methods; however, we only discuss those of the respective ISIC and maximum likelihood estimation, due to the methodological implications raised in their origins.

We found that the statistic explored for the established ISICs, large was estimated at 0.14; this result is statistically significantly different from the Wald F test and the null hypothesis $H = 1$ was rejected, suggesting that the large sectors or components are "indispensable" inputs for production. According to the volumes of inputs, all the methodologies reported in Table 5 have the same results, sign and significance, being the estimation of the statistics, robust to any of the applied methods.

Table 5. Arellano-Bond one-stage estimates using 27 observations; dependent variable CIF

| Variable | Coefficient | Standard deviation | Statistic t | p-value | |
|-----------------|-------------|--------------------|-------------|---------|----|
| DCIF(-1) | 0,53303 | 0,236437 | 2,2544 | 0,02417 | ** |
| const | 2,42656e+06 | 1,33129e+06 | 1,8227 | 0,06835 | * |
| BASE_IMPOSSIBLE | -2,15886 | 2,29021 | -0,9426 | 0,34586 | |
| VALUE_CFR | -3,97243 | 4,41105 | -0,9006 | 0,36782 | |
| VAT | -4,97411 | 2,65724 | -1,8719 | 0,06122 | * |
| ADVALOREM | 2,41828 | 1,85009 | 1,3071 | 0,19117 | |
| FOB | 6,49374 | 3,45912 | 1,8773 | 0,06048 | * |

Sum of squares of residuals = 5.44898e+015

Standard deviation of residuals = 1.6506e+007

AR error contrast (1): z = -1.6196 (p-value 0.1053)

AR error contrast (2): z = -0.922924 (p-value 0.3560)

Sargan over-identification contrast:

Chi-square (9) = 15.6477 (p-value 0.0746)

Wald contrast (set)

Chi-square (6) = 1.08388e+006 (p-value 0.0000)

The estimated model contains the results of the scale effect, considered using the Arellano and Bond test. Similarly to the results without scaling, we only discuss those of the differenced estimation, due to the methodological implications discussed in the respective table. Along these lines, we find the behavior of the different ISICs have the same sign and follow the same direction, obtained in the undifferenced model. Moreover, the differenced statistic minus one is statistically significant, different from that of the

Wald F test; the null hypothesis $H = 1$ was rejected, suggesting that large sectors operate in a non-competitive and continuous environment. For small sectors, the H statistic is 0.67; the hypotheses $H = 0$ and $H = 1$ were also rejected, which means that small sectors operate in a scenario of relative concentration of their production, similar to medium sectors. These results are in line with those obtained in Apergis et al. (2016) and Sun (2011), who mention that the results estimated in equations of evolution of domestic, versus imported, scaled composition are quite similar and the degree of sector do not change from one to another.

Analysis of the Motorcycle Manufacturing Sector (ISIC 30) using Weighted Least Squares Regression

The results obtained in the Model, estimation by weighted least squares, evidence the results of model 1, in particular, the independent variables in panel denote the incidence, correspondence, of the imported intermediate goods in the composition of the final good; making more robust the estimation versus the first one of Arellano and bond, making practically one the determination coefficient. Finally, upon verification, it is evidenced that there is heterogeneity, balanced in the panel; therefore, the process gains in reliability and stability, within the established methodology.

Table 6. MC estimates weighted using 42 observations;
dependent variable CIF

| Variable | Coefficient | Standard deviation | Statistic t | p-value | |
|-----------------|-------------|--------------------|-------------|----------|-----|
| const | 5744,18 | 1389,22 | 4,1348 | 0,00020 | *** |
| BASE_IMPOSSIBLE | -0,0104647 | 0,00436122 | -2,3995 | 0,02172 | ** |
| VALUE_CFR | 0,962472 | 0,0101099 | 95,2005 | <0,00001 | *** |
| VAT | -0,015652 | 0,00612772 | -2,5543 | 0,01502 | ** |
| ADVALOREM | 0,020309 | 0,00625394 | 3,2474 | 0,00252 | *** |
| FOB | 0,0494678 | 0,00987711 | 5,0083 | 0,00001 | *** |

Note. Prepared by the authors 2022.

Statistics based on weighted data:

Sum of squares of the residuals = 39.358

Standard deviation of residuals = 1.0456

R2 = 1

Corrected R2 = 1

Statistic F (5, 36) = 9.83896e+007 (p-value < 0.00001)

Akaike's information criterion = 128.462

Schwarz Bayesian information criterion = 138.888

Hannan-Quinn criterion = 132.284

Statistics based on the original data:

Dependent var. mean = 1.03125e+008

Standard deviation of the dependent var. = 1.56282e+008

Sum of squares of residuals = 4.53323e+010

Standard deviation of residuals = 35485.7

Analysis of the vehicle manufacturing sector (ISIC29) using 3 models

In the comparison of model 1 versus model 2 and model 3, with respect to ISIC 29, it could be observed that of greater adjustment, significance and representativeness is the weighted least squares model, after the iteration process of lags seen in model 1 up to twenty lags; The same that presents a coefficient of determination of almost one, which implies the degree of representativeness and importance of the result variables, taxes, as a referent of the local productive activity; however the ad-valorem, has strong representativeness; which gives indications to think of the degree of collection is strongly correlated with the aggregate productive activity; in the national composition.

In relation to model two, without lags, it is determined that regardless of the serial correlation, the variables CIF value and taxes have a direct influence with the levels of national composition, being the three models tested highly significant in their variables. The contribution of the signs of the coefficients, in their positivity and negativity, show the direction of the relationship established in the three models, showing the balance and equilibrium of the structured panel.

In relation to model three in the weighted estimation, it shows consistency, correlativity, guaranteeing the previous in model one and two, the weighting adjusts the possible problems of

endogeneity, it is noteworthy that the third estimation is developed by maximum likelihood, confirming the efficiency of the parameter estimated by ordinary least squares.

In summary, the validity and reliability of the three modelings are conclusive in determining the influence of the mediating variables, resulting from tax activity in this case, towards the participation of the national composition in the value addition of final goods production.

Analysis of the food manufacturing sector (ISIC 10) using two models

With respect to ISIC 10, in the comparison of model 1 versus model 2, comparing the CIF and FOB value, considering fixed effects and 42 lags, with respect to ISIC 29, under the maximum likelihood method. Where the results are effectively positive, with an R2 of 0.99996, this given to the iteration of the residuals the representativeness and importance of the result variables, taxes, as a referent of the local productive activity; however, the ad-valorem, has strong correlation; so a potential causality with the aggregate productive activity is inferred; in the national composition.

In relation to model two, estimation by maximum likelihood, as an alternative mechanism, without lags; it was determined that indistinctly of the serial correlation, the variables both CIF value and taxes, keep direct influence with the levels of national composition, being these two models tested highly

significant in their variables, as a set or balanced panel in fixed effects. The contribution of the signs of the coefficients, in their positivity and negativity, show the direction of the relationship established in the two models, showing equilibrium.

In summary, ISIC 10 in terms of its validity and reliability are highly significant, the two subsequent modelings are conclusive in determining the influence and a potential causality towards the participation of the national composition in the value addition of final goods production.

Table 8. ISIC 10 estimates using 2 tests.

| Model 1: Fixed effects estimations using 42 observations, dependent variable FOB. | | | | | | Model 2: Maximum likelihood estimation, dependent variable CIF | | | | | |
|---|-------------|--------------------|-----------|---------|---------|--|-------------|--------------------|-----------|----------|---------|
| Variable | Coefficient | Standard deviation | Statistic | p-value | p-value | Variable | Coefficient | Standard deviation | Statistic | p-value | p-value |
| VAT ID | 5,39092 | 1,383 | 3,898 | 0,0042 | *** | const | -1218,91 | 3087,92 | -0,3947 | 0,69531 | |
| BASE_I | 0,158702 | 0,0459727 | 3,4521 | 0,00147 | *** | BASE_IM | - | 0,00259935 | -0,1354 | 0,893 | |
| MPOSSIBLE | | | | | | POSSIBLE | 0,000352038 | | | | |
| VALUE_CFR | -4,57075 | 1,3986 | -3,2681 | 0,00243 | *** | VALUE_CFR | 0,963652 | 0,00607934 | 158,5127 | <0,00001 | ** |
| VAT | 0,143579 | 0,0653278 | 2,1978 | 0,03467 | ** | ADVALO | 0,00715351 | 0,00297094 | 2,4078 | 0,02115 | ** |
| | | | | | | REM | | | | | |

| | | | | | | | | | | |
|---------------------------------------|--------|----------|-------|------|---|-----------|----------|-------|-----|----|
| ADVAL | - | 0,070508 | - | 0,18 | FOB | 0,0371232 | 0,006380 | 5,817 | <0, | ** |
| OREM | 0,0954 | 1 | 1,353 | 454 | | | 98 | 8 | 000 | * |
| | 403 | | 6 | | | | | | 01 | |
| R² = | | | | | Mean of dependent var. = | | | | | |
| 0.99999 | | | | | 1.03125e+008 | | | | | |
| 6 | | | | | Standard deviation of the dependent var. = | | | | | |
| R² corrected = | | | | | 1.56282e+008 | | | | | |
| 0.999995 | | | | | Log-likelihood = - | | | | | |
| Statistic F (6, 35) = | | | | | 484.107 | | | | | |
| 1.44162e+006 (p-value < | | | | | Akaike's information criterion = | | | | | |
| 0.00001) | | | | | 978,214 | | | | | |
| Durbin-Watson | | | | | Schwarz Bayesian information criterion = | | | | | |
| statistic = 1.30318 | | | | | 986.902 | | | | | |
| Log-likelihood = - | | | | | Hannan-Quinn criterion = | | | | | |
| 590.564 | | | | | 981.399 | | | | | |
| Akaike's information criterion | | | | | Heteroscedasticity likelihood ratio test by group - | | | | | |
| = 1195.13 | | | | | Null hypothesis: units have the same variance of the | | | | | |
| Schwarz Bayesian information | | | | | disturbance. | | | | | |
| criterion = 1207.29 | | | | | Contrast statistic: Chi-square(1) = | | | | | |
| Hannan-Quinn | | | | | 36.1656 | | | | | |
| criterion = 1199.59 | | | | | with p-value = 1.8124e- | | | | | |
| | | | | | 009 | | | | | |

Note. Prepared by the authors 2022.

Once the different test results have been analyzed, different authors' postulates can be cited and possible ideas can be contrasted regarding the general topic discussed and how they align with or differ from the findings of this work.

According to Vásquez Orozco (2010) mentions that exports are very important for the country as long as they are stable over time since they are part of economic growth; however, imports should be considered as an important component in the development of a country as long as they are relatively tolerable, otherwise an unfavorable trade balance will be created for the countries.

Salazar, Morales and Martinez (2020)(2020), states that the manufacturing industry is a very important industry for the GDP of many countries; it also states that the greater the demand for manufactured products, the greater the profitability obtained by exporting products, which is why the sector under study is fundamental for the development of the country; however, it has been underdeveloped because it depends on intermediate inputs for the production of a final good, leading to a deficit over a period of years. For this reason, Ordoñez and Hinojosa (2014) propose as a state policy to transform the productive matrix to generate added value and similarly reduce imports. This in turn would imply generating diversification in finished products.

Payares (2012)in his research Estimation of land value potential in Barranquilla, questions the selection of a panel model with fixed effect since Egger (1999) identifies some difficulties associated with the model when spatial variables are involved, which is why he considers using another

maximum likelihood test for the redundancy of the fixed effects, this test verifies the hypothesis of equality between coefficient different from zero, i.e. considers different tests for its modeling, this with the purpose of verifying the relevant estimates. This corroborates and approves the use of different tests used in this work and in strengthening the findings.

Thus, it can be evidenced that the different tests implemented in this paper support the results found and can foresee a strong dependence of imports on local final products.

Conclusions

In the case of Ecuador, it was demonstrated that manufacturing industries are fundamental for the development of the economy. In recent years, an exponential growth has been evidenced. In developed countries, the manufacturing sector is very dynamic and standardized, which creates competitive advantages over developing countries, especially in Latin American countries, especially in Ecuador, where the literature corroborates a high dependence on intermediate inputs for the production of local products, which means that the country does not industrialize and depends on imported inputs.

On the other hand, the high rate of imports leads to a deficit in the trade balance, especially when most of the industries work as assemblers and in other cases their finished products have around 80% of imported intermediate products, thus

affecting the growth or evolution of the country's industrialization.

The vehicle manufacturing industry is one of the largest importers of intermediate products, especially from the Asian continent, so as a state policy a clause should be implemented in which companies implement Ecuadorian products or a minimum percentage of the goods. This would be a functional device to boost the domestic industry for the production of intermediate goods for other sectors.

This paper was structured by ISIC (2 digits) making a conglomerate of companies by their economic activity. Using the simple random method, the representative companies of ISIC 29, 10 and 30 were chosen, showing that in each group of companies there is a high dependence on intermediate inputs, obtaining that the most important factors are technologies for the production of automobiles, motorcycles and food products.

The results of ISIC 30 by means of the econometric modeling developed Data panel under the Arellano Bond and Weighted Least Squares tests evidenced a high statistical significance, which implies a high participation of intermediate components in the ISIC of analysis and a high serial correlation of the data, in general the variables participating in the panel which are: CIF, ADVALOREM, FOB VAT, CFR VALUE, TAXABLE BASE, show an interaction in economic context that

implies a high balanced correlativity of imports for the manufacturing activity of this segment.

On the other hand, for ISIC 29 the following tests were used: fixed effects, weighted least squares and estimations without lags, proving to be appropriate for the analysis of this sector; however, the least square test was the optimum with an r^2 equal to 1 in which the variables used were pertinent for the study, this sector being the most representative, implying a high correlativity of imports. The validity and reliability of the three modelings are conclusive in determining the influence of the mediating variables, resulting from the tax activity in this case, towards the participation of the national composition in the value addition of the production of final goods.

Finally, for ISIC 10, two tests were used: fixed effects and maximum likelihood estimations, using 42 observations to strengthen the results obtained from the contrast of the models. Both tests proved to be significantly explanatory for the study; however, the fixed effects model for ISIC 10 was the most suitable for its explanation, demonstrating a high dependence on foreign intermediate products.

The different tests show the dependence on imported inputs and to that extent no value is added to the development of the industry, showing a high dependence on intermediate inputs.

References

- Arboleda, A., & Alonso, J. (2016). Panel Analysis to Determine the Effect of Marketing Actions on Sales of Personal Care Products. *Journal of Quantitative Methods for Economics and Business*, 22, 230-249. <https://www.upo.es/revistas/index.php/RevMetCuant/article/view/2349>
- Enriquez, I. (2017). Marxist analysis of the world economy and development studies. *Revista de Ciencias Sociales Iztapalapa* 38(82), 199-232. doi:<https://doi.org/10.28928/revistaiztapalapa/822017/aot3/enriquezperezi>
- Fearne, A. (1998). The evolution of partnerships in the meat supply chain: Insights from the British beef industry (Vol. III). Doi: 10.1108/13598549810244296.
- Fedesarrollo (1972). Special report on Ecuador. PDF document. <http://hdl.handle.net/11445/2838>
- Fernández, J., & Gavilanes, J. (2017). Learning by importing in emerging innovation systems: evidence from Ecuador. *The Journal of International trade & Economic Development*, 26(1), 45-64. Doi:<https://doi.org/10.1080/09638199.2016.1205121>
- Fulton, M. E., & Holmlund, M. (1999). NETWORKING FOR SUCCESS: STRATEGIC ALLIANCES IN THE NEW AGRICULTURE. (C. f.-o. University of Saskatchewan, Ed.) Miscellaneous Publications. doi:10.22004/ag.econ.31769.

- Gómez, O. (2011). Costs and production processes, a strategic option for productivity and competitiveness in the children's clothing industry in Bucaramanga. *Revista Escuela de Administración de Negocios*, (70), 67-180. <http://www.scielo.org.co/pdf/ean/n70/n70a14.pdf>
- Green, R. H., and Dos Samos, R. R. (1992). Network economics and agribusiness restructuring. *Journal of Agrosocial Studies* (162), 37-61. <https://dialnet.unirioja.es/servlet/articulo?codigo=2165736>.
- Gutierrez, J. (2008). todoeconometria.com. [Online document] <https://todoeconometria.com/paneldata1/>
- Hobbs, J. E. (2001). Against All Odds: Explaining The Exporting Success Of Danish Pork Co-Operatives. (C. f.-o. University of Saskatchewan, Ed.) Miscellaneous Publications. doi 10.22004/ag.econ.31771.
- Hobbs, J. E., Kerr, W. A., & Klein, K. K. (1998). Creating international competitiveness through supply chain management: Danish pork." *Supply Chain Management*, III(2), 68-78. doi:<https://doi.org/10.1108/13598549810215388>
- Huerta, A. (2017). Impact of U.S. protectionist policy on the Mexican economy. *Revista Economía UNAM*, 14(42). <http://www.scielo.org.mx/pdf/eunam/v14n42/1665-952X-eunam-14-42-118.pdf>.
- Hurtado, Á., and Martínez, E. (2017). Binary Networks and the Input-Output Matrix: A Regional Application.

- Trayectorias Journal*, 9(45), 57-76.
<http://www.scielo.org.mx/pdf/trcsuanl/v19n45/2007-1205-trcsuanl-19-45-00057.pdf>
- Kokko, A., Zeján, M., & Tansini, R. (2001). Trade regimes and spillover effects of FDI: Evidence from Uruguay. *Weltwirtschaftliches Archiv*, 137, 124-149. doi:<https://doi.org/10.1007/BF02707603>
- Lall, S. (2010). The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-98. *Journal Oxford Development Studies*, 28(3), 337-369. DOI: 10.1080/713688318
- North, D. C., and Bércena, A. (1993). *Institutions, Institutional Change and Economic Performance*. (Second ed.).https://www.academia.edu/34959794/INSTITUCIONES_CAMBIO_INSTITUCIONAL_Y_DESEMPEÑO_ECONÓMICO?bulkDownload=thisPaper-topRelated-sameAuthor-citingThis-citedByThis-secondOrderCitations&from=cover_page
- Obschatko, E. S. (1997). Articulación productiva a partir de los recursos naturales: el caso del complejo oleaginoso argentino. Digital Repository: ECLAC. <https://repositorio.cepal.org/handle/11362/9776>
- Ordóñez Iturralde, D., and Hinojosa Dazza, S. (2014). Ecuador's foreign policy in the framework of the National Plan for Good Living. *Journal of Management Science and Economics*, 4(8), 143-155.: DOI: 10.17163.ret.n8.2014.07.

- Payares Ayola, D. (2012). Estimation of Land Valuation Potential in Barranquilla "Fixed Effects Estimates in Panel Data. *Caribbean Economic Journal*.
<http://www.scielo.org.co/pdf/ecoca/n10/n10a03.pdf>
- Pearce, T. (1997). Lessons learned from the Birds Eye Wall's ECR initiative. *Supply Chain Management*, 99-106.
doi:<https://doi.org/10.1108/13598549710178282>
- Salazar Araujo, E. J., Morales Trujillo, K. A., and Martínez Solano, J. M. (2020). Analysis of manufacturing sector exports in the departments with the highest industrial development index in Colombia. *Revista Venezolana de Gerencia*, 25(90), 564-578.
- Sancho, A., and Serrano, G. (2004). Panel data models. [Documento en línea]
<https://www.uv.es/~sancho/panel#:~:text=En%20los%20modelos%20de%20datos%20de%20panel%2C%20la%20discusi%C3%B3n%20se,por%20ejemplo%2C%20la%20habilidad%20de>
- Vargas, B. (2014). The COBB - DOUGLAS Production Function. *Revista de difusión cultural y científica de la Universidad La Salle de Bolivia*, 8(8), 67-74.
http://www.scielo.org.bo/pdf/rfer/v8n8/v8n8_a06.pdf
- Vázquez Orozco, R. (2010). The impact of banana trade on the development of Ecuador. *Afese Magazine*, 53(53).

Adoption of Industry 4.0 in the Organizational Management of the Commercial Sector in the City of Cuenca-Ecuador

Diego Marcelo Cordero Guzman

Catholic University of Cuenca, dcordero@ucacue.edu.ec
<https://orcid.org/0000-0003-2138-2522>

Deysi Catalina Urgilés Criollo

Catholic University of Cuenca, dortiz@ucacue.edu.ec
<https://orcid.org/0000-0002-6230-2384>

Ximena Abril Fajardo

University of Azuay, xabril@uazuay.edu.ec
<https://orcid.org/0000-0002-7465-5355>

Pablo Perez Jara

Catholic University of Cuenca , pperezj@ucacue.edu.ec
<https://orcid.org/0000-0001-8538-5955>

Diego Fernando Ortiz Lazo

Catholic University of Cuenca, dortiz@ucacue.edu.ec
<https://orcid.org/0009-0009-3940-8322>

Introduction

The adoption of Industry 4.0 in organizational management is currently a topic of growing importance worldwide in the business context (Senna et al., 2022) as it represents a significant change in the way organizations operate and relate to each other. In Industry 4.0, we observe a fusion between production operation systems and contemporary technologies, particularly in the field of information and communication (Wang et al., 2015). This transformation within organizational environments impacts strategies, frameworks

and operating models, which will need to adjust and amalgamate in accordance with these new dynamics (Barreto et al., 2017).

Ecuador is in constant economic development and is no stranger to this global trend (Awan et al., 2021). (Awan et al., 2021).. However, despite the potential advantages offered by Industry 4.0, there are significant challenges that require further research and detailed understanding.

Industry 4.0 enables the connection of information, objects and people through physical and virtual environments, by means of cyber-physical systems. As a result, it facilitates the transformation of industries and organizations towards smart environments (Thoben et al., 2017), reflecting the growing impact of interactions between interconnected computing systems and the physical world that is defined as a core subject rather than a specific discipline (L. Wang et al., 2015).

Cuenca is one of Ecuador's cities with a commercial sector that plays an essential role in the country's economy (Tobar-Pesántez & Solano-Gallegos, 2018).. Companies in this sector are diverse, varying from small stores to large distribution and service chains. The adoption of Industry 4.0 in organizational management in the commercial sector in Cuenca involves the incorporation of advanced technologies, such as process automation, the use of massive data, the Internet of Things (IoT) and artificial intelligence (AI), cybersecurity, 3D printing, among others. However, to date, there is a lack of specific research that analyzes the status and methods of adoption of

these technologies in the commercial sector in Cuenca and the factors that influence this process (Cordero et al., 2023).

The research problem lies in the lack of understanding about the degree of adoption of Industry 4.0 in organizational management in the commercial sector of Cuenca (Ecuador), and the obstacles faced by companies in this process. Despite the growing importance of Industry 4.0, there is a lack of updated and specific data on the implementation of these technologies in the local context of Cuenca, which makes it difficult to make strategic decisions and identify areas for improvement (García-Reyes et al., 2022).

The research is relevant because it provides valuable information to companies in the commercial sector in Cuenca, as well as to local authorities and stakeholders involved in the economic development of the city. Knowing the current state of Industry 4.0 adoption and the specific challenges in the commercial sector allows the development of strategies and policies that foster innovation and competitiveness, thus contributing to the sustainable growth of the local economy (Cabrera et al., 2022).

Research on the adoption of Industry 4.0 in organizational management in the commercial sector of Cuenca (Ecuador) is of high economic relevance by enhancing the competitiveness and efficiency of a vital sector in a city in constant growth. Additionally, by addressing the lack of local data in this area, the research contributes to filling a crucial gap, enabling evidence-based decision making. The adoption of advanced technologies promotes innovation and competitiveness of

local businesses, which translates into a boost in business growth (Cordero et al., 2023).. Likewise, by exploring the impact on employment and possible implications for sustainable development, the research addresses fundamental aspects for both the workforce and the environmental setting, generating a broad impact on the community and the environment at large (Dongfang et al., 2022).

Moreover, the direct beneficiaries of this research include companies in the commercial sector in Cuenca, which will gain key information to improve their organizational management and effective adoption of Industry 4.0 technologies. In addition, local and regional governments can use the findings to develop policies and programs that foster Industry 4.0 adoption and economic growth in the region, while academic institutions will be able to develop training and capacity building programs related to Industry 4.0.

As an indirect beneficiary consists of the local community, which is nurtured by a stronger and more sustainable economy, generating jobs and economic opportunities (Tobar-Pesántez & Solano-Gallegos, 2018).. Workers are also favored, as they have access to increased training and updated skills to face the changing demands of the labor market, and the environment benefits from the potential reduction of the environmental footprint through the adoption of advanced technologies.

Therefore, the following research question was posed: What is the current status of the adoption of Industry 4.0 in

organizational management in the commercial sector in the city of Cuenca-Ecuador?

Definition of Industry 4.0

Saucedo Martínez et al. (2018) define Industry 4.0, as the new phase in the organization and control of the entire value chain throughout the product life cycle. It is a concept that focuses on the digitization and interconnection of industrial processes, from design and production to distribution and after-sales service.

While Kagermann and Wahlster (2022) mention that Industry 4.0 is based on the interconnection of physical objects with information systems through the internet of things. This enables collaboration between machines, autonomous decision making and the creation of highly personalized products and services. On the other hand, Sony and Naik (2019) validate that Industry 4.0 represents a fundamental transformation in the way goods are designed, manufactured and delivered, and in the way service is provided. It combines digital and physical technologies, generating a change in the way organizations operate and compete in the market.

In addition, De Propris and Bellandi (2021) indicate that Industry 4.0 is about the integration of digitization and automation in manufacturing, enabling customized and more efficient mass production, and smarter management of industrial resources and assets. Finally, Agostini and Filippini. (2019) note that Industry 4.0 is a manufacturing paradigm characterized by the convergence of digital technologies, systems integration and automation, resulting in more

efficient production, greater flexibility and an enhanced ability to adapt to changing demands.

In summary, various authors have defined Industry 4.0 as a new phase that involves the digitalization and interconnection of processes throughout the value chain, from design to distribution, allowing customized production, collaboration between machines and autonomous decision making. (Alcácer & Cruz-Machado, 2019; Cordero et al., 2023; Ghobakhloo, 2018; Nagy et al., 2018).. This transformation combines digital and physical technologies, improving efficiency and adaptation to changing market demands, as well as enabling smarter management of industrial resources and assets.

The evolution of Industry 4.0 is an ongoing process that has been taking shape over time (Iyer, 2018). The evolution of Industry 4.0 since its inception is described from the 18th century to the present date.

The first industrial revolution (18th-19th century) was characterized by the transition from manual to mechanized production, driven by the invention of the steam engine and the mechanization of the textile industry. Meanwhile, the second Industrial Revolution (end of the 19th century - beginning of the 20th century) was the stage in which technologies such as electricity and chain production were developed, which allowed for greater efficiency in manufacturing and transportation. Subsequently, the third industrial revolution (Mid-20th Century - 1970s and 1980s) was

marked by automation, electronics and information technology.

Computers and process automation played a fundamental role in production and business management. Finally, the fourth Industrial Revolution (Late 20th Century to the Present) was termed Industry 4.0 where the convergence of technologies such as the internet of things (IoT), big data, artificial intelligence (AI), augmented reality (AR) and additive manufacturing (3D printing) are transforming the way organizations operate. Device connectivity, real-time data analytics, and data-driven decision making are key features of this phase (Zhang, 2021).

Moreover, in the 21st century, the world is witnessing the fourth industrial revolution and the digital transformation of the organizational world, which is commonly referred to as Industry 4.0 where it basically addresses the new technology (Ardito et al., 2019) has been the most successful in recent years. Since the dissemination of the term Industry 4.0 in 2011, the whole world has been digitally transformed, this new trend immediately caught the attention of industries, organizations and governments around the world for greater agility and international communication (Nascimento et al., 2019).

Key Industry 4.0 technologies include the internet of things (IoT), which enables device and sensor connectivity; artificial intelligence, which drives autonomous decision making; big data analytics (Big Data), which facilitates the extraction of valuable information from large data sets; robotics, which automates repetitive and dangerous tasks; 3D printing, which

enables customized and efficient manufacturing; and cybersecurity, which protects systems against digital threats. These technologies are integrated into organizational management to improve the efficiency, quality, and customization of products and services (Jagatheesaperumal et al., 2022).

The adoption of Industry 4.0 brings a number of significant benefits to organizations. These include improving operational efficiency through process automation, reducing costs by optimizing the supply chain, and customizing products and services to meet individual customer needs. In addition, data-driven decision making becomes a key pillar, enabling organizations to make more informed and timely decisions. Ultimately, Industry 4.0 enhances the competitiveness of companies in an ever-changing global marketplace (Masood & Sonntag, 2020)..

The adoption of Industry 4.0 is influenced by a number of both internal and external factors. Internal factors include organizational culture, which can promote or resist change, leadership driving the transformation, and available investment capacity. External factors include government regulation, which may encourage or restrict adoption, market competition and customer demand for innovative products and services. Understanding these factors is critical to making strategic decisions about the adoption of Industry 4.0 (Abdullah et al., 2022).

The adoption of Industry 4.0 involves the implementation of a series of technological advances and changes in the way

companies operate and compete in today's market. These advances include process automation, including advanced robotics and task automation; the ability to efficiently customize products; supply chain integration and connectivity; global competitiveness, arising from the ability to adapt quickly to changing trends and demands; investment in enabling technologies, such as artificial intelligence and cybersecurity; growth of the digital workforce with digital skills; reduced operating costs through improved efficiency and process automation (Rosin et al., 2022).. These indicators are essential to assess a company's progress in its adoption of Industry 4.0 and its ability to take advantage of the benefits that this industrial revolution offers in terms of efficiency, competitiveness and agile response to changing market demands.

Industry 4.0 was born in 2011 at the Hannover Messe Fair in Germany, it is a change in the traditional industry model, currently it is a smart manufacturing strategy that is based on digitization, interconnection and automation of processes to increase efficiency, effectiveness and flexibility in production (Kagermann & Wahlster, 2022).

Combining the above, Industry 4.0 also known as the fourth industrial revolution focuses on the creation of smart factories where machines, systems and people are interconnected and share information in real time, so that manufacturing costs are significantly reduced by up to 30% (Yan et al., 2017). According to Carreiro and Martinho (2020) Cyber-Physical Systems applications are the fundamental pillars for the implementation of Industry 4.0 today worldwide.

Industry 4.0 indicators are key measures for assessing the adoption of advanced technologies and digital transformation in the business environment. These indicators cover a variety of aspects, such as the use of social media for business purposes, the implementation of cloud computing services, the development of mobile applications for users, the interconnection of devices through the Internet of Things (IoT), the implementation of cybersecurity measures, the collection and analysis of Big Data for decision making, the implementation of artificial intelligence systems, the use of 3D printing in production, and the adoption of robotic technologies. These indicators are essential to measure a company's maturity in adopting Industry 4.0 and its ability to take advantage of the benefits of digitization and automation today (Abdullah et al., 2022).

Several competitive models have emerged from the Technology Acceptance Model (TAM) in relation to information technology (IT) acceptance. Kim et al. (2009) emphasize that attitude toward technology use plays a crucial role by fully mediating the effects of salient beliefs on behavioral intention when attitude is strong, and partially when it is weak. This approach coincides with the perspective of Iyer et al. (2020) who note that some studies have integrated virtual learning environments in China, including standard TAM constructs, where attitude toward system use plays a key role.

Cognitive dissonance theory suggests that, for those who value consistency in their beliefs, when there is mismatch, the attitude will change to resolve the dissonance (Marikyan et al.,

2023; Xi et al., 2022).. In addition, attitude is considered a critical precursor to technology adoption and use, highlighting two attitudes, hedonic and utilitarian, which are examined to assess their influence on technological satisfaction (Liu et al., 2020). While the hedonic attitude may not directly lead to use, but influence satisfaction, the utilitarian attitude is linked to use and satisfaction (Ashraf et al., 2019). This approach is supported by Sampat and Sabat (2021) who state that perceived usefulness (PU) and perceived ease of use (PEOU) have a positive impact on attitude, leading to continued intention and satisfaction in the use of eGovernment services. Attitude, along with perceived usefulness and self-efficacy, can support user intention.

Additionally, Wang et al. (2019) suggest that leaders' attitude acts as a mediator of advanced information technology adoption, as well as technological factors and adoption intentions. However, so far, there is no scholarly evidence that has proven the mediating effect of executives' attitude on technology adoption in an organizational setting. Moreover, attitudinal and motivational states play a crucial role in the prediction of innovation, with examples of models derived from motivational approaches (Pierce & Delbecq, 1977)..

Attitude reflects a person's favorable or unfavorable disposition towards the adoption of a specific technology. Although it is not the only determinant of usage, as it is also influenced by system performance, which has an impact on technological intention and adoption. Attitude of use and intention to accept are endogenous factors, and previous studies have shown their positive impact on intention to use

new technologies (Iyer, 2018). Similarly, perceived ease of use of social networks is positively related to attitude toward their use (Sampat & Sabat, 2021).

In this context, a model is presented that examines how attitudes influence the purchase decision, known as the binary choice model, which focuses on the adoption of artificial intelligence (AI) at the individual level. It is used to determine adoption and usage behavior according to hedonistic and utilitarian attitudinal antecedents (Liu et al., 2020). Consequently, attitude influences the adoption intention of Industry 4.0 in the Organization. (Cordero et al., 2023).. Based on the literature review, a group of research questions has been defined, leading to 10 hypotheses to be demonstrated, giving rise to the model specified in Figure 1.

The hypotheses proposed are listed below and are intended to be validated in the commercial sector in the city of Cuenca in Ecuador, containing both the dependent and independent variables.

H1: Social networks positively influence the adoption of Industry 4.0 in the commercial sector.

H2: The cloud positively influences the adoption of Industry 4.0 in the commercial sector.

H3: Mobile applications positively influence the adoption of Industry 4.0 in the commercial sector.

H4: The internet of things positively influences the adoption of Industry 4.0 in the commercial sector.

H5: Cybersecurity positively influences the adoption of Industry 4.0 in the commercial sector.

H6: Big data or macro data positively influences the adoption of Industry 4.0 in the commercial sector.

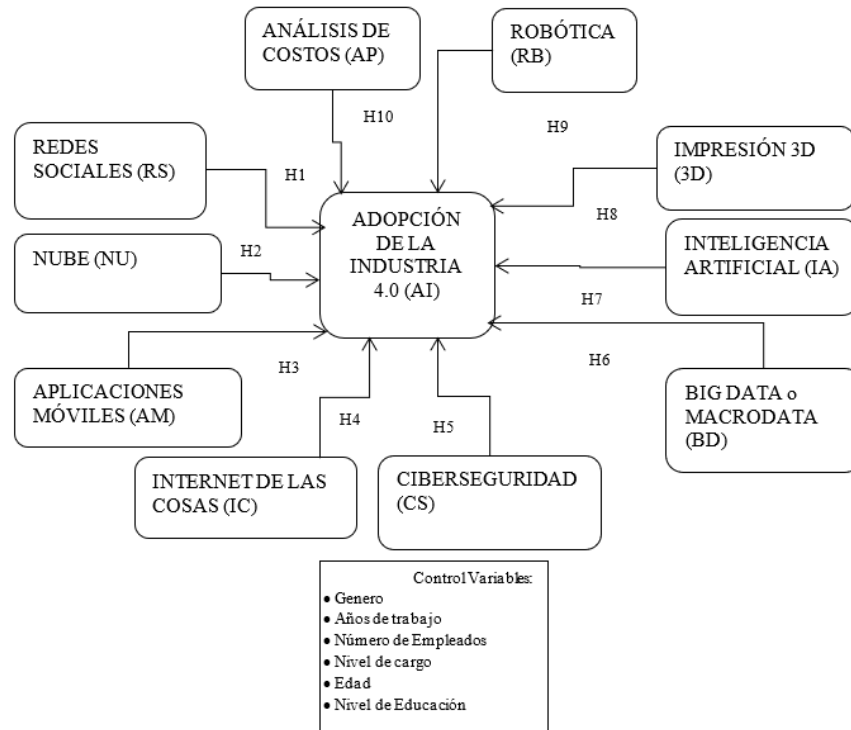
H7: Artificial intelligence positively influences the adoption of Industry 4.0 in the commercial sector.

H8: 3D printing positively influences the adoption of Industry 4.0 in the commercial sector.

H9: Robotics positively influences the adoption of Industry 4.0 in the commercial sector.

H10: Cost analysis positively influences the adoption of Industry 4.0 in the commercial sector.

Figure 1. Research model and hypothesis



Therefore, the general objective was to determine the adoption of Industry 4.0 in organizational management in the commercial sector in the city of Cuenca, using indicators such as social networks (RS), cloud computing services (UN), mobile applications for users (AM), internet of things (IC), cybersecurity activities (CS), big data analysis (BD), artificial intelligence (AI) system, use of 3D printing (3D), uses of robotics (RB) and cost analysis (AP); in order to improve operational efficiency, increase competitiveness and adapt to the demands of today's market.

Methodological aspects

This study was based on a non-experimental, descriptive-correlational, cross-sectional research, as noted by Snyder (2019). The choice of this methodological approach was due to its suitability to provide a comprehensive understanding of the current state of Industry 4.0 adoption in companies in the commercial sector in the city of Cuenca. The descriptive research allowed us to explore in detail the practices, technologies and processes used by these companies, while the correlational approach facilitated the analysis of possible relationships between the adoption of specific Industry 4.0 technologies and variables such as operational efficiency, competitiveness and market adaptation. By using a cross-sectional design, it was possible to collect information at a specific point in time, providing a snapshot of the current industry landscape in the region. This methodology provided a solid foundation for understanding the challenges and opportunities faced by companies in the commercial sector as they move towards full adoption of Industry 4.0 technologies.

Population

The participants in this study were employees in strategic positions such as managers and administrators of companies in the commercial sector located in the city of Cuenca (Ecuador). Table 1 details the information on active companies in the city of Cuenca obtained from the Superintendence of Companies (updated to October 20, 2023). In which, the population under study was 1800 (26.82%) of the registered companies of wholesale and retail trade; repair of motor vehicles and motorcycles.

Table 7. Absolute and relative frequencies of ISIC.

| | <i>n</i> | % |
|---|-------------|------------|
| A. Agriculture, livestock, forestry and fisheries | 131 | 1.95 |
| B. Mining and quarrying | 68 | 1.01 |
| C. Manufacturing industries | 506 | 7.54 |
| D. Electricity, gas, steam and air conditioning supply. | 16 | 0.24 |
| E. Water distribution; sewerage, waste management and sanitation activities. | 16 | 0.24 |
| F. Construction. | 537 | 8.00 |
| G. Wholesale and retail trade; repair of motor vehicles and motorcycles. | 1800 | 26.82 |
| H. Transportation and storage. | 548 | 8.17 |
| I. Lodging and food service activities. | 274 | 4.08 |
| J. Information and communication | 350 | 5.22 |
| K. Financial and insurance activities | 217 | 3.23 |
| L. Real estate activities | 244 | 3.64 |
| M. Professional, scientific and technical activities | 824 | 12.28 |
| N. Administrative and support service activities | 560 | 8.34 |
| P. Teaching. | 174 | 2.59 |
| Q. Human health care and social assistance activities. | 315 | 4.69 |
| R. Arts, entertainment and recreation. | 80 | 1.19 |
| S. Other service activities | 50 | 0.75 |
| T. Activities of households as employers; undifferentiated activities of households as producers of goods and services for own use. | 1 | 0.01 |
| Total | 6711 | 100 |

Source: Superintendencia of Companies (2023)

Sample

The selection of the companies was done by simple random probability sampling and stratified to ensure the representativeness of different sample sizes employees of strategic positions of companies in the commercial sector located in the city of Cuenca. The population size was 1800 according to the base of the directory of the Superintendence of Companies (2023) of the city of Cuenca according to the commercial sector, with a confidence level of 95%, with an expected proportion of 50%, with the effect of 1 and with a precision of 4.5% ($n = 376$). Sampling was carried out using the *EpiData* program.

Table 8. *Sampling.*

| Accuracy | Sample Size |
|----------|-------------|
| 0,100 | 1.797 |
| 0.500 | 1.720 |
| 0.900 | 1.563 |
| 1.300 | 1.367 |
| 1.700 | 1.168 |
| 2.100 | 986 |
| 2.500 | 829 |
| 2.900 | 699 |
| 3.300 | 592 |
| 3.700 | 505 |
| 4.100 | 434 |
| 4.500 | 376 |
| 4.900 | 328 |
| 5.300 | 288 |

The inclusion criteria were defined to include employees in strategic positions, such as managers and administrators, within companies in the commercial sector. A minimum

requirement of one year of work experience in the corresponding company was established. In addition, participants had to voluntarily accept to be part of the study, which was formalized by means of the informed consent provided by them.

On the other hand, exclusion criteria were established to delimit the scope of the study. Employees working in commercial enterprises that were not registered with the Superintendency of Companies or were in an initial stage of operation, i.e., commercial enterprises with less than one year of operation, were excluded. These exclusion criteria were applied to ensure the consistency and reliability of the data collected, focusing on established companies with experience in the commercial sector.

Variables and Instrument

First, an ad-hoc survey of the following socio-demographic variables of the commercial company employee was applied: gender, number of employees, years of work in the organization, position level, age and level of education. Subsequently, the questionnaire on the adoption of Industry 4.0 in organizational management in the commercial sector consisted of 27 questions divided into nine key dimensions related to the adoption of Industry 4.0.

Participants must evaluate respond in a Likert fashion in agreement with each question using a scale of 1 (Strongly Disagree) to 5 (Strongly Agree). These dimensions include the use of social media for business purposes, cloud computing services, mobile applications for users, Internet of Things (IoT),

cybersecurity activities, big data analytics (BIG DATA), artificial intelligence systems, use of 3D printing and uses of robotics. The questionnaire aims to collect data on the adoption of Industry 4.0 in Cuenca's commercial sector and provide valuable information on its impact on organizational management and business competitiveness in a constantly evolving business environment.

Statistical analysis in the context of the adoption of Industry 4.0 in the organizational management of the commercial sector in Cuenca can provide a quantitative perspective. First, structural equations allow modeling and analyzing the relationships between latent variables, offering a deeper insight into the complexity of the factors involved in the adoption of Industry 4.0. By applying this technique, interactions between technological infrastructure, personnel training, sensor integration and other key elements can be identified and quantified, providing a more precise understanding of their impact on business efficiency and competitiveness.

In addition, the application of structural equations and the evaluation of the reliability of the measures through coefficients such as Cronbach's alpha, composite reliability and AVE, together with discriminant validation, provide a solid basis for the quantitative evaluation of the adoption of Industry 4.0 in the organizational management of the commercial sector in Cuenca, Ecuador. These methods contribute to more informed decision making and the identification of areas for continuous improvement in this business transformation process.

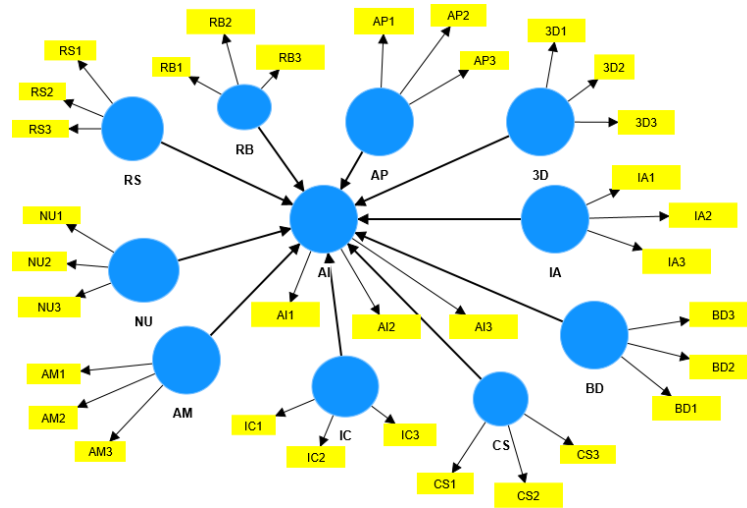
Table 9. *Descriptive analysis of the sociodemographic variables.*

| | n (%) |
|--|-----------|
| Genre | |
| Female | 167 (44%) |
| Male | 209 (56%) |
| Number of Employees | |
| 0-49 | 45 (12%) |
| 111-199 | 75 (20%) |
| 51-99 | 256 (68%) |
| Years of work in the organization | |
| < 5 | 14 (3.7%) |
| > 21 | 76 (20%) |
| Between 11 and 15 | 8 (2.1%) |
| Between 16 and 21 | 92 (24%) |
| Between 5 and 11 | 186 (49%) |
| Position level | |
| Strategic | 88 (23%) |
| Operative | 140 (37%) |
| Tactical | 148 (39%) |
| Age | |
| 25-35 | 37 (9.8%) |
| 35-45 | 108 (29%) |
| 45-55 | 163 (43%) |
| < 25 | 20 (5.3%) |
| > 55 | 48 (13%) |
| Level of Education | |
| Grade | 127 (34%) |
| Postgraduate | 211 (56%) |
| Secondary | 38 (10%) |

Analysis of the proposed model

The model proposed in this study was subjected to analysis using the partial least squares (PLS) technique, which was carried out using the Smart PLS 4 software. This methodological choice is based on the advantages offered by the PLS approach in terms of flexibility and ability to handle complex models with relatively small sample sizes. In addition, PLS is widely recognized for its effectiveness in exploring relationships between latent and observed variables, which makes it a suitable tool for the analysis of theoretical models such as the one proposed in this study. Figure 2 shows the model relationships in the software tool.

Figure 2. Smart PLS model.



Measurement Model

Cronbach's alpha (CA), composite reliability (CR), average variance extracted (AVE) and discriminant validity are

determined here; Figure 3 illustrates the results of the measurement model.

Figure 3. Measurement model

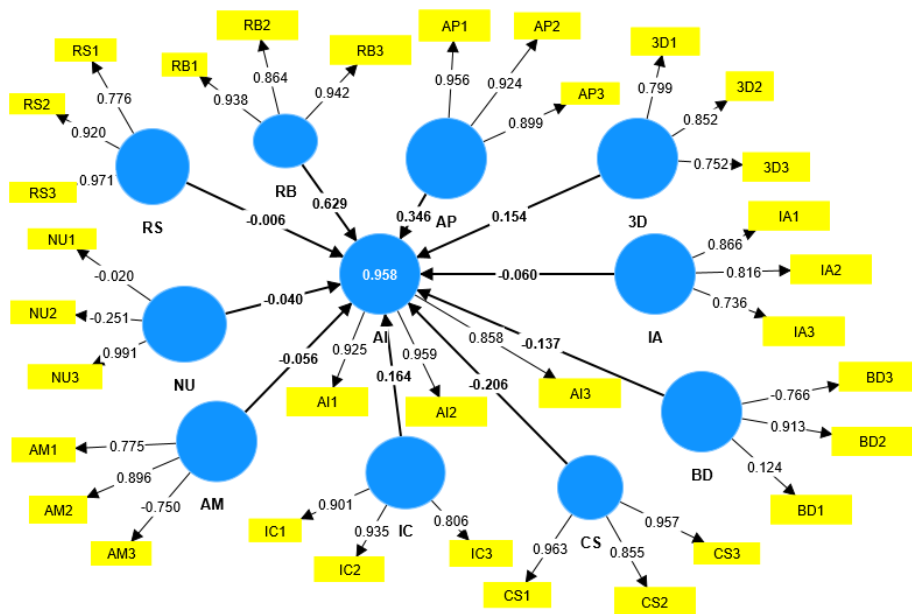


Table 4 shows that the Cronbach's alpha (factor loading) of the indicators is greater than 0.7, suggesting that the indicators are valid for the most part. However, some exceptions were identified that may require a more detailed review of the text of the indicators or associated questions. This review is crucial to ensure the consistency and reliability of the measurement instruments used in the study, which in turn contributes to the validity of the results obtained.

As for the reliability of the constructs, it was evaluated by means of the composite reliability (CR) and alpha reliability

(AC) values, where a value higher than 0.7 is considered acceptable. In Table 4, it can be observed that the constructs show a satisfactory level of internal consistency reliability, since all of them present values higher than 0.7. This indicates that the constructs are well defined and that the items associated with each one of them consistently measure the phenomenon to be studied.

In addition, the convergent validity of each construct was analyzed through the average variance extracted (AVE) value. A value of AVE greater than 0.5 is considered acceptable. In Table 4, it can be observed that all constructs present an AVE value greater than 0.5, suggesting that the items associated with each construct converge adequately in the measurement of the underlying phenomenon. This finding reinforces the validity of the constructs and supports the interpretation of the results obtained in the structural analysis of the proposed model.

Table 4. *Structural model measurement instrument: Reliability and convergent validity.*

| <i>Variable</i> | <i>Indicator</i> | <i>Factor Load</i> | <i>CA</i> | <i>CR</i> | <i>AVE</i> |
|------------------------------------|------------------|--------------------|-----------|-----------|------------|
| Social Networking (SR) | RS1 | 0.776 | 0.905 | 1.112 | 0.797 |
| | RS2 | 0.92 | | | |
| | RS3 | 0.971 | | | |
| Cloud Computing Services (UN) | NU1 | -0.02 | 0.308 | 0.883 | 0.349 |
| | NU2 | -0.251 | | | |
| | NU3 | 0.991 | | | |
| Mobile Applications for Users (AM) | AM1 | 0.775 | -0.525 | 0.815 | 0.655 |
| | AM2 | 0.896 | | | |
| | AM3 | -0.75 | | | |
| | IC1 | 0.901 | 0.858 | 0.888 | 0.778 |

| | | | | | |
|-------------------------------------|-----|--------|--------|-------|-------|
| Internet of Things (IoT) | IC2 | 0.935 | | | |
| | IC2 | 0.806 | | | |
| Cybersecurity Activities (CS) | CS1 | 0.963 | | | |
| | CS2 | 0.855 | 0.917 | 0.95 | 0.858 |
| | CS3 | 0.957 | | | |
| Macro data analysis (BD) | BD1 | 0.124 | | | |
| | BD2 | 0.913 | -0.506 | 0.7 | 0.479 |
| | BD3 | -0.766 | | | |
| Artificial intelligence (AI) system | IA1 | 0.866 | | | |
| | IA2 | 0.816 | 0.738 | 0.766 | 0.653 |
| | IA3 | 0.736 | | | |
| Use of 3D printing (3D) | 3D1 | 0.799 | | | |
| | 3D2 | 0.852 | 0.723 | 0.73 | 0.644 |
| | 3D3 | 0.752 | | | |
| Robotics applications (RB9) | RB1 | 0.938 | | | |
| | RB2 | 0.864 | 0.903 | 0.921 | 0.838 |
| | RB3 | 0.942 | | | |
| Adoption of Industry 4.0 (IA) | AI1 | 0.925 | | | |
| | AI2 | 0.959 | 0.901 | 0.908 | 0.837 |
| | AI3 | 0.858 | | | |
| Cost analysis (PA) | AP1 | 0.956 | | | |
| | AP2 | 0.924 | 0.918 | 0.937 | 0.859 |
| | AP3 | 0.899 | | | |

Note: CA= Cronbach's alpha, CR= Composite Reliability, AVE= Average Extracted Variance.

The discriminant validity analysis was performed on the basis of Fornell & Larcker, which determines whether the value of the square root of the mean extracted variance is greater than the inter-construct correlations; it is 100% satisfied for all cases. For this reason, it can be concluded that the model meets the discriminant validity criterion and that the latent variables are clearly differentiated (see Table 5).

Table 5. Discriminant validity. Fornell-Larcker criterion test.

| | 3D | AI | AM | AP | BD | CS | IA | IC | NU | RB | RS |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|
| 3D | 0.802 | | | | | | | | | | |
| AI | 0.898 | 0.915 | | | | | | | | | |
| AM | -0.842 | -0.868 | 0.809 | | | | | | | | |
| AP | 0.596 | 0.786 | -0.615 | 0.927 | | | | | | | |
| BD | 0.775 | 0.759 | -0.665 | 0.541 | 0.692 | | | | | | |
| CS | 0.802 | 0.784 | -0.711 | 0.551 | 0.876 | 0.926 | | | | | |
| IA | -0.77 | -0.774 | 0.716 | -0.529 | -0.811 | -0.728 | 0.808 | | | | |
| IC | 0.763 | 0.689 | -0.744 | 0.296 | 0.629 | 0.73 | -0.602 | 0.882 | | | |
| NU | -0.68 | -0.709 | 0.704 | -0.543 | -0.602 | -0.718 | 0.509 | -0.599 | 0.59 | | |
| RB | 0.896 | 0.918 | -0.818 | 0.637 | 0.887 | 0.898 | -0.818 | 0.698 | -0.7 | 0.915 | |
| RS | -0.024 | 0.079 | -0.064 | 0.245 | 0.124 | 0.173 | -0.067 | -0.082 | -0.263 | 0.082 | 0.893 |

The measurement model is validated after analyzing its parameters, which implies that the instrument is statistically valid and reliable and that the theory is supported.

Structural model

It was executed based on the evaluation of the weight and magnitude of the relationships between the different variables; this is done based on the R index², the f effect², the standardized path coefficients β and the *Bootstrapping* analysis (See Figure 3). R^2 , determines the predictive power of the model, values higher than 0.67, 0.33 and 0.19, denoted as substantial, moderate and weak are feasible. Table 6, exhibits values that ensure the percentage of variability of the construct which ratifies the predictive characteristic of the model. On the other hand, f^2 identifies the impact on a dependent construct of a variable, if $f^2 > 0.35$, it implies large

size; $0.15 < f^2 \leq 0.35$ implies medium effect and $0.02 < f^2 \leq 0.15$, represents small effect size (see Table 7).

Table 6. *R² of the dependent variables.*

| | <i>R Square</i> | <i>R Adjusted square</i> | <i>Level</i> |
|-----------------------------|-----------------|--------------------------|--------------|
| ADOPTION OF INDUSTRY 4.0 | 0.958 | 0.957 | Substantial |

The results obtained show that the adjusted R-squared of the model reaches a considerably high value of 0.957, indicating that the proposed model is highly explanatory and capable of explaining 95.7% of the variance in the Industry 4.0 adoption variable (Table 6). This finding suggests that the variables included in the model have a significant influence on the adoption of Industry 4.0 within the business context studied.

Such a high adjusted R-squared reflects the model's ability to capture and explain the variability observed in the dependent variable. This level of fit suggests that the independent variables considered in the model are strongly related to the Industry 4.0 adoption variable and are contributing substantially to its explanation. This supports the robustness of the proposed model and suggests that the relationships identified between the variables are highly statistically and practically significant.

In practical terms, such a high adjusted R-squared indicates that the model has high predictive power and can be used to

accurately forecast the level of Industry 4.0 adoption in different business contexts. This can be of great use to companies and decision makers, as it allows them to better understand the factors that influence the adoption of these technologies and develop effective strategies to promote their implementation and maximize their impact on organizational performance.

Table 7. *Effect size f^2 .*

| | Adoption of Industry 4.0 | Category |
|----|---------------------------------|-----------------|
| 3D | 0.075 | Small |
| AM | 0.013 | Small |
| AP | 1.242 | Great effect |
| BD | 0.064 | Small |
| CS | 0.114 | Medium |
| IA | 0.022 | Small |
| IC | 0.157 | Medium |
| NU | 0.013 | Small |
| RB | 0.655 | Medium |
| RS | 0.001 | Small |

Table 7, highlights that cost analysis (PA) has great effect on the adoption of Industry 4.0. This suggests that understanding and managing costs are directly related to the likelihood or speed of Industry 4.0 adoption. An effective approach to cost management could be a significant driver for the successful implementation of Industry 4.0 in an organization. While cybersecurity (CS) activities, internet of things (IC) and robotics (RB) uses have a medium effect on Industry 4.0 adoption.

Hypothesis testing

The *bootstrapping* analysis is the resampling procedure that treats the observed sample as if it represented the population; Figure 4 shows the bootstrap values of the model. In addition, this analysis allows testing of the hypotheses by calculating the standard error of the parameters and *Student's t* values; in this area, indicators whose *Student's t* is greater than 1.96 are considered to be significant. Table 8 shows the relationships between the constructs of the model through the standardized beta paths, the standard error, the *Student's t* value, the significance level and the acceptance or rejection of the hypothesis.

Figure 3. Bootstrapping

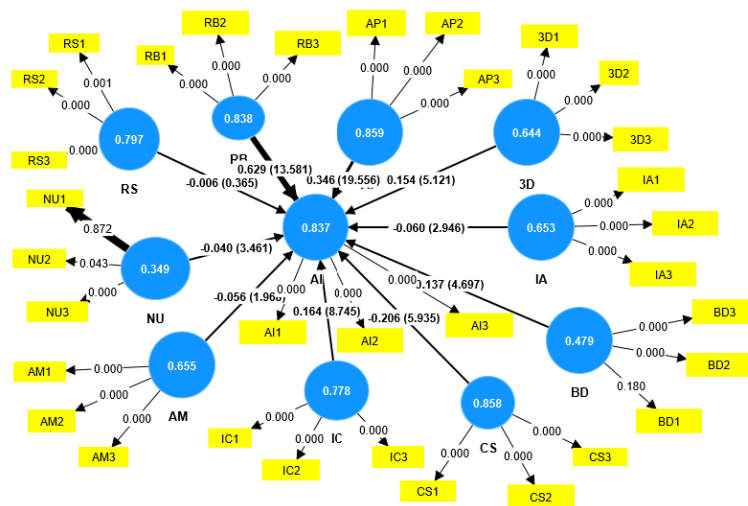


Table 8. Summary of structural model results.

| | β | Standard deviation | t - student | p-values | Significance level | Results |
|--------------|---------|--------------------|-------------|----------|--------------------|----------|
| H1:RS -> AI | -0.006 | 0.015 | 0.365 | 0.715 | | Rejected |
| H2:NU -> AI | -0.04 | 0.011 | 3.461 | 0.001 | ** | Accepted |
| H3:AM -> AI | -0.056 | 0.028 | 1.968 | 0.049 | * | Accepted |
| H4: IC -> AI | 0.164 | 0.019 | 8.745 | 0 | *** | Accepted |
| H5:CS -> AI | -0.206 | 0.035 | 5.935 | 0 | *** | Accepted |
| H6:BD -> AI | -0.137 | 0.029 | 4.697 | 0 | *** | Accepted |
| H8:3D -> AI | 0.154 | 0.03 | 5.121 | 0 | *** | Accepted |
| H9:RB -> AI | 0.629 | 0.046 | 13.581 | 0 | *** | Accepted |
| H10:AP -> AI | 0.346 | 0.018 | 19.556 | 0 | *** | Accepted |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

The accepted hypotheses, with a high level of significance are: H4 corresponding to the indicator internet of things (IC), H5 corresponding to the indicator cyber security (CS), H6 corresponding to the indicator big data (BD); accepted hypotheses with a medium level of significance are: H2 corresponding to the cloud applications indicator (UN) and H7 corresponding to the industry adoption indicator (IA) and lastly accepted hypotheses with a low level of significance are: the H3 corresponding to the mobile applications indicator (AM).

The model results show that the variables with the highest positive and significant relationship with the adoption of Industry 4.0 with the following hypotheses: mobile

applications, cybersecurity, big data), 3D printing, cost analysis and robotics.

Conclusions

The development of this study has represented a significant effort aimed at understanding in depth the determining factors in the adoption of Industry 4.0 in the business environment. Throughout this research, we have sought to identify and analyze the most relevant indicators that influence the process of implementing technologies and practices associated with this new industrial revolution. In this sense, the successful fulfillment of the objectives set has shed light on the nature of these influences and their impact on contemporary business management.

The results obtained have confirmed the validity of the hypotheses put forward, suggesting a positive correlation between the variables analyzed and the adoption of Industry 4.0. This corroboration provides a solid basis for understanding how factors such as automation, data connectivity, artificial intelligence and other emerging technologies are shaping the way companies operate and compete in today's marketplace.

It is important to note that while some variables exhibit a more marked influence on Industry 4.0 adoption, others show an impact of medium magnitude. However, the latter group should not be underestimated, as their potential to increase their influence over time is significant. This finding suggests that as these variables develop and become more deeply integrated into business operations, they could play an even

more crucial role in improving productivity and achieving higher levels of efficiency and competitiveness.

In this sense, the results of this research not only provide a snapshot of the current situation in terms of Industry 4.0 adoption, but also point towards the future, suggesting areas of focus and development that could be key for companies looking to stay ahead in an increasingly digitized and globalized business environment.

Ultimately, this research not only contributes to the existing body of knowledge on Industry 4.0 and its impact on business management, but also offers practical insights for business leaders and decision makers seeking to make the most of the opportunities this new industrial era has to offer. In this regard, the findings of this study have the potential to inform more effective and forward-looking business strategies, helping organizations adapt and thrive in an ever-changing business environment.

References

- Abdullah, F. M., Al-Ahmari, A. M., & Anwar, S. (2022). Exploring Key Decisive Factors in Manufacturing Strategies in the Adoption of Industry 4.0 by Using the Fuzzy DEMATEL Method. *Processes*, 10(5). <https://doi.org/10.3390/pr10050987>.
- Agostini, L., & Filippini, R. (2019). Organizational and managerial challenges in the path toward Industry 4.0. *European Journal of Innovation Management*, 22(3), 406-421. <https://doi.org/10.1108/EJIM-02-2018-0030>.
- Alcácer, V., & Cruz-Machado, V. (2019). Scanning the Industry

- 4.0: A Literature Review on Technologies for Manufacturing Systems. *Engineering Science and Technology, an International Journal*, 22(3), 899-919. <https://doi.org/10.1016/j.jestch.2019.01.006>
- Ardito, L., Petruzzelli, A. M., Panniello, U., & Garavelli, A. C. (2019). Towards Industry 4.0: Mapping digital technologies for supply chain management-marketing integration. *Business Process Management Journal*, 25(2), 323-346. <https://doi.org/10.1108/BPMJ-04-2017-0088>.
- Ashraf, R. U., Hou, F., & Ahmad, W. (2019). Understanding Continuance Intention to Use Social Media in China: The Roles of Personality Drivers, Hedonic Value, and Utilitarian Value. *International Journal of Human-Computer Interaction*, 35(13), 1216-1228. <https://doi.org/10.1080/10447318.2018.1519145>.
- Awan, U., Sroufe, R., & Shahbaz, M. (2021). Industry 4.0 and the circular economy: A literature review and recommendations for future research. *Business Strategy and the Environment*, 30(4), 2038-2060. <https://doi.org/10.1002/bse.2731>
- Barreto, L., Amaral, A., & Pereira, T. (2017). Industry 4.0 implications in logistics: an overview. *Procedia Manufacturing*, 13, 1245-1252. <https://doi.org/10.1016/j.promfg.2017.09.045>.
- Cabrera, D., Cerrada, M., Macancela, J. C., Sigüencia, J., & Sánchez, R. V. (2022). Technology selection for Industry 4.0 oriented condition-based monitoring system: A case study in the paper mills industry. *IFAC-PapersOnLine*, 55(19), 211-216. <https://doi.org/10.1016/j.ifacol.2022.09.209>.

- Carreiro, R., & Martinho, J. L. (2020). An Industry 4.0 maturity model proposal. *Journal of Manufacturing Technology Management*, 31(5), 1023-1043. <https://doi.org/10.1108/JMTM-09-2018-0284>.
- Cordero, D., Altamirano, K. L., Parra, J. O., & Espinoza, W. S. (2023). Intention to Adopt Industry 4.0 by Organizations in Colombia, Ecuador, Mexico, Panama, and Peru. *IEEE Access*, 11(November 2022), 8362-8386. <https://doi.org/10.1109/ACCESS.2023.3238384>.
- De Propriis, L., & Bellandi, M. (2021). Regions beyond Industry 4.0. *Regional Studies*, 55(10-11), 1609-1616. <https://doi.org/10.1080/00343404.2021.1974374>.
- Dongfang, W., Ponce, P., Yu, Z., Ponce, K., & Tanveer, M. (2022). The future of industry 4.0 and the circular economy in Chinese supply chain: In the Era of post-COVID-19 pandemic. *Operations Management Research*, 15(1-2), 342-356. <https://doi.org/10.1007/s12063-021-00220-0>.
- García-Reyes, H., Avilés-González, J., & Avilés-Sacoto, S. V. (2022). A Model to Become a Supply Chain 4.0 Based on a Digital Maturity Perspective. *Procedia Computer Science*, 200(2019), 1058-1067. <https://doi.org/10.1016/j.procs.2022.01.305>.
- Ghobakhloo, M. (2018). The future of manufacturing industry: a strategic roadmap toward Industry 4.0. *Journal of Manufacturing Technology Management*, 29(6), 910-936. <https://doi.org/10.1108/JMTM-02-2018-0057>
- Iyer, A. (2018). Moving from Industry 2.0 to Industry 4.0: A case study from India on leapfrogging in smart manufacturing. *Procedia Manufacturing*, 21, 663-670. <https://doi.org/10.1016/j.promfg.2018.02.169>.

- Iyer, S., Pani, A. K., & Gurunathan, L. (2020). User Adoption of eHRM - An Empirical Investigation of Individual Adoption Factors Using Technology Acceptance Model. In *IFIP Advances in Information and Communication Technology* (Vol. 617). Springer International Publishing. https://doi.org/10.1007/978-3-030-64849-7_21
- Jagatheesaperumal, S. K., Rahouti, M., Ahmad, K., Al-Fuqaha, A., & Guizani, M. (2022). The Duo of Artificial Intelligence and Big Data for Industry 4.0: Applications, Techniques, Challenges, and Future Research Directions. *IEEE Internet of Things Journal*, 9(15), 12861-12885. <https://doi.org/10.1109/JIOT.2021.3139827>.
- Kagermann, H., & Wahlster, W. (2022). Ten Years of Industrie 4.0. *Sci*, 4(3), 1-10. <https://doi.org/10.3390/sci4030026>. <https://doi.org/10.3390/sci4030026>
- Kim, Y. J., Chun, J. U., & Song, J. (2009). Investigating the role of attitude in technology acceptance from an attitude strength perspective. *International Journal of Information Management*, 29(1), 67-77. <https://doi.org/10.1016/j.ijinfomgt.2008.01.011>.
- Liu, F., Lim, E. T. K., Li, H., Tan, C. W., & Cyr, D. (2020). Disentangling utilitarian and hedonic consumption behavior in online shopping: An expectation disconfirmation perspective. *Information and Management*, 57(3), 103199. <https://doi.org/10.1016/j.im.2019.103199>.
- Marikyan, D., Papagiannidis, S., & Alamanos, E. (2023). Cognitive Dissonance in Technology Adoption: A Study of Smart Home Users. *Information Systems Frontiers*, 25(3), 1101-1123. <https://doi.org/10.1007/s10796-020-10042-3>.

- Masood, T., & Sonntag, P. (2020). Industry 4.0: Adoption challenges and benefits for SMEs. *Computers in Industry*, 121(103261), 1-26. <https://doi.org/10.1377/hlthaff.2018.0059>
- Nagy, J., Oláh, J., Erdei, E., Máté, D., & Popp, J. (2018). The role and impact of industry 4.0 and the internet of things on the business strategy of the value chain-the case of Hungary. *Sustainability (Switzerland)*, 10(10). <https://doi.org/10.3390/su10103491>.
- Nascimento, D. L. L. M., Alencastro, V., Quelhas, O. L. G., Caiado, R. G. G. G., Garza-Reyes, J. A., Lona, L. R., & Tortorella, G. (2019). Exploring Industry 4.0 technologies to enable circular economy practices in a manufacturing context: A business model proposal. *Journal of Manufacturing Technology Management*, 30(3), 607-627. <https://doi.org/10.1108/JMTM-03-2018-0071>.
- Pierce, J. L., & Delbecq, A. L. (1977). Organization Structure, Individual Attitudes and Innovation. *Academy of Management Review*, 2(1), 27-37. <https://doi.org/10.5465/amr.1977.4409154>
- Rosin, F., Forget, P., Lamouri, S., & Pellerin, R. (2022). Enhancing the Decision-Making Process through Industry 4.0 Technologies. *Sustainability (Switzerland)*, 14(1), 1-35. <https://doi.org/10.3390/su14010461>.
- Sampat, B. H., & Sabat, K. C. (2021). What leads consumers to spread eWOM for Food Ordering Apps? *Journal of International Technology and Information Management*, 29(4), 50-77. <https://doi.org/10.58729/1941-6679.1480>
- Saucedo-Martínez, J. A., Pérez-Lara, M., Marmolejo-Saucedo, J. A., Salais-Fierro, T. E., & Vasant, P. (2018). Industry 4.0 framework for management and operations: a review.

- Journal of Ambient Intelligence and Humanized Computing*, 9(3), 789-801.
<https://doi.org/10.1007/s12652-017-0533-1>.
- Senna, P. P., Ferreira, L. M. D. F., Barros, A. C., Bonnín Roca, J., & Magalhães, V. (2022). Prioritizing barriers for the adoption of Industry 4.0 technologies. *Computers and Industrial Engineering*, 171, 1-12.
<https://doi.org/10.1016/j.cie.2022.108428>.
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104(July), 333-339.
<https://doi.org/10.1016/j.jbusres.2019.07.039>
- Superintendence of Companies (2018). Retrieved from
<https://www.supercias.gob.ec/portalscv/index.htm>
- Thoben, K. D., Wiesner, S. A., & Wuest, T. (2017). "Industrie 4.0" and smart manufacturing-a review of research issues and application examples. *International Journal of Automation Technology*, 11(1), 4-16.
<https://doi.org/10.20965/ijat.2017.p0004>.
- Tobar-Pesántez, L., & Solano-Gallegos, S. (2018). The importance of small and medium enterprises in the city of cuenca-ecuador and their contribution to the creation of employment. *Academy of Accounting and Financial Studies Journal*, 22(2), 2635.
- Wang, L., Törngren, M., & Onori, M. (2015). Current status and advancement of cyber-physical systems in manufacturing. *Journal of Manufacturing Systems*, 37(2), 517-527. <https://doi.org/10.1016/j.jmsy.2015.04.008>
- Wang, Y., Jin, L., & Mao, H. (2019). Farmer Cooperatives' Intention to Adopt Agricultural Information Technology- Mediating Effects of Attitude. *Information Systems*

- Frontiers*, 21(3), 565-580.
<http://link.springer.com/10.1007/s10796-019-09909-x>
- Xi, W., Baymuminova, N., Zhang, Y. W., & Xu, S. N. (2022). Cognitive Dissonance and Public Compliance, and Their Impact on Business Performance in Hotel Industry. *Sustainability (Switzerland)*, 14(22), 1-20. <https://doi.org/10.3390/su142214907>.
- Yan, J., Meng, Y., Lu, L., & Li, L. (2017). Industrial Big Data in an Industry 4.0 Environment: Challenges, Schemes, and Applications for Predictive Maintenance. *IEEE Access*, 5, 23484-23491. <https://doi.org/10.1109/ACCESS.2017.2765544>.
- Zhang, L. (2021). Why the industrial revolution started in 18th century Britain, not China, from the perspective of globalization. *Frontiers of Economics in China*, 16(1), 124-169. <https://doi.org/10.3868/s060-013-021-0006-5>

Economic activity and its impact on the delinquency rate of private banks in Ecuador

Econ. Víctor Quinde Rosales, MSc.

Docente-Investigador, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
vquinde@uagraria.edu.ec
<https://orcid.org/0000-0001-9617-8054>

Ing. Rina Bucaram Leverone, PhD.

Docente-Investigadora, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
rbucaram@uagraria.edu.ec
<https://orcid.org/0000-0003-4456-7095>

Econ. Francisco Quinde Rosales, MSc.

Docente-Investigador, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
fquinde@uagraria.edu.ec
<https://orcid.org/0000-0001-9243-3513>

Introduction

The Ecuadorian economy, like others in recent decades, has experienced significant fluctuations in its development. These can be explained by factors of production, technology and natural resources, where oil exports stand out. However, it cannot be said that Ecuador's true economic growth can be measured only by oil revenues.

In this context, analyzing how economic activity affects delinquency in Ecuador's private banks is crucial to understand how economic activity impacts financial stability, especially in the private banking sector, where delinquency can be a key indicator of economic health. Therefore, this chapter addresses this question through a comprehensive

analysis of the relationship between economic activity as measured by the Index of Short-Term Economic Activity (IDEAC) and private bank delinquency during the period 2013-2019.

In the framework of this study, delinquency is addressed through the total number of defaulted loans in the different segments of private banks, classified by size. It is essential to understand the interrelationships between these variables, as they provide a comprehensive perspective of the country's current economic outlook.

In this sense, the level of indebtedness and the population's payment capacity are determining factors in financial stability, being crucial to avoid falls in the standard of living and to prevent difficulties in the recovery of the gross portfolio in environments with high delinquency rates.

The main objective is to establish whether there is a significant relationship between these two factors and to what extent economic activity influences bank delinquency. To achieve this, an ordinary least squares econometric model will be used to identify patterns and trends in the data.

This chapter contributes to the field of economics by providing a deeper understanding of how economic activity affects the financial stability of private banking. The results obtained will not only benefit researchers and academics interested in the subject, but also economic and financial policy makers who seek to maintain the stability of the banking system in a changing economic context.

Empirical evidence of the relationship between macroeconomic variables and bank delinquencies

The relationship between macroeconomic variables and bank delinquency has been the subject of numerous studies over time, addressing different contexts and regions. This relationship has been widely explored due to its relevance for the financial and economic stability of countries. In this regard, several authors have explored how factors external to banking institutions can influence the quality of their assets and, in particular, the level of delinquency in their loan portfolios.

In this regard, Louzis et al. (2012) analyzed the impact of macroeconomic and bank-specific variables on loan delinquency in Greece, finding that unemployment, GDP and government debt yields are key determinants of household and corporate loan delinquency.

Authors such as Saurina and Jiménez (2006) studied the various determinants of bank delinquency in Spain, finding that credit growth, interest rates and the economic cycle are relevant factors. These results highlight the importance of considering macroeconomic conditions when analyzing the quality of banks' loan portfolios.

Hanifan (2017) on the other hand, focused on Indonesian banks and used a GMM time series model to assess the impact of different macroeconomic variables on NPLs. The results indicated that both economic growth and labor market conditions are crucial determinants of credit quality. This study also indicated that macroeconomic policies can play an

important role in mitigating the adverse effects on bank delinquency.

On the other hand, Singh and Sharma's (2016) work on banks in India highlights how inflation and interest rates affect delinquency. They found that high interest rates and high inflation tend to deteriorate borrowers' ability to repay, thus increasing delinquency. This study provides empirical evidence on how changes in monetary policy can influence the financial health of banks, which is crucial for policymakers and regulators.

In the same line of research, Trenca et al. (2015) analyzed the impact of macroeconomic factors on bank liquidity in a particular group of countries recently affected by adverse economic and financial conditions: Greece, Portugal, Spain, Italy, Croatia and Cyprus, which included 40 commercial banks. Through a GMM model they evidenced that the macroeconomic factors that determine the level of liquidity are inflation rate, government deficit, unemployment rate, gross domestic product and liquidity index of the previous period.

This evidence suggests the importance of considering and closely monitoring macroeconomic variables to understand and effectively manage liquidity in the banking sector. Financial institutions should consider the macroeconomic environment when making liquidity management decisions, as factors such as inflation, unemployment and economic growth can significantly affect banks' ability to meet their short-term payment obligations.

Establishment of the methodological proposal

After having reviewed the information on the theoretical and scientific bases related to the present study, which contribute to the reader's knowledge and understanding, several scientific bases cited by other authors were identified that address topics such as credit, risk and its different typologies, the delinquency rate and its possible implications in business activity, as well as the associated measurement methods. We will now proceed to detail our methodological aspects.

The independent variables considered in this study are: the Index of Business Activity (IDEAC), the total liquidity of the economy (M2) and the Gross Domestic Product of Ecuador (GDP). On the other hand, the dependent variable responds to the delinquency rate of the total portfolio of private banks in Ecuador. These data were collected through official sources such as the web page of the Superintendency of Banks, where quarterly data on the delinquency rate of private banks of different scales were obtained. Likewise, the official web page of the Central Bank of Ecuador provided relevant information on the Economic Activity Index (IDEAC).

Finally, Eviews 9 econometric software will be used to analyze the possible relationship between the study variables by applying a multiple linear regression model. In addition, homoscedasticity, normality of residuals and autocorrelation tests will be carried out to validate the assumptions of the model.

Unit Root Test

For the calculation, it is based on the estimation of the following general equation:

$$\Delta X_t = \beta_0 + \beta_1 t + \gamma X_{t-1} + \sum_{j=1}^p \delta_j \Delta X_{t-j} + \varepsilon_t,$$

To corroborate the existence of a unit root, it is equivalent to testing the hypothesis $H_0: \gamma = 0$ against $H_1: \gamma < 0$.

For the present study, the Unit Root test will be performed for each of the variables.

Table 1 shows that the ADF statistic of the IDEAC variable is lower than the critical values for the 1%, 5%, and 10% significance level, the null hypothesis of the presence of a unit root in the time series of the Short-Term Activity Index is rejected. Therefore, it is concluded that the time series of the Short-term Activity Index is stationary, which suggests that the variable does not present a trend or non-stationary behavior.

Table 10. ADF Test variable IDEAC

| | t-Statistic | Prob.* |
|--|-------------|--------|
| Augmented Dickey-Fuller test statistic | -6.319835 | 0.0000 |
| Test critical values: 1% level | -3.769597 | |
| 5% level | -3.004861 | |
| 10% level | -2.642242 | |

Note: Prepared by the authors, 2023.

Since the ADF statistic of the total liquidity of the economy (m2) variable is less than the critical values at the 5% and 10% levels, we can reject the null hypothesis that the series has a unit root at these significance levels. The associated probability of 0.0103 reinforces this conclusion, indicating significance at 5%. This suggests that the time series of the m2 variable is stationary at least at the 5% significance level Table 2. In practical terms, the stationarity of the M2 series implies that fluctuations in the series are temporary and tend to revert to a mean over time.

Table 11. *ADF Test Variable total liquidity*

| | t-Statistic | Prob.*. |
|--|-------------|---------|
| Augmented Dickey-Fuller test statistic | -3.685638 | 0.0103 |
| Test critical values: 1% level | -3.699871 | |
| 5% level | -2.976263 | |
| 10% level | -2.627420 | |

Note: Prepared by the authors, 2023.

With respect to the delinquency variable, this variable turned out to be stationary after applying first differences. With a p-value of 0.0182 we proceed to reject the null hypothesis that indicates the presence of a unit root and allows us to express that the series is stationary in I(1) (see Table 3).

Table 12. *ADF Variable Delinquency Test*

| | | t-Statistic | Prob.* |
|--|-----------|-------------|--------|
| Augmented Dickey-Fuller test statistic | | -3.449436 | 0.0182 |
| Test critical values: | 1% level | -3.711457 | |
| | 5% level | -2.981038 | |
| | 10% level | -2.629906 | |

Note: Prepared by the authors, 2023.

Finally, GDP does not present a unit root because of its probability whose value is less than 0.05, giving clear indications to reject the H_0 and express that the variable is stationary.

Table 13. *ADF Test variable GDP*

| | | t-Statistic | Prob.* |
|--|-----------|-------------|--------|
| Augmented Dickey-Fuller test statistic | | -4.648723 | 0.0011 |
| Test critical values: | 1% level | -3.711457 | |
| | 5% level | -2.981038 | |
| | 10% level | -2.629906 | |

Note: Prepared by the authors, 2023.

Econometric modeling

Regression analysis is a fundamental tool in economic and financial research to study the relationships between variables. According to Gujarati and Porter (2009), multiple linear regression is a statistical method that allows analyzing how a dependent variable is related to two or more independent variables. In this context, it seeks to model the functional

$$MCT = \beta_0 + \beta_1 * X_{IDEAC} + \beta_2 * X_{GDP} + \beta_3 * X_{LBP} + u_i$$

relationship between variables by estimating coefficients that quantify the impact of the independent variables on the dependent variable. The general model to be estimated is detailed below:

Where:

The MCT variable corresponds to the delinquency value of the total portfolio, X_IDEAC corresponds to the percentage value of the Short-Term Economic Activity Index, and X_GDP refers to the percentage value of the Gross Domestic Product. The variable X_LBP refers to the percentage value of private banks' liquidity.

Impact of economic activity on private bank delinquency rates in Ecuador

The estimated econometric model reveals that both the Index of Economic Activity (IDEAC) and the Gross Domestic Product (GDP) have a significant and negative impact on the delinquency of large private banks in Ecuador, suggesting that better economic performance is associated with lower levels of delinquency Table 5.

Specifically, it is observed that a one unit increase in IDEAC is associated with a decrease of 0.031729 units in large private banks, while a one unit increase in GDP is associated with a decrease of 0.145245 units, holding all other variables constant. Although Total Liquidity of the economy (M2) presents a positive coefficient, it is not statistically significant. The R-squared of the model indicates that the variability of

large banks' NPLs is explained in about 57.04% by the independent variables included in the model.

However, the presence of positive autocorrelation in the residuals, evidenced by the value of the Durbin-Watson statistic of 0.775874, should be noted, suggesting that the observations may be correlated over time and requiring additional adjustments in the analysis to ensure the validity of the inferences made.

Table 14. *Estimated non-performing loans of large private banks*

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| C | 8.562619 | 1.717617 | 4.985173 | 0.0000 |
| IDEAC | -0.031729 | 0.011163 | -2.842235 | 0.0090 |
| GDP | -0.145245 | 0.034291 | -4.235653 | 0.0003 |
| M2 | 9.130622 | 5.370548 | 1.700129 | 0.1020 |
| R-squared | 0.570367 | Mean dependent var | | 3.507399 |
| Adjusted R-squared | 0.516663 | S.D. dependent var | | 0.586173 |
| S.E. of regression | 0.407522 | Akaike info criterion | | 1.174121 |
| Sum squared resid | 3.985784 | Schwarz criterion | | 1.364436 |
| Log likelihood | -12.43769 | Hannan-Quinn criter. | | 1.232302 |
| F-statistic | 10.62054 | Durbin-Watson stat | | 0.775874 |
| Prob(F-statistic) | 0.000124 | | | |

Note: Prepared by the authors, 2023.

In addition, we proceed to the application of the contrasts. First, a partial correlation matrix is performed to measure the multicollinearity between our study variables. The matrix shown in Table 6 indicates that there is no multicollinearity between the variables, i.e., they are not linearly related to

each other, since the values shown are less than the parameter 0.75.

Table 15. *Partial correlation matrix*

| | MBG | IDEAC | GDP |
|-------|-----------|-----------|-----------|
| MBG | 1.000000 | -0.480467 | -0.645596 |
| IDEAC | -0.480467 | 1.000000 | 0.268021 |
| GDP | -0.645596 | 0.268021 | 1.000000 |

Note: Prepared by the authors, 2023.

Subsequently, we proceed to measure the Heteroscedasticity of the model. In Table 7 we observe that with a probability greater than 5% (critical level of significance), the null hypothesis of homoscedasticity is rejected and we say that there is evidence that the model is heteroscedastic, that is, the variance of the errors is not constant over time.

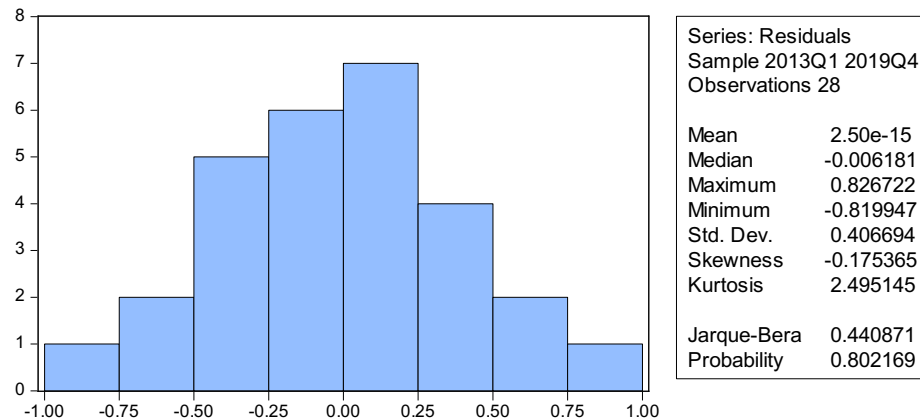
Table 16. *White contrast*

| | | | |
|---------------------|----------|---------------------|--------|
| F-statistic | 0.744548 | Prob. F(5,22) | 0.5986 |
| Obs*R-squared | 4.052318 | Prob. Chi-Square(5) | 0.5419 |
| Scaled explained SS | 2.415021 | Prob. Chi-Square(5) | 0.7892 |

Note: Prepared by the authors, 2023.

Figure 1 refers to the results of the Jarque-Bera normality test, which indicates with a probability greater than 5% that the null hypothesis is accepted, i.e., it can be indicated that the errors follow a normal distribution.

Figure 1. Normal waste assumption



Note: Prepared by the authors, 2023.

The results presented show the existence of a close relationship between the variables included in the study. On the other hand, the total liquidity of the economy is expressed does not influence private bank delinquency, corroborating what has been indicated in the various research works (Bernanke et al., 1999; Lizarzaburu and Del Brío, 2016; Uquillas and González 2017).

In that line of research Uquillas and Gonzalez (2017) show strong evidence that bank delinquency increases when there is a decrease in the price of oil, i.e., the delinquency rate grows when the amount of credit granted is greater than the country's economic activity. Furthermore, the authors point out that liquidity and net interest margin are indifferent to a change in banks' NPLs.

On the other hand, the study by Cabrera et al. (2014) states that the components of delinquency and the private financial system show a deterioration of portfolio quality in relation to GDP growth. Additionally, they indicated that the liquidity of the financial system does not significantly affect the degrees of delinquency, showing agreement with the results presented here.

Conclusion

The analysis conducted in this study confirms the existence of a significant relationship between economic activity and delinquency of large private banks in Ecuador, validating the hypothesis initially put forward. In contrast, no significant relationship was found in the case of medium and small private banks. It was observed that a decrease in the IDEAC and GDP indices was associated with a 7.64% increase in the NPLs of large private banks on a quarterly basis, while an increase in IDEAC resulted in a -0.02 decrease in NPLs, and a 1% increase in Gross Domestic Product was related to a -0.13 decrease in NPLs. The significant model identified that both the Index of Short-Term Economic Activity and Gross Domestic Product are relevant variables in explaining NPLs in large private banks, while total liquidity of the economy did not contribute significantly to the study.

It was evidenced that economic activity, influenced by productive sectors and external events such as the oil price crisis in 2015, directly impacts bank delinquency. Regarding the ordinary least squares assumptions, the correlation matrix test ruled out the presence of multicollinearity among the variables, and the White test revealed evidence of

heteroscedasticity in the model, indicating that the variance of the errors is not constant over time.

It is recommended to include in future research the analysis of the total liquidity of the economy (M2) and the price of oil, with the objective of determining its incidence on the delinquency rate of the total portfolio of private banks in Ecuador. This would allow a better understanding of the factors that influence bank delinquency and would provide valuable information for decision making in the financial sector.

In addition, it is suggested that variables such as bank interest rates and the Index of Short-term Economic Activity (IDEAC) be considered as an alternative measure of the country's economic activity, instead of the Gross Domestic Product (GDP). While GDP has been widely used in previous research, the IDEAC could provide a complementary perspective by more accurately capturing short-term fluctuations in the economy.

The inclusion of these additional variables in future research would provide a more complete picture of the factors influencing the delinquency rate of private banks in Ecuador. This would contribute to a better understanding of the phenomenon and facilitate the formulation of more effective strategies and policies to mitigate credit risk in the banking system.

References

- Bernanke, B., Gertler, M., & Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. *Handbook of Macroeconomics*, 1, 1343-1390. doi:[https://doi.org/10.1016/S1574-0048\(99\)10034-X](https://doi.org/10.1016/S1574-0048(99)10034-X).
- Cabrera, W., Melo, L., and Parra, D. (2014). Relationship between systemic risk in the financial system and the real sector: a FAVAR approach. *Essays on Economic Policy*, 32(75), 1-21. doi:<https://doi.org/10.1016/j.espe.2014.08.001>
- Gujarati, D., and Porter, D. (2010). *Econometrics 5th edition*. Mexico: Mc Graw Hill.
- Hanifan, U. (2017). The impact of macroeconomic and bank-specific factors toward non-performing loan: evidence from Indonesian public banks. *Banks and Bank Systems*, 12(1), 67-74. doi:[http://dx.doi.org/10.21511/bbs.12\(1\).2017.08](http://dx.doi.org/10.21511/bbs.12(1).2017.08).
- Lizarzaburu, E., and Del Brío, J. (2016). Evolution of the Peruvian financial system and its reputation under the Merco index. Period: 2010-2014. *Suma de Negocios*, 7(16), 2-13. doi:<https://doi.org/10.1016/j.sumneg.2016.06.001>
- Louzis, D., Vouldis, A., & Metaxas, V. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking & Finance*, 36(4), 1012-1026. doi:<https://doi.org/10.1016/j.jbankfin.2011.10.012>

- Saurina, J., & Jiménez, G. (2006). Credit Cycles, Credit Risk, and Prudential Regulation. *International Journal of Central Banking*, 2(2), 65-98.
- Singh, A., & Sharma, A. (2016). An empirical analysis of macroeconomic and bank-specific factors affecting liquidity of Indian banks. *Future Business Journal*, 2(1), 40-52. doi:<http://dx.doi.org/10.1016/j.fbj.2016.01.001>
- Trenca, I., Petria, N., & Corovei, E. (2015). Impact of Macroeconomic Variables upon the Banking System Liquidity. *Procedia Economics and Finance*, 32, 1170-1176. doi:[https://doi.org/10.1016/S2212-5671\(15\)01583-X](https://doi.org/10.1016/S2212-5671(15)01583-X).
- Uquillas, A., and González, C. (2017). Macro and microeconomic determinants for credit risk stress tests: a comparative study between Ecuador and Colombia based on the delinquency rate. *Essays on Economic Policy*, 35(84), 246-258. doi:<https://doi.org/10.1016/j.espe.2017.11.002>

Organizational Resilience and challenges of the cooperative sector in the city of Cañar

Renán Teodoro Rodríguez Pillaga

Catholic University of Cuenca, rtrdriguezp@ucacue.edu.ec
<https://orcid.org/0000-0002-5456-5619>

Daniela Dolores Jiménez Rodríguez

Catholic University of Cuenca, danielajimenez870@gmail.com
<https://orcid.org/0009-0007-4673-4367>

Priscila Isabel Ruiz Alvarado

Catholic University of Cuenca, pruiza@ucacue.edu.ec
<https://orcid.org/0000-0001-7286-7496>

Magdalena Emilia Ordóñez Gavilanes

Catholic University of Cuenca, meordonezg@ucacue.edu.ec
<https://orcid.org/0000-0001-7860-1314>

Introduction

Over time, organizations have been exposed to different types of risks that have affected business continuity. An example of this is the Great Depression of the 1930s (Bilbao and Lanza, 2009). (Bilbao and Lanza, 2009)The Great Depression of the 1930s, which resulted from the stock market crash, is an example of this. In 1997, the Asian crisis occurred, a conflict that began in Thailand due to a monetary confusion (Kim, 2001). (Kim, 2001) causing an increase in interest rates, lower prices of stocks, land, and lack of corporate governance that triggered the decline of Asian companies and their

capacity to consume raw materials, impacting the rest of the world.

Between 2008-2009 the global financial crisis (Phillips and Yu, 2011) triggered by the subprime mortgage uncertainty in the United States and the European PIIGS crisis in Portugal, Ireland, Italy, Greece and Spain (Castro, 2013) events that impacted commodity markets, exchange rates and economic activity, with global consequences. This is why crises, regardless of their magnitude, affect everyone and undoubtedly affect organizations, which over the years have challenged the complexity of a changing environment.

In Ecuador, the economic crisis at the end of the 1990s, known as the "banking holiday", hit the pockets of millions of citizens, resulting in the freezing of deposits, the bank bailout, the overdue portfolio in financial institutions and the devaluation of the sucre for the subsequent adoption of the dollar as the official currency (Loaiza, 2022).

Thus, in the cooperative sector there is a particular case called "Caso Coopera" that affected thousands of members, due to the closure of this financial institution, where allegedly money laundering and corruption operations were carried out, due to unjustified transactions, coming from Venezuelan companies, this affected thousands of members of the Cooperativa de Ahorro y Crédito Coopera Ltda (Fiscalía General del Estado, 2019). Organizations in Ecuador have been hard hit by the

different crises, not only financial and economic, but also political, social and health, which can cause damage causing its closure, however, the deficient administrative process, planning and control, lack of leadership, deficiency of innovation and creativity and inadequate decision making, can cause the same end.

Since 2020 the world suffered a global health emergency crisis caused by COVID-19 that was initially underestimated, due to the lack of self-awareness of the risk of organizations; which generated a deep recession and economic, financial, social, political and health threats (Ewertowski & Kuzminski, 2021).. Being the origin of this crisis the plan to combat this pandemic in which governments took all precautions by limiting the normal functioning with the implementation of a social quarantine, to restrict the direct spread of the epidemic throughout the community (Liu et al., 2020). During the health emergency, economic organizations had to innovate their business processes with the conviction to find a new way to face adversity and adapt to the new conditions of the environment, so that not only companies but all social organizations can survive such radical changes as a result of the pandemic.

The question arises as to how some companies, over time, have been resisting these crises, and thus the concept of resilience becomes relevant, addressed as "the ability to

adapt to change and immediately recover from adversity" (Ortiz & Erazo, 2021, p. 366). (Ortiz & Erazo, 2021, p. 366).. From this perspective, this research is oriented to determine which were the success factors that contributed to the Savings and Credit Cooperatives in the city of Cañar to successfully assume the socio-political changes, in the regulations of the popular and solidarity financial system and in the pandemic process. The information will be vital for the generation of concrete and real knowledge of the financial institution, which will allow it to adjust to the changes and dynamism of the environment. Thus, the problem will be approached from the theoretical foundation of organizational resilience, the capacities of resilient organizations and the factors that contribute to the generation of organizational resilience.

Organizational Resilience in the face of the challenges of a changing and dynamic environment

Nowadays in business there are no certainties, since the environment has become dynamic and changing, the market evolves day after day; and companies have the only option to face uncertainty through the resilience capacity of each organization. The term organizational resilience has been evolving in the last years (Vogus and Sutcliffe, 2007) defines resilience as the maintenance of a positive adjustment to challenging conditions so that the organization emerges from those conditions stronger and more resourceful.

For Ortiz de Mandoja and Bansal, (2016) defines it as the ability of companies to detect and correct maladaptive trends and cope positively. Furthermore, resilience can be considered as "the ability of an organization to absorb and adapt in a changing environment so that it can meet its objectives and to survive and thrive." (Quiñonez & Prado, 2017, p. 489). Faced with this volatile scenario, it has become necessary for public, private and cooperative sector organizations to prepare themselves to face the challenges and understand that flexibility must be part of them.

Thus, organizations must have tools, technology and trained human resources, with skills and abilities that enable them to manage and adapt to changes, and they must also have contingency plans to minimize the risk of failure in emerging situations. According to García-Contreras et al. (2021), in response to crises and situations that exceed plans, organizations have had to determine resilient processes in which both management and operations have been transformed. Consequently, thanks to the dynamism of resilient companies and their reactive capacity, they are able to regenerate and resume their operations and activities with apparent normality without neglecting their ability to progress.

Regarding the dynamics of the cooperative sector, it should be noted that since they are organizations that promote the

improvement of members' conditions, through cooperation, with a philosophy based on values and principles (Coba et al., 2022) They play a fundamental role in local development and the country's economy. These organizations are subject to changes in state policies and in the tastes and needs of their partners, so they must adapt to change. It is evident then that organizational resilience is the result of an interactive process between organizations and their environment where there is a bilateral relationship of learning and orientation based on capabilities.

Capabilities of Resilient Organizations

The capabilities of resilient organizations correspond to a set of activities, routines, tasks that are executed to create strategies, according to their context, to obtain a competitive advantage, in effect, the combination of capabilities, technology, resources and human talent can improve the behavior of organizations in dynamic environments. (Rotundo, 2020). Based on the above considerations, organizations can create value through capabilities, which they can shape, transform and integrate into their business objectives, even making people develop skills to manage and adapt to change.

In addition, organizational resilience is a process that allows companies to adjust to changes in the environment through innovation strategies, so it is not only a matter of companies

surviving, but also of changing the way they are managed in the long term.

Thus, resilient organizations are characterized by continuously and comprehensively adapting to changes in the environment in which they develop, seeking a long-term benefit; mitigating possible disruptions without affecting their economic profitability, profit or growth, improving internal effectiveness through the implementation of organizational resilience as a strategic objective. (Abrego Almazán et al., 2017).. With reference to the above. Sanchis & Poler, (2020) propose 3 basic capabilities of resilient companies, which are shown below:

Graph 1. Capabilities of Resilient Companies



Preparedness: From this proactive perspective, based on the anticipation of these events, companies must increase their

work in improving their ability to prepare, through strategies or actions focused on the prevention of events that negatively impact the company, although it is true that companies will never be fully prepared for certain eventualities, but they can implement initiatives in their short and long term planning... (Sanchis & Poler, 2019). (Sanchis & Poler, 2019).. Therefore, the ability of organizations to be prepared for adverse or unexpected situations leads to minimize risks in adverse conditions.

It turns out that the capacity of preparation and/or anticipation that organizations have can contribute to the prior identification of threats or weaknesses, as well as strengths and opportunities, both internal and external, so that the capacity of preparation can be considered as "acting in a preventive and efficient way to minimize recovery actions in the future" (Ortiz & Erazo, 2021). (Ortiz & Erazo, 2021). With this, organizations can be more alert to changes, in order to mitigate their negative effects.

Adaptation: Organizations are open systems that are exposed to continuous and unavoidable changes in the environment, and according to Sanchis & Poler (2020) According to Sanchis & Poler (2020), this adaptive capacity of companies should contribute to the implementation of innovative actions, activities or processes to adapt to the new reality; from another perspective, it refers

to the ability to recover efficiently, giving continuity to operations. In addition, organizations need strong coping capabilities and the ability to take advantage of their strengths and opportunities, to counteract their weaknesses and threats, in order to gain an advantage in the market. (Sanchez et al., 2022)

In this sense, the resilience of companies depends greatly on the flexibility with which they can face and adapt to circumstances, both internal and external, since they can change the perspective of doing business, in terms of the affectation from the economic point of view, since the impact can be directly or indirectly related to profits (Jimenez, 2017). Resilient companies are then able to challenge the circumstances and emerge victorious, through rapid adaptation strategies with which they obtain benefits and even competitive advantage.

Recovery: The recovery stage is reactive, so organizations must reestablish their management based on the new knowledge and learnings left by the crisis, because from this, historical information can be generated for actions that will contribute to the future. (Sanchis & Poler, 2020).. After surviving the adverse circumstances triggered by the environment, companies are not only obliged to return to normality in terms of their operations, but rather have to

recover from the impacts and improve their operations, based on feedback and post-crisis feedback.

The ability of companies or organizations to recover will not always be immediate, since it will depend on their crisis management; however, resilient companies tend to minimize their vulnerability to turbulent environments and manage to recover in less time and at a lower cost (Ortiz & Erazo, 2021). (Ortiz & Erazo, 2021).. In this context, information and internal communication play a fundamental role, since all the actors involved must contribute to recover from the crisis. After facing crises, companies must improve their operating and adaptation models, since it is not only a matter of returning to old practices and functions, but also of improving after setbacks.

Those organizations capable of withstanding and managing change have been able to survive, thanks to the set of historical lessons learned and making the right decisions, protecting the company in a comprehensive manner in the face of environmental pressures or rebuilding itself after the impacts... (Meza, 2021). (Meza, 2021). In addition, it is evident that these three capabilities are fundamental for the construction of a resilience process in the organization associated with internal and external factors of the organization.

Organizational factors that drive Organizational Resilience

According to Lee et al.,(2013) y Ewertowski & Kuzminski, (2021) there are factors that contribute to organizational resilience, and from a systemic point of view, it is necessary to analyze each of the factors that affect and contribute to resilience within the organization and the ways in which they are related, i.e. each of the factors contributes to the entire organizational system. Thus, the following factors have been considered in this research:

Leadership: the leader must acquire new skills to adapt to the new ways of doing business, because the needs of the environment are not static, and thanks to the dynamism of people, companies can face the crisis (Ayuso & Herrera, 2017). In the context of the cooperative sector, it is necessary to have personnel, capable of ensuring participation and a management model that ensures the efficiency and effectiveness of the organization, it is important to identify and promote leadership skills in each of its employees, with the aim of achieving their goals in the short, medium and long term. In other words, leadership is not simply a matter of recognizing authority, but of valuing the efforts and ideas of employees and influencing them, in order to face the volatility of the environment and deal with crises. (Sumba et al., 2022)

Staff commitment and participation: Organizations must efficiently manage the human talent they have at their disposal, since they are the main actors in the growth and development of the organization, in addition organizations must be able to guarantee the working conditions and professional projection of their collaborators, since the optimal achievement of the organization's objectives depends largely on them (Checa-Llontop et al., 2020). (Checa-Llontop et al., 2020)..

Innovation and Creativity: Economic, social, political and technological changes have forced companies to rethink the way they do business, because with the growth and expansion of technology, it has changed the perspective of passive organizations that only sought profit, to give way to organizations more involved in meeting the needs of customers, being proactive and dynamic and even innovative. For Macias (2015) innovation becomes a tool that generates adaptability for companies regardless of their size, since it contributes to their configuration to meet the new demands of the environment.

In the context of resilience in the cooperative sector, innovation plays a fundamental role in the creation and improvement of strategies to face uncertainty. Organizations focus on diagnosing, identifying and detecting possible

changes in the market, which may have a positive or negative impact. (Demuner-Flores et al., 2022)..

Information and Knowledge: Effectively managing information and knowledge in organizations is also an essential factor since internal processes can be improved from structures that promote the free exchange of information and knowledge, so its organizational structure should facilitate and support the practices of knowledge transfer, with this the staff will always be prepared to occupy key positions, since the processes and activities are known (Quiñonez & Rivera, 2021). (Quiñonez & Rivera, 2021)..

Likewise, information and knowledge must be a priority, since all personnel must have data available for analysis in a timely manner, because from them, trained personnel can solve problems or the requirements of the organization in the face of changes, in addition to ensuring confidentiality and proper storage of critical information. (Lee et al., 2013).

Monitoring and control of the situation: It is necessary for organizations to constantly monitor the internal and external situation in the face of crisis situations, likewise to have instruments that allow the monitoring and control of situations (Rodriguez & Bañuls, 2023), i.e. it is essential to control by means of indicators the scope of action or operational plans in order to carry out a rigorous monitoring and measurement that facilitates decision-making. (Rubio-

Rodrigues et al., 2019).. With regard to monitoring and control, it is necessary to verify the correct management of the resources used in crisis management.

Decision making: Organizations face a process of choosing alternatives that entail greater challenges, i.e. they make long-term decisions, this is a transformative process that involves great responsibility for the actors involved and can improve the management of changes in the immediate environment, so it is important that the staff has sufficient authority and is highly qualified and involved in organizational affairs to be able to make decisions in response to the crisis. (Sanchez-De-Roux, 2022).. In the cooperative sector, it is essential to surround oneself with collaborators who are motivated and committed to moving the company forward, since it takes into account all suggestions, options, available data and evaluates the needs of the company in crisis situations, thus strengthening the decision-making process.

Planning strategies: Managing organizations through strategic planning, operational plans and emergency plans helps to direct and direct organizational efforts and resources towards specific objectives through planned actions, thus providing clarity and focus on the future and analyzing the consequences and internal and external risk of potential crises (Gutiérrez et al., 2021). (Gutiérrez et al., 2021).. Planning strategies will allow the establishment of guidelines for the

achievement of objectives, without neglecting the organization's flexibility in the face of possible changes.

It is also important to evaluate the plans, to know the degree of compliance with the same, which allows analyzing the scope and deviations from the original strategic plan, however, at present, planning should be flexible, according to the reality of each organization, without neglecting that it provides an ideal vision, where efforts are directed towards. (Lee et al., 2013).

Proactive posture: The proactive posture of organizations refers to their willingness to analyze and remain open to ideas and suggestions from employees in specific areas that require supervision, as well as to take advantage of the flexibility of their plans and processes to face new circumstances, by modifying them, to increase the quality of management (Hernandez et al., 2022). proactive employees can adapt positively to the conditions of the environment and are able to maintain a leadership attitude, thanks to the ability to influence, motivate and encourage the work team to take advantage of the strengths of each of the employees.

Discussing findings

The methodological strategy applied to this research project is relevant to the research objectives and allowed determining the factors that drive organizational resilience, with a cooperative approach. Thus, the phenomenon of

organizational resilience is approached with a descriptive scope that allows characterizing the factors that determine organizational resilience.

For the collection of information, a survey structured by 25 questions using a 7-level Likert scale was applied, ranging from items with a response of: Strongly Agree/ Strongly Agree/ Agree/ Agree/ Neither Agree nor Disagree/ Disagree/ Strongly Disagree/ Strongly Disagree. The survey considered dimensions such as leadership, staff commitment and participation, innovation and creativity, monitoring and control, decision making, planning strategies and proactive posture. It is important to note that the instrument applied for the collection of information underwent a conceptual and statistical validation, thus, when analyzing the data with Cronbach's Alpha, a reliability of 0.981 was verified.

The most relevant data collected through a form from the Google Forms platform to 45 cooperative employees on the factors that contribute to Organizational Resilience. The results obtained from the data collection instrument will be presented in 4 tables that summarize the 8 factors that are conceptually important for resilience, the same that were consulted on a scale of how important they are for operational and administrative staff.

Table 17. *Resilience Factors Leadership and Commitment*

| Factors | Questions | Media | Deviation |
|---|--------------|-------------|-------------|
| Leadership | L1 | 4,96 | 1,53 |
| | L2 | 4,60 | 1,42 |
| | L3 | 5,29 | 1,27 |
| | L4 | 4,91 | 1,29 |
| | MEDIA | 4,94 | 1,38 |
| Staff commitment and participation | CP1 | 4,4 | 1,23 |
| | CP2 | 4,62 | 1,17 |
| | CP3 | 5 | 1,2 |
| | MEDIA | 4,67 | 1,20 |

SOURCE: AUTHORS.

Table 1 presents the results of the factors of leadership and staff commitment and participation, as factors that contribute to the consolidation of organizational resilience. Regarding Leadership, the dimension has an overall mean of 4.98 with a deviation of 1.38, which represents that they agree that Leadership contributes to building resilience in organizations. While in the global factor of staff commitment and participation, it has a mean of 4.67 and a deviation of 1.20, constituting another factor that helps the resilience of the organization.

Table 18. *Factors that determine Resilience Innovation and Creativity and Information and Knowledge.*

| Factors | Questions | Media | Deviation |
|---------------------------------|--------------|-------------|-------------|
| Innovation and Creativity | IC1 | 4,2 | 1,53 |
| | IC2 | 4,2 | 1,51 |
| | MEDIA | 4,20 | 1,52 |
| Information and Knowledge | INF1 | 4,36 | 1,49 |
| | INF2 | 4,64 | 1,55 |
| | INF3 | 4,33 | 1,5 |
| | INF4 | 4,53 | 1,53 |
| | MEDIA | 4,47 | 1,52 |

SOURCE: AUTHORS.

Table 2 shows the factors of innovation and creativity and information and knowledge. The innovation and creativity factors have a mean of 4.20 and a deviation of 1.52, which shows that those involved are indifferent to this aspect. Regarding the information and knowledge items, the respondents consider that this factor is indifferent as a factor of organizational resilience with a mean of 4.47, deviation of 1.52.

Table 19. *Resilience Factors Monitoring and Control and Decision Making.*

| Factors | Questions | Media | Deviation |
|---|-----------|-------------|-------------|
| Monitoring and control of the situation | SC1 | 4,87 | 1,54 |
| | SC2 | 4,64 | 1,14 |
| | MEDIA | 4,76 | 1,34 |
| Decision making | TD1 | 4,62 | 1,46 |
| | TD2 | 4,71 | 1,47 |
| | TD3 | 4,56 | 1,5 |
| | TD4 | 4,58 | 1,37 |
| | MEDIA | 4,62 | 1,45 |

SOURCE: AUTHORS.

In Table 3, of the factors of monitoring and control of the situation, in which the vigilance of the financial institution and of the employees to the situation is analyzed, the respondents agree that these aspects contribute to the building of organizational resilience. The factor monitoring and control of the situation has a mean of 4.76 with a deviation of 1.34, while the decision-making dimension has a mean of 4.62, with a deviation of 1.45.

Table 20. *Resilience Factors Planning Strategies and Proactive Posture.*

| Factors | Questions | Media | Deviation |
|---------------------|--------------|-------------|-------------|
| Planning Strategies | EP1 | 4,47 | 1,29 |
| | EP2 | 5,2 | 1,39 |
| | EP3 | 5,11 | 1,38 |
| | MEDIA | 4,93 | 1,35 |
| Proactive Posture | PP1 | 4,84 | 1,24 |
| | PP2 | 4,87 | 1,16 |
| | PP3 | 4,64 | 1,24 |
| | MEDIA | 4,78 | 1,21 |

SOURCE: AUTHORS.

In table 4, corresponding to the factor, planning strategies, employees agree with the items, strategies and plans to achieve success before, during and after the crisis are analyzed, with a mean of 4.93, deviation of 1.35. Regarding the proactive posture factor, they agree with the items, with a mean of 4.78, deviation of 1.2.

Conclusions

Organizations in the cooperative sector have so far had the resilience to face policy and regulatory changes and the COVID 19 pandemic effectively, implementing new digital channels that allow users to perform banking operations without any problems.

Employees consider that the cooperatives' management has a vision of the future, considering that it is vital to plan ahead for crises, which will allow them to better face possible disruptions in the organization.

It is important to note that employees are motivated to develop their work, and are willing to achieve objectives defined by the organization, i.e. the institution has the commitment of employees for the creation of organizational resilience, therefore, it is essential to promote this factor, as it can strengthen the competitive advantage, because empowered employees can take the organization afloat even in crisis situations, however, employees should be rewarded for using creativity and innovation to improve the effective solution of problems within the cooperative.

However, employees consider the communication process to be weak, which makes it difficult to access the most relevant information. In addition, the institution must improve the monitoring and control of internal and external processes in the event of crisis situations, so that decision makers can execute what was planned and suggest the development of contingency plans to take control of the activities in case of a crisis.

In addition, employees consider that the short, medium and long term planning strategies and strategic, operational and emergency plans to face the crisis contribute to the

improvement of the organization, since they have clear and achievable objectives, for which they constantly strive. Likewise, the financial institution has trained and proactive human capital that collaborates and works efficiently in order to increase the quality of management and service of the cooperative.

Finally, it is worth highlighting the importance of the factors of leadership, staff commitment and participation, innovation and creativity, information and knowledge, monitoring and control of the situation, decision making, planning strategies and proactive posture, which contribute positively to building resilience in organizations.

References

- Abrego Almazán, D., Sánchez Tovar, Y., & Medina Quintero, J. M. (2017). Influence of information systems on organizational results. *Contaduría y Administración*, 62(2), 321-338.
<https://doi.org/10.1016/j.cya.2017.03.001>
- Ayuso, D. A., & Herrera, I. H. (2017). *LEADERSHIP IN HEALTHCARE ENVIRONMENTS Management forms*. 37.
- Bilbao, L. M., & Lanza, R. (2009). When all else fails. Anatomy of the Great Depression, 1929-1939. *Cuadernos de Economía*, 32(88), 43-70.
[https://doi.org/10.1016/s0210-0266\(09\)70034-2](https://doi.org/10.1016/s0210-0266(09)70034-2).
- Castro, V. (2013). Macroeconomic determinants of the credit risk in the banking system: The case of the GIPSI.

- Economic Modelling*, 31(1), 672-683.
<https://doi.org/10.1016/j.econmod.2013.01.027>
- Checa-Llontop, L. A., Cabrera-Cabrera, X., & Chávarry-Ysla, P. del R. (2020). Human talent management strategy to improve job performance in a banking institution. *Investigación Valdizana*, 14(4), 188-197.
<https://doi.org/10.33554/riv.14.4.746>.
- Coba, E., Díaz- Córdova, J., Carrion-Gavilanes, G., & Chango-Casanova, D. (2022). Gender diversity and performance in the Ecuadorian financial sector. *Finance and Economic Policy Journal*, 14(2).
<https://doi.org/10.14718/revfinanzpolitecon.v14.n2.2022.10>.
- Demuner-Flores, M. del R., Delgado-Cruz, A., & Vargas-Martínez, E. E. (2022). Innovation and performance: Relationship mediated by learning and market orientation in Mexican firms. *Estudios Gerenciales*, 82-94. <https://doi.org/10.18046/j.estger.2022.162.4706>.
- Ewertowski, T., & Kuzminski, P. (2021). OrgRes Diagnostic Tool for Organizational Resilience: The Case of a Polish Aviation Company during the Pandemic. *EUROPEAN RESEARCH STUDIES JOURNAL*, XXIV(Special Issue 5), 122-139. <https://doi.org/10.35808/ersj/2707>
- García-Contreras, R., Valle-Cruz, D., & Canales-García, R. A. (2021). Organizational selection: Resilience and performance of SMEs in the COVID-19 era. *Estudios Gerenciales*, 73-84.
<https://doi.org/10.18046/j.estger.2021.158.4291>.
- Gutiérrez, J. M., Romero, J., & Hernández, L. (2021). Situational strategic planning: A methodical-practical

- process. *Revista Venezolana de Gerencia*, 26(94), 762-783. <https://doi.org/10.52080/rvgluzv26n94.17>.
- Hernández, M., Mora, R., & Leiva, J. C. (2022). Entrepreneurial orientation and innovative performance in MSMEs. The moderating role of strategic orientation. *Estudios Gerenciales*, 95-108. <https://doi.org/10.18046/j.estger.2022.162.4519>
- Jiménez, R. A. (2017). *Business resilience key element in organizational change*. 16.
- Kim, S. (2001). The Asian Financial Crisis of 1997: The Case of Korea. *Multinational Business Review*, 9(1), 50.
- Lee, A. V., Vargo, J., & Seville, E. (2013). Developing a Tool to Measure and Compare Organizations' Resilience. *Natural Hazards Review*, 14(1), 29-41. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000075](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000075).
- Li, J., Chen, L., Yi, J., Mao, J., & Liao, J. (2019). Ecosystem-specific advantages in international digital commerce. *Journal of International Business Studies*, 50(9), 1448-1463. <https://doi.org/10.1057/s41267-019-00263-3>
- Loaiza, Y. (2022). *Pyramid schemes, a crime that became fashionable in Ecuador and reached the highest echelons of power*. 5.
- Macias, C. J. G. (2015). ORGANIZATIONAL ADAPTABILITY FROM THE CONTINGENCY THEORY APPROACH AND THE CONFIGURATION SCHOOL. 3(4), 15.
- Meza, J. F. (2021). *Organizational Resilience and Adaptability in Times of Pandemic*: 48.
- Ortiz, H. A., & Erazo, C. A. (2021). Entrepreneurial resilience in times of pandemic: Challenges for microenterprises. *Revista Arbitrada Interdisciplinaria Koinonía*, 6(12), 366. <https://doi.org/10.35381/r.k.v6i12.1293>

- Ortiz - de - Mandojana, N. and Bansal, P. (2016), The long-term benefits of organizational resilience through sustainable business practices. *Strat. Mgmt. J.*, 37: 1615-1631. doi: 10.1002 / smj.2410.
- Phillips, P. C. B., & Yu, J. (2011). Dating the timeline of financial bubbles during the subprime crisis. *Quantitative Economics*, 2(3), 455-491. <https://doi.org/10.3982/qe82>.
- Quiñonez, C., & Rivera, W. F. (2021). Knowledge management model for productivity and innovation centers. *Telos Journal of Interdisciplinary Studies in the Social Sciences*, 23(2), 347-366. <https://doi.org/10.36390/telos232.09>
- Quiñonez, R. E., & Prado-Solis, M. (2017). *Organizational resilience: Ideas for debate in the Ecuadorian context*. 3, 17.
- Rodríguez, R. T., & Víctor A. Bañuls (2023). Challenges of Emergency Management Digital Transformation in Industrial Parks. In V. L. Thomas J. Huggins (Ed.), *Proceedings of the ISCRAM Asia Pacific Conference 2022* (pp. 196-203). Palmerston North, New Zealand: Massey University.
- Rubio-Rodrigues, G. A., Blandón López, A., & Serna Gómez, H. (2019). Analysis of the factors that compose an Enterprise management system. Case study. *Revista Científica Hermes-Fipen*, 25, 408-430. <https://doi.org/10.21710/rch.v25i0.492>
- Sánchez, M. P. R., Paparella, L. E. S., & Rotundo, G. J. Z. (2022). *DYNAMIC CAPABILITIES THEORY: CONTRIBUTIONS AND EVOLUTION FROM THE WORK OF DAVID TEECE*. <https://doi.org/10.5281/ZENODO.7127188>

- Sánchez-De-Roux, M. M. (2022). *Organizational process management for decision making*. 28, 12.
- Sanchis, R., & Poler, R. (2019). Enterprise Resilience Assessment-A Quantitative Approach. *Sustainability*, 11(16), 4327. <https://doi.org/10.3390/su11164327>.
- Sanchis, R., & Poler, R. (2020). Universitat Politècnica de València. *Ingeniería del agua*, 18(1), ix. <https://doi.org/10.4995/ia.2014.3293>
- Sumba, R. Y., Chóez, S. I., & Pico, Y. M. (2022). *Liderazgo Empresarial como factor de desarrollo de las Pymes Business leadership as a development factor for SMEs A liderança empresarial como fator de desenvolvimento para as PME*. 8, 18.
- Vogus, T. J., & Sutcliffe, K. M. (2007). Organizational resilience: Towards a theory and research agenda. *Conference Proceedings - IEEE International Conference on Systems, Man and Cybernetics*, 3418-3422. <https://doi.org/10.1109/ICSMC.2007.4414160>

Analysis of corruption in public administration

Gilberto Carrion-Barco

Pedro Ruiz Gallo National University – Peru, gcarrion@unprg.edu.pe
<https://orcid.org/0000-0002-1104-6229>

Alejandro Chayan-Coloma

Pedro Ruiz Gallo National University – Peru, achayanc@unprg.edu.pe
<https://orcid.org/0000-0003-2445-5037>

Rodolfo Pastor Tineo-Huancas

Pedro Ruiz Gallo National University – Peru, rtineo@unprg.edu.pe
<https://orcid.org/0000-0003-1812-6149>

Dany Amparito Vega-Clavo

Señor de Sipan University – Peru, danyv@uss.edu.pe
<https://orcid.org/0000-0001-5973-965X>

Introduction

Organized criminal activities are being fueled by the lack of bold and firm actions to fight corruption and strengthen public institutions, which is undermining democracy, human rights and threatening the Sustainable Development Goals (CNN, 2023). In that sense, one way to perceive how the phenomenon of corruption has evolved at the international, regional or local level can be achieved through measurement indicators (Cuzme et al., 2023). Since the 1990s, several agencies have implemented tools in order to obtain a more complete understanding of the problem of corruption and its impact. The main trends in measuring corruption include opinion surveys and government statistical tools. In addition, similar experiences exist at the national or local level, as well as international experiences (OAS, 2023).

The Corruption Perceptions Index of the Transparency International Organization is published annually, where Denmark, Finland and New Zealand were the cleanest countries in 2023, i.e. with the lowest perception of public sector corruption. Afghanistan, North Korea and Somalia ranked lowest in terms of public sector corruption (Transparency International, 2023). According to the index results, Uruguay and Chile are considered the least corrupt countries in Latin America in 2023, while Venezuela, Haiti and Nicaragua are considered the countries with the worst levels of corruption. Guatemala and Honduras are also among the nations with the highest levels of corruption (Statista, 2023).

Corruption is a serious problem that can have serious consequences in a society. When corruption is allowed to run rampant and affect public officials, it erodes trust in government, the effectiveness of institutions, and justice. Corruption has overwhelmed all levels of control in recent years; for example, corruption in the health sector during the COVID-19 pandemic is considered a global problem (Hossain et al., 2023). Because of its connection to life-saving medical products, corruption in the health sector has a harmful and unfair impact on people's lives (Mhazo & Maponga, 2022). Corruption in the health sector affects both developed and developing countries (Campante & Do, 2014). Public health in developing countries has been hampered by the lack of basic health infrastructure, human resources, adequate supplies and equipment, among other factors (Fagbadebo & Dorasamy, 2022; Torres-Puraca, 2020).

Corruption and bribery are practices that undermine trust in public institutions and weaken the rule of law. These acts not only negatively affect a country's economy and development, but also harm citizens by diverting resources that could be allocated to essential services such as education, health and security (Dragan et al., 2020; Falisse & Leszczynska, 2022; Macedo et al., 2023). It is important to foster a culture of integrity and ethics in public service. This can be achieved through training and sensitizing public officials on the risks and consequences of corruption, as well as promoting accountability and citizen participation in the oversight of government activities (Rieznik & Lee, 2021; Vaquero & Cadaval, 2022).

A review of the literature on the subject will provide an understanding of how corruption affects the effectiveness of public administration, which is fundamental to identifying problem areas and seeking solutions to improve the management of public affairs. Researching the effects of corruption on the effectiveness of public administration is essential to improve governance, transparency and the quality of government services. This not only benefits society at large, but also improves the functioning of governments and the fight against corruption.

The assessment of corruption and its effects on the effectiveness of public administration is the focus of this research. It seeks to investigate how corruption affects the ability of government institutions to fulfill their functions and effectively serve public interests and to provide a deeper

understanding of the underlying mechanisms linking corruption and administrative effectiveness.

Effects of corruption on public trust and confidence

In recent years, the lack of trust in public institutions, as is the case of the Spanish public administration, has worsened significantly as a result of the consequences of corruption (Vaquero & Cadaval, 2022). The annual trust report, known as *Trust Barometer* and published by the consulting firm Adelman, already indicated in 2014 that the level of trust in the Spanish government was at 18 points on a scale from 0 to 90 (where 90 represents maximum trust), while the average was 45 points. By 2017, the average of the index dropped 4 points, and of the 27 countries analyzed, in 20 of them citizens distrusted their governments, placing Spain as one of the countries with the highest distrust in its executive, surpassed only by South Africa, Poland, Mexico and Brazil. Given this situation, policies oriented towards transparency, Responsible Public Management, and citizen access to public information become essential as measures to address the lack of connection with citizens. The growing distrust in public administrations has given rise to a new approach based on transparency, through which governments try to recover the legitimacy they have lost (Rodríguez-Martín et al., 2020). Many people are aware of the widespread corruption in the public sphere and consider it a significant problem. Despite this, there are obstacles that make it difficult to report cases of corruption, such as lack of information, fear of reprisals, lack of adequate support and fear of the authorities (Klopp et al., 2022).

The study by Dinh Thanh et al. (2023), points out that corruption is a significant problem in Vietnam, adversely affecting attempts to improve the quality of governance and public administration. This phenomenon has the potential to undermine public trust in government institutions, as citizens may perceive that public officials do not act in their best interest and that the system is designed to favor the few rather than the many. It also generates a decrease in the credibility of government institutions and affects the social compact between the state and its citizens (Hoa et al., 2023; Dung & Thanh, 2023). Lack of trust in government entities can have negative repercussions on the nation's political stability and economic progress. The absence of knowledge generates feelings of frustration and helplessness among the population. A study conducted in South Africa for the implementation of e-government found that citizens lack trust in the local municipality and believe that it is rife with corruption (Galushi & Malatji, 2022). Jones (2022), on the other hand, indicates that public trust in government institutions in Malaysia has been undermined due to corruption. The widespread presence of corruption, especially at high levels of government, has led to a decline in public confidence in the integrity and transparency of government institutions. This loss of confidence can have significant consequences on the stability and legitimacy of government, as well as on the perceived effectiveness of government policies and programs.

The case of South American countries is no stranger to this distrust, the public administration and its governmental entities, from the national level to regional and local

governments, are involved in areas such as education, health, security, infrastructure, among others. They face various challenges that impact their effectiveness and ability to meet the needs of society. Corruption is one of these persistent challenges in Peruvian public administration. Lack of transparency, inadequate resource management and impunity have undermined trust in government institutions, making it difficult to implement effective policies and programs. Likewise, excessive bureaucracy and slow administrative processes have hindered efficiency and agile decision making. These situations have caused delays in the provision of services and have had a negative impact on the quality of service to the public (Sánchez-Huamán et al., 2023).

Table 1. *Effects of corruption on public trust and confidence, additional comments*

| Author | Comment |
|-----------------------|---|
| De Oliveira (2023) | The organizational aspects of public administration are fundamental to its effectiveness in providing services to society, but they are not decisive in themselves. |
| Elicin (2020) | Corruption and clientelism practices in Turkish municipalities have weakened democracy, undermined the efficiency of local governments and negatively impacted the rights and representation of local citizens. |
| Mansour et al. (2021) | In societies where power is delegated for public spending, there is a risk that resources will go to projects that benefit officials rather than the public interest. |

Public trust is negatively affected by various forms of corruption in government institutions. Corruption can negatively affect trust in government institutions, which could have a negative impact on the effectiveness and efficiency of public policies. Corruption also has an impact on the political stability and economic progress of the country, as well as on the credibility of government institutions and the social compact between the state and its citizens. Corruption can weaken the effectiveness of government policies, halt economic progress, and contribute to the persistence of poverty and underdevelopment throughout the country.

Mechanisms for preventing and combating corruption in public administration

When autonomous bureaucrats exercise control over politicians, for example, by voicing criticism against the lack of efficiency in a public works project, there is the possibility of redirecting public resources from poorly managed projects to growth-enhancing initiatives, such as properly planned public infrastructure (Dahlström & Lapuente, 2022). Supreme audit institutions are not officially designated as anti-corruption agencies, but theoretical and empirical research shows that their activities have a beneficial effect on reducing corruption.

From a theoretical point of view, it is argued that supreme audit institutions have the capacity to discourage public officials from engaging in irregular practices, due to the transparency and accountability required in their audit processes (Nonki Tadida, 2023).

The transparency and monitoring procedure for EU Funds expenditure involves more detailed requirements, such as the obligation to submit expenditure data to national transparency portals or to report to the European Commission. In addition, the use of EU Funds is subject to additional monitoring by both national and European control bodies, such as the European Anti-Fraud Office (OLAF) or the European Court of Auditors. These are efforts implemented to prevent and combat corruption in public administration in the field of EU Funds spending in beneficiary countries (Fazekas & King, 2019).

There are many programs and measures in the administrative reform of governments in various countries, where governance-related theories are widely discussed and indeed improve public administration by changing traditional practice and transforming government in recent years (Liu et al., 2021). A higher degree of budget transparency implies more advanced governance management, resulting in greater accountability on the part of the government, providing crucial information to the public and reducing corruption. The Open Budget Index (OBI) is a widely used tool for assessing budget transparency. The Center on Budget and Policy Priorities (CBPP) and the International Budget Partnership (IBP) collaborate with civil society globally to employ budget analysis as a tool to improve efficiency in the use of public funds (Stanimirović, 2022).

In Slovakia, during the election period between 2012 and 2016, a number of allegations of corruption emerged in both public administration and high political spheres. Sectors

affected by corruption cases in this period included healthcare, IT services and e-government. At the same time, the government implemented anti-corruption measures, such as the establishment of a state electronic marketplace for public procurement, with the aim of eliminating clientelism in government and local institutions. Amendments were also made to the public procurement law, new electoral codes were established focusing on the financing of political parties, and the law for the protection of whistleblowers against antisocial or corrupt activities was enacted. In addition, the participation of *shell companies* with unidentified owners in public procurement processes was prohibited. All these initiatives can be considered as measures aimed at combating corruption (Lendvorský et al., 2022).

Leadership and culture are key factors in the fight against corruption. Countries that have successfully minimized corruption, such as Singapore and Hong Kong, have demonstrated strong leadership and implemented zero-tolerance policies. In addition, they have worked to change the culture of corruption through effective measures. On the other hand, countries with corrupt leadership and a culture of corruption, such as Japan, Taiwan, and Malaysia, have faced difficulties in combating this problem (Quah, 2022).

Table 2. Mechanisms for preventing and combating corruption, additional comments

| Author | Comment |
|--|--|
| Brás & Dowley (2021) | Transparency in local government benefits civic engagement and accountability, preventing corruption and mismanagement by making government activities and decisions visible to the public. |
| Fedotov & Voloshyna (2019); Kotukov et al. (2023). | To combat corruption, the Ukrainian government has implemented institutional reforms, established an anti-corruption system, specific legislation, public and civil servant education programs. These measures are aimed at improving transparency, eliminating conditions conducive to corruption and strengthening the legal system. |
| Ingrams & Schachter (2019) | Municipal administrators can combat corruption through electronic tools of participation, the effective levels of which are based on physical resources, such as funding, Internet access, as well as social capital and public demand for accountability. |
| Kolomoiets & Makarenkov (2021); Zou et al. (2023); | Digital technologies such as e-government or open data are effective in preventing corruption in the public sector by facilitating interactions without physical contact between officials and citizens, |

| | |
|---|--|
| Zumofen et al. (2022). | eliminating the giving of gifts and bribes, formalizing procedures and neutralizing corruption risks through legal mechanisms. |
| Lee et al. (2019); Matheus & Janssen (2020). | The rule of law and control of corruption are essential to mediate open government and prosperity, especially social capital and the environment. Open government alone will not have a full impact on prosperity if efforts are not made to build or maintain these mechanisms. |

Several countries have implemented various mechanisms to combat corruption in public administration. The use of digital technologies and e-government, the participation of supreme audit institutions, specific institutional reforms and policies on transparency and access to public information are some of the measures. These mechanisms aim to increase transparency, eradicate situations that foster corruption and strengthen the legal system. To effectively address this challenge, each country can adapt these measures to its particular context.

Impact of corruption on government efficiency

The study conducted by Sánchez-Hernández et al. (2020) in Spain highlights that corruption exerts a substantial influence on government effectiveness. It indicates that the global crisis, together with inadequate organizational practices, has exposed disturbing problems of corruption in public administration at the local level, specifically in sectors such as

urban planning, construction and public procurement. These instances of corruption have given rise to notable risks and have impacted government efficiency and administration. Corruption has unfavorable impacts on government effectiveness. It can result in the inefficient allocation of resources, distortions in policy decisions, and poor governance. In addition, corruption has the potential to impair the effectiveness of government policies and hinder economic development (Tawiah, 2023; Gonçalves De Godoi, 2020).

Poor and ineffective oversight of the public sector leads to a decline in the efficiency of the overall economy. This scenario is likely to have a significant and multiplier impact on market failures, which will contribute to the persistence of extreme poverty and underdevelopment at the national level (Muzurura & Mutambara, 2022). Fighting corruption is essential to achieve sustainable development, as this practice hinders economic progress, intensifies income disparity, contributes to the proliferation of poverty and deteriorates human development indicators (Castro & Lopes, 2023).

Andrade (2021) points out that corruption can affect the distribution of resources by diverting them to lower-priority projects or individuals, rather than directing them toward initiatives that truly benefit society as a whole. This highlights how corruption can distort political decisions and harm the overall development of a community. In addition, corruption can increase the costs associated with government projects, as corrupt officials may solicit bribes to approve projects or award contracts. This behavior could result in the choice of less efficient suppliers or the execution of superfluous or low-

quality projects. Corruption in government is recognized as a serious problem that impacts both developing and developed nations. This corruption has evolved in its style and methods, challenging the ability of prosecutors to handle cases, which has generated distrust in the effectiveness of anti-corruption measures implemented by governments. In addition, corruption at the government level affects social stability and security, damages national and international reputation, and undermines democratic values, ethics, and justice (Huang et al., 2021). Corruption also has the potential to erode trust in government institutions, which, in turn, could impact the efficiency and effectiveness of public policies (Wenzel, 2021).

Acts of corruption in public procurement harm the effectiveness of the use of public funds. This is because corruption can result in the awarding of contracts to companies that do not offer the best prices or services, thus leading to inefficient use of public resources. In addition, corruption can generate the absence of competition in bidding processes, which also affects the efficiency in the allocation of contracts and the use of public funds (Psota et al., 2020).

Table 3. *Impact of corruption on governmental efficiency, additional comments*

| Author | Comment |
|----------------------------|---|
| Anggono & Wahanisa, (2022) | Corruption is divided into state capture, which involves bribing officials to write policies that benefit one party, and administrative corruption, which involves bribing officials to implement policies that favor a specific party. |
| Bergh & Erlingsson, (2023) | The complex organizational structure of municipalities can generate governance and accountability problems, which in turn constitutes a corruption risk. |
| Fan et al. (2023) | The symptom of crime is an unaddressed problem for municipal administrators, who either feel powerless in the face of crime or are so involved in it that they are unlikely to contribute to the enactment of effective anti-corruption laws. |

The impact of corruption on government efficiency can be measured using a variety of observable indicators and effects. Some of these include inefficient allocation of resources, poor governance, weakening of the effectiveness of government policies, an obstacle to economic development, and a decrease in overall economic efficiency. Lack of transparency, citizens' perception of the integrity and effectiveness of government institutions and the quality of public services can be examples of these effects. In addition, corruption can

negatively affect the public's trust in government, which could affect the effectiveness and efficiency of policies.

Conclusions

Preventing corruption in public administration is a fundamental challenge that requires comprehensive actions. Education plays a crucial role in this process, as promoting ethical values from an early age and fostering a culture of integrity can help prevent corruption in the future. It is essential that citizens, especially young people, are taught about the importance of honesty, responsibility and respect for the law in government.

The fight against corruption in public administration requires a joint effort by society, government and institutions. Although many countries have implemented measures to strengthen controls and prevent corruption, much remains to be done. The creation of specialized anti-corruption agencies, the implementation of stricter laws and the promotion of transparency in public management are important steps in the right direction.

It is vital that citizens are informed and actively participate in the fight against corruption in public administration. Reporting any suspicious acts and demanding accountability from public officials are key actions in this process. In addition, governments must continue to strengthen control and sanction mechanisms, as well as promote transparency and ethics in public management to ensure the efficient and honest functioning of government institutions.

References

- Andrade, S. N. (2021). Institutionalizing anti-corruption policies through international mission support. *OPERA*, 30, 197-213. <https://doi.org/10.18601/16578651.n30.11>
- Anggono, B. D., & Wahanisa, R. (2022). Corruption Prevention in Legislative Drafting in Indonesia. *WSEAS TRANSACTIONS ON ENVIRONMENT AND DEVELOPMENT*, 18, 172-181. <https://doi.org/10.37394/232015.2022.18.19>
- Bergh, A., & Erlingsson, G. Ó. (2023). Municipally owned corporations in Sweden: A cautionary tale. *Public Money & Management*, 1-8. <https://doi.org/10.1080/09540962.2023.2270272>
- Brás, G. R., & Dowley, K. M. (2021). Impact of demographic, political and financial factors on municipal transparency: A dynamic panel approach. *International Journal of Public Sector Management*, 34(2), 101-117. <https://doi.org/10.1108/IJPSM-11-2019-0289>
- Campante, F. R., & Do, Q.-A. (2014). Isolated Capital Cities, Accountability, and Corruption: Evidence from US States. *American Economic Review*, 104(8), 2456-2481. <https://doi.org/10.1257/aer.104.8.2456>
- Castro, C., & Lopes, I. C. (2023). E-Government as a Tool in Controlling Corruption. *International Journal of Public Administration*, 46(16), 1137-1150. <https://doi.org/10.1080/01900692.2022.2076695>
- CNN. (2023, February 1). *Latin American countries with highest levels of corruption perception, according to Transparency International*. CNN. <https://cnnespanol.cnn.com/2023/02/01/america-latina->

paises-mas-corruptos-segun-transparencia-internacional-orix/

- Cuzme, L., Marín, J., Garcia, O. D., & Aniyar, D. C. (2023). Towards understanding the historical and macroeconomic determinants of corruption in Ecuador: A study from critical criminology. *Encuentros. Revista De Ciencias Humanas, Teoría Social Y Pensamiento Crítico*, 18(mayo-agosto), 303-316. <https://doi.org/10.5281/ZENODO.7901738>
- Dahlström, C., & Lapuente, V. (2022). Comparative Bureaucratic Politics. *Annual Review of Political Science*, 25(1), 43-63. <https://doi.org/10.1146/annurev-polisci-051120-102543>
- De Oliveira, J. A. P. (2023). Evolution of the Brazilian public administration. *Public Administration Issues*, 0(6), 30-43. <https://doi.org/10.17323/1999-5431-2023-0-6-30-43>.
- Dinh Thanh, S., Nguyen, C. P., Duy-Tung, B., Binh, N. Q., & Van, D. T. B. (2023). Spatial spillover effects of fiscal decentralization on governance and public administration quality. *Regional Studies*, 57(3), 478-496. <https://doi.org/10.1080/00343404.2022.2078801>.
- Dragan, O. V., Yermakova, G. S., Chvaliuk, A. M., Kurchin, O. G., & Karagodin, O. V. (2020). Psychological Aspects of Corruption in Public Administration: Case-Study of Ukraine. *Academic Journal of Interdisciplinary Studies*, 9(6), 264. <https://doi.org/10.36941/ajis-2020-0130>.
- Dung, N. D., & Thanh, N. T. (2023). An Analysis of Corruption Risks in Issuing the Land Use Certificate in Vietnam. *Revista de Gestão Social e Ambiental*, 17(3), e03308. <https://doi.org/10.24857/rgsa.v17n3-013>

- Elicin, Y. (2020). The Unbearable Failure of Decentralisation in Turkey. *Hrvatska i komparativna javna uprava*, 20(3), 497-522. <https://doi.org/10.31297/hkju.20.3.4>
- Fagbadebo, O., & Dorasamy, N. (2022). Pandemic Within Pandemic: Corruption as an Impediment to Effective Management of COVID-19 in Nigeria and South Africa. In N. Dorasamy (Ed.), *Governance Challenges During the COVID-19 Pandemic in Africa* (pp. 253-271). Springer International Publishing. https://doi.org/10.1007/978-3-031-11244-7_13
- Falisse, J.-B., & Leszczynska, N. (2022). Do Anti-Corruption Messages Improve Public Service Delivery? Insights from a Lab-in-the-Field Experiment in Burundi. *The Journal of Development Studies*, 58(1), 96-114. <https://doi.org/10.1080/00220388.2021.1969010>.
- Fan, Y., Heydari, M., Saeidi, M., Lai, K. K., Yang, J., Cai, X., & Chen, Y. (2023). Corruption and infrastructure development based on stochastic analysis. *Archives for Technical Sciences*, 1(28), 11-28. <https://doi.org/10.59456/afts.2023.1528.011Y>.
- Fazekas, M., & King, L. P. (2019). Perils of development funding? The tale of EU Funds and grand corruption in Central and Eastern Europe. *Regulation & Governance*, 13(3), 405-430. <https://doi.org/10.1111/rego.12184>.
- Fedotov, A., & Voloshyna, M. (2019). Reformation of the institutional anti-corruption system in the context of european integration transformation. *Baltic Journal of Economic Studies*, 5(1), 224. <https://doi.org/10.30525/2256-0742/2019-5-1-224-232>.
- Galushi, L. T., & Malatji, T. L. (2022). Digital Public Administration and Inclusive Governance at the South

- African Local Government, in Depth Analysis of E-Government and Service Delivery in Musina Local Municipality. *Academic Journal of Interdisciplinary Studies*, 11(6), 116. <https://doi.org/10.36941/ajis-2022-0154>. <https://doi.org/10.36941/ajis-2022-0154>
- Gonçalves De Godoi, C. E. (2020). Transparency as a budget for the fight against corruption in public procurement in Brazil. *Boletín Mexicano de Derecho Comparado*, 1(155), 841.
- Hoa, N. T., Thuy, N. T. T. T., & Thanh, N. N. N. (2023). Factors affecting corruption in the public sector: Evidence from Vietnam. *Journal of Liberty and International Affairs, Institute for Research and European Studies - Bitola*, 9(2), 63-88. <https://doi.org/10.47305/JLIA2392063tt>
- Hossain, M. M., Rahaman, M. M., & Rahman, M. J. (2023). Covid-19 corruption in the public health sector-emerging evidence from Bangladesh. *Health Policy and Planning*, 38(7), 799-821. <https://doi.org/10.1093/heapol/czad036>.
- Huang, C.-H., Hsiao, L. H. C., & Ko, S.-L. (2021). Effect of Applying Case Method to Anti-Corruption Education on Learning Motivation and Learning Effectiveness. *Journal of Cercetare Si Interventie Sociala*, 73, 276-287. <https://doi.org/10.33788/rcis.73.17>.
- Ingrams, A., & Schachter, H. L. (2019). E-participation Opportunities and the Ambiguous Role of Corruption: A Model of Municipal Responsiveness to Sociopolitical Factors. *Public Administration Review*, 79(4), 601-611. <https://doi.org/10.1111/puar.13049>
- Jones, D. S. (2022). Challenges in combating corruption in Malaysia: Issues of leadership, culture and money

- politics. *Public Administration and Policy*, 25(2), 136-149.
<https://doi.org/10.1108/PAP-01-2022-0002>
- Klopp, J. M., Trimble, M., & Wiseman, E. (2022). Corruption, gender, and small-scale cross-border trade in East Africa: A review. *Development Policy Review*, 40(5), e12610.
<https://doi.org/10.1111/dpr.12610>
- Kolomoiets, T., & Makarenkov, O. (2021). Digital intervention in legal mechanisms for detecting the proceeds of corruption. *Baltic Journal of Economic Studies*, 7(5), 235-242. <https://doi.org/10.30525/2256-0742/2021-7-5-235-242>
- Kotukov, O., Kotukova, T., Kozlov, K., Makarenko, O., & Odyntsova, O. (2023). The effectiveness of the national anti-corruption policy of Ukraine. *Revista Amazonia Investiga*, 12(66), 304-313.
<https://doi.org/10.34069/AI/2023.66.06.28>.
- Lee, S. Y., Díaz-Puente, J. M., & Martin, S. (2019). The Contribution of Open Government to Prosperity of Society. *International Journal of Public Administration*, 42(2), 144-157.
<https://doi.org/10.1080/01900692.2017.1405446>
- Lendvorský, M., Mališová, D., Pekár, B., Mikušová Meričková, B., & Štrangfeldová, J. (2022). Legal Responsibility for Corrupt Practices with an Impact on the Enforcement of Political Accountability: Case Study of Slovakia. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*, 29(3).
<https://doi.org/10.46585/sp29031395>.
- Liu, H.-C., Hsiao, H. C., & Lin, J.-S. (2021). Effects of Anti-Corruption Governance Strategy on Organizational Trust and Job Satisfaction in Ministry of National Defense.

- Journal of Cercetare Si Interventie Sociala*, 74, 108-119.
<https://doi.org/10.33788/rcis.74.7>
- Macedo, S. V., Valadares, J. L., Mendes, W. D. A., & Miranda, M. S. (2023). Percepções sobre o acesso à informação e a corrupção na gestão pública municipal: Os dois lados da mesma moeda. *Revista Brasileira de Políticas Públicas*, 12(3).
<https://doi.org/10.5102/rbpp.v12i3.7901>.
- Mansour, S., Wallace, S., Sadiraj, V., & Hassan, M. (2021). How do electoral and voice accountability affect corruption? Experimental evidence from Egypt. *European Journal of Political Economy*, 68, 101994.
<https://doi.org/10.1016/j.ejpoleco.2020.101994>.
- Matheus, R., & Janssen, M. (2020). A Systematic Literature Study to Unravel Transparency Enabled by Open Government Data: The Window Theory. *Public Performance & Management Review*, 43(3), 503-534.
<https://doi.org/10.1080/15309576.2019.1691025>
- Mhazo, A. T., & Maponga, C. C. (2022). The importance of prioritizing politics in Good Governance for Medicines Initiative in Zimbabwe: A qualitative policy analysis study. *Health Policy and Planning*, 37(5), 634-643.
<https://doi.org/10.1093/heapol/czac007>
- Muzurura, J., & Mutambara, E. (2022). Effective Supreme Auditing Institutions, Sound Public Finance Management and National Development: Lessons for Zimbabwe's Office of Auditor General. *Humanities and Social Sciences Letters*, 10(3), 223-237.
<https://doi.org/10.18488/73.v10i3.3017>
- Nonki Tadida, E. Z. (2023). Public auditing: What impact does the quality of the institutional framework have on the

- level of corruption? *International Review of Administrative Sciences*, 89(4), 1131-1146. <https://doi.org/10.1177/00208523231155385>
- OAS. (2023). *Guide to Mechanisms for the Promotion of Transparency and Integrity in the Americas*. OAS - Secretariat for Political Affairs. https://www.oas.org/es/sap/dgpe/guia_herramientas.asp
- Psota, V., Chyzhevskya, L., Osychka, O., Zaika, S., & Koval, N. (2020). Competition in public procurement in the fight against corruption: Analysis of an example of Ukraine. *Intellectual Economics*, 14(1), 89-112. <https://doi.org/10.13165/IE-20-14-1-06>.
- Quah, J. S. T. (2022). Leadership and culture in combating corruption: A comparative analysis. *Public Administration and Policy*, 25(2), 193-207. <https://doi.org/10.1108/PAP-05-2022-0043>.
- Rieznik, S., & Lee, H.-B. (2021). Citizens' Perception of Corruption and Transparency as Determinants of Public Trust in Local Government in Ukraine. *Hrvatska i komparativna javna uprava*, 21(2), 225-258. <https://doi.org/10.31297/hkju.21.2.2>
- Rodríguez-Martín, A., Palomo-Zurdo, R., & González-Sánchez, F. (2020). Transparency and circular economy: Analysis and assessment of municipal management of municipal solid urban waste. *CIRIEC-Spain, Journal of Public, Social and Cooperative Economics*, 99, 233. <https://doi.org/10.7203/CIRIEC-E.99.16011>.
- Sánchez-Hernández, M. I., Aguilar-Yuste, M., Maldonado-Briegas, J. J., Seco-González, J., Barriuso-Iglesias, C., & Galán-Ladero, M. M. (2020). Modelling Municipal Social

- Responsibility: A Pilot Study in the Region of Extremadura (Spain). *Sustainability*, 12(17), 6887. <https://doi.org/10.3390/su12176887>.
- Sánchez-Huamán, Y. D., Villafuerte-Miranda, C. A., Flores-Morales, J. A., & Neyra-Huamani, L. (2023). Organizational change management in public administration. *Revista Venezolana de Gerencia*, 28(Special 10), 1126-1139. <https://doi.org/10.52080/rvgluz.28.e10.16>.
- Stanimirović, T. (2022). Improving Budget Transparency to Achieve Effective and Sustainable Governance. *Central European Public Administration Review*, 20(2), 81-100. <https://doi.org/10.17573/cepar.2022.2.04>.
- Statista (2023). *Latin America Corruption Index 2022*. Statista. <https://es.statista.com/estadisticas/1073892/america-latina-indice-percepcion-corrupcion-pais/>
- Tawiah, V. (2023). The impact of IPSAS adoption on corruption in developing countries. *Financial Accountability & Management*, 39(1), 103-124. <https://doi.org/10.1111/faam.12288>.
- Torres-Puraca, B. (2020). Los Actos De Corrupción En Las Contrataciones Del Estado A Consecuencia Del Covid-19: ¿Delito Funcional O Infracción Administrativa? *REVISTA DE DERECHO*, 5(1), 21-34. <https://doi.org/10.47712/rd.2020.v5i1.67>
- Transparency International (2024, January 30). *CORRUPTION PERCEPTIONS INDEX*. Transparency International. <https://www.transparency.org/en/cpi/2023>
- Vaquero, A., & Cadaval, M. (2022). Reflections and proposals to combat public corruption in local government. *Revista*

- Española de la Transparencia*, 15, 181-205.
<https://doi.org/10.51915/ret.219>.
- Wenzel, D. (2021). Droughts and corruption. *Public Choice*, 189(1-2), 3-29. <https://doi.org/10.1007/s11127-020-00843-0>.
- Zou, Q., Mao, Z., Yan, R., Liu, S., & Duan, Z. (2023). Vision and reality of e-government for governance improvement: Evidence from global cross-country panel data. *Technological Forecasting and Social Change*, 194, 122667.
<https://doi.org/10.1016/j.techfore.2023.122667>.
- Zumofen, R., Kakpovi, B. G., & Mabillard, V. (2022). Outcomes of government digitization and effects on accountability in Benin. *Transforming Government: People, Process and Policy*, 16(3), 305-317. <https://doi.org/10.1108/TG-10-2021-0173>

Savings and investment strategies of private banks in the canton of Cuenca, province of Azuay

Carmen Yolanda Jaramillo Calle

Universidad Católica de Cuenca, cjaramillo@ucacue.edu.ec,
<https://orcid.org/0000-0003-3088-8322>

Monica Alexandra Hermida Carpio

Universidad Católica de Cuenca, monica.hermida@est.ucacue.edu.ec,
<https://orcid.org/0009-0002-1474-9525>

Christian Mauricio Banegas Campoverde

Universidad Católica de Cuenca, cbanegas@ucacue.edu.ec,
<https://orcid.org/0000-0002-9618-3803>

Pedro Yamil Astudillo Arias

Universidad Católica de Cuenca, pastudillo@ucacue.edu.ec,
<https://orcid.org/0000-0003-4639-0318>

Introduction

In recent years, economic and financial markets worldwide have undergone serious changes as a result of globalization. In Ecuador, financial institutions have developed significant changes to achieve efficiency in their operating systems, focusing on the various banking services and on the knowledge of private banking, all of which are aimed at customer satisfaction (Estévez, 2001).

The present research is carried out strategically for the analysis of the strategies proposed by the financial entities in which we will observe through the study of multiple linear regression the positive strategies that lead to the success of private banking,

banking is a sector of the economy in which through financial planning manages the available funds in an efficient way (Izarra, 2013).

The Objective is to analyze the savings and investment strategies of private banking in Cuenca Canton of the Province of Azuay; the research question Are the savings and investment strategies efficient in private banking in Cuenca Canton of the Province of Azuay? And the hypothesis: are the savings and investment strategies of the private bank in the Cuenca Canton of the Province of Azuay efficient? Comprehensive advice, Attracting customers, Customer loyalty, Increasing brand recognition, Increasing the volume managed, Personalized treatment, Maintaining stable communication with the customer.

Private banking

Private banking is defined as the service in which it offers personalized financial advice to a group of people of high standards or high net worth for a long time, the term private refers to the personalized service provided by the banker to each of his clients (Fernandez L. , 2013).

The term of high level of wealth reviews those people who exceed a high amount determined as liquid assets the exact figure in which this asset can be denominated is not generalized since it depends on each financial institution (Morales, 2018).

Private banking is established as a fundamental organization within the country's economic system, its main activity consists

of receiving each client's resources, which they deposit in savings and investment accounts to subsequently grant credits to those who require it; thus achieving an interaction with private agents that originate goods and services, generating liquidity for the bank and can continue with the provision of services (León, 2014).

Private banking is granted an important and essential development in the country's economy, since by providing its services it generates an efficient development of the economy, by obtaining savings and investments from customers it carries out its financial service, where; it has the option to generate loans and obtain income through this option (Berger, 2011).

Private banking seeks new ways to capture the attention of customers, in 2016 they developed financial services focused on the customer, where they have proposed a plan of strategies with responsible investment criteria and thanks to this they have been generating new customers and capturing the attention of them, they established an impact on cell phone applications thus creating, a platform for educational microfinance, obtaining a leading position in the banking sector by the volume of loans granted (Zaragoza, 2013).

Private banking provides a personalized attention by a certainly trained advisor, with a modern and updated technology, where; each process is going to be performed efficiently, optimizing time and managing to obtain the inclination of the client towards the bank, thus generating; the capture of the investment, satisfaction for the information

delivered and customer loyalty generating trust and accreditation for future customers (Hernandez, 2010).

It is important to clarify, that private banking generalizes to all those institutions and entities of the banking business, is guided by the principles of transparency in each transaction carried out, being this an impact against poverty, favoring economic development and respecting each of the ethical values, manages to capture the loyalty of customers by the transparent methods performed, obtaining renown and generating the attention of new investor customers and customers in which they require to deposit their savings in banking (Levinson, 2012).

Currently, each of the savings received by customers help and allow the financing of carrying out sustainable projects, generating a stable economy, which contributes to the economic development of the country by drawing goals set for customers, with the obtaining of the money collected, they achieve an efficient activity with the application of investment funds, private banking when exercising their services has to address a group of risks associated with liquidity sufficiency, credit volume, interest and operational risks due to this at the time they make investments new credits may arise (Bravo, 2018).

Savings and investment strategies

The strategy is the result of multiple options is the implementation of solutions, innovation and trying to set objectives is the determination of the goals and objectives of the financial institution the actions to be taken and the

allocation of resources necessary for the success of private banking (Castelló, 2010).

The savings strategy is to act in a future term where goals have been established with a committed purpose where an acceptable term is established to generate success for the financial institution and at the same time be prepared for any adversity (Accenture, 2006).

The strategy allows to know What is the business? What should the business be? How to lead the business to success? What the organization is dedicated to, certain areas require a series of previous knowledge that, together with experience, form the ideas that allow adapting or carrying out actions that lead to the success of the organization, which allows positioning and success in the market (Rahman, 2020).

Each strategy is not long-lasting because the competition will change the structure and copy ideas, so it is necessary to be in constant movement while generating new strategies, which is why the strategy of an organization is not done quickly if it is not analyzed according to the needs of users, it requires time and the application of sufficient resources to achieve success (Accenture, 2006).

The use of resources is not only limited to the financial aspect, but also includes the organization's personnel; training processes should be aimed at the competencies of its human resources in order to establish competitive advantages over the competition (Fernandez, 2003).

Application of the principle of continuity or ongoing business is to establish long-term objectives so that they can be structured adaptable to what the market demands where it is possible to establish the goal of always looking ahead by placing all the strategies and moving them in such a way that the horizon becomes much more feasible leading to the success of the financial institution (Morales, 2018).

Through time, several strategies have been generated to follow, where most of them have been of great help, being compatible and generating profits to private banking, therefore; at the moment a strategy is selected, it is essential that it fits the needs and objectives of the investor, where the capture and acceptance for investing in the banking institution is achieved, in this way it has been possible to establish strategies: ranging from the simplest, to the most complicated in order to obtain the success of the bank (Aranda, 2015).

Integral Advice: Financial advisors play a fundamental role in private banking, since they will be the ones who will have the first contact with the client; in which they will be able to have a more personal relationship generating confidence and security in their words in each of the aspects that they carry out through the financial processes, being so; they must be trained in an efficient way, with a lot of experience and with values that demonstrate the closeness to the client, indicating the efficiency in each process and obtaining the acceptance of the client in investing in banking (Levinson M. , 2008).

The basic objective of making investments in banking is to satisfy the needs of the clients and at the same time to access

their funds through profits generated for the bank, in which both parties obtain benefits, the reason for which the investment in private banking is made, is with the guarantee of obtaining future benefits depending on the time invested and the amount, through adequate planning, thus achieving success and fulfilling the expectations of the bank and the clients (Estevez, 2001).

In the case of Latin America, the Mexican bank Banorte indicates the effectiveness of the strategy in the realization of sustainability, with a technique of environmental and social risk management in the execution of credits, thus obtaining; new clients, capturing the trust and security of depositing their savings in private banking, executed new financing mechanisms to achieve obtaining a greater amount of financial projects, counting on personalized services, adapting to the needs of existing and potential new clients (Comunicarseweb, 2017).

To achieve success in private banking, it is necessary to analyze and establish the correct strategies that are directed to a process of adaptation to the market environment, generating and capturing customer interest, satisfying their needs and obtaining income where the investment process has a strategic plan to be able to achieve the desired and expected results, in order to take advantage of opportunities and reduce threats that may occur in the financial markets (Miller, 2005).

Client acquisition: Companies dedicated to providing financial services must constantly analyze the trends and behavior of

their customers in order to adjust their strategies and adapt to the new demands of a market that presents continuous changes (Castelló, 2010).

Banks seek to generate profitability in each operation they carry out and this grows with the number of their operations and multiplies with the volume of the same, so that profitability is generated by itself on the repetitive basis of transactions with customers, customer banking seeks to generate profitability in its relationship with each customer (Andrews, 1979).

It is important for the customer service executive to have a solid financial background, together with good communication and commercial skills, as well as the ability to manage human relations; all these aspects add up and are important at the time of being able to meet the requirements of customers and finally satisfy their needs in the financial institution (Castelló, 2010).

Customer loyalty: To capture the attention of customers and generate income in private banking, the service of personalized financial advisors to the customer is fundamental and a priority, much of it depends on visualizing the customer, generating interest and obtaining the necessary resources to obtain the investment in banking, it must be remembered that the customer is the real engine of the banking entity, therefore; it is important to analyze and review banking strategies in order to adapt them to the needs and requirements of customers and above all, that they are

directed to the achievement of the increase of their investments (García, 2001).

After having analyzed what has been exposed by the various authors, it can be stated that private banking, in spite of the time elapsed and the changes made, needs to continue innovating its strategies to achieve the fulfillment of its objectives outlined by the banking entity (García, 2001).

To this end, the strategies established should be directed towards the loyalty of existing customers and, above all, to attract new customers, technological resources, trained personnel and efficient strategies of the banking entity should be aligned with operational management, to generate trust and loyalty of users in making their investments and deposits of their savings in the bank (García, 2001).

Increasing brand recognition: This refers to the generation of new clients, thus achieving the acceptance of the chosen private bank, at the moment of the election, prestige, popularity and renown are generated for the entity, since the mention of the clients towards the banking entity would be taken as a fruitful publicity, generating confidence for future deposits in savings accounts (Del Valle Zaragoza, 2006).

At the moment that the brand is increased and recognized, the banking entity grows in the advertising field since it generates more renown with the clients and at the same time the confidence to continue making their deposits in the same, obtaining the attraction and acceptance by the user, demonstrating efficiency in each process carried out (Estévez, 2001).

Increasing brand recognition is a positive strategy that, in addition to obtaining more clients due to the trust it provides, generates the success of the bank since being recognized generates interest from new users and, in addition to this, the banking entity continues to grow in different places where it is established (Accenture, 2006).

Investment Strategies. the concept of strategy begins with a vision of how the financial entity wants to be seen with the intention of fulfilling its objectives being reflected a prospective analysis where it is intended to show all those entities the success generated demonstrating that the bank is prepared to face the various challenges that the market demands with very well structured and elaborated plans in which each of them have a plan of action, position and positive outlook for the banking entity (Aranda, 2015).

A consciously defined action plan in which a situation can be faced successfully, establishing a maneuver and can gain advantage in the field of competition achieving identification in the environment that moves, being able to learn adapt and do faster than the competition to lead the bank to success thus getting positioned in the market (AFI, 2012).

The investment strategy is defined as a set of frequent programs of action that carry with them commitments to implement the mission of the organization starting with a purpose and a planned direction where a series of plans are established in which the allocation of tasks and resources taken by each of the departments to make it feasible to achieve the proposed objectives (Perez, 2009).

The power of the strategy consists in guiding the organization where it has several alternatives in each financial crisis and in the improvement of the bank, therefore it can have different options to be able to take action in each situation being the execution of the strategies by the leaders, to clarify, make the impulse and act coherently in each situation with the possibility of offering new services and committing to the achievement of the objectives (Marín, 2009).

When choosing a plan, the idea proposed as a strategy by the bank must have the certainty of viability and that it is not obeying a simple whim but a good analysis of the proposals generated being within the system and describing the current situation of the organization where you can make solid projections about the future of the bank with safe purposes within the strategic planning with a process of adaptation and evolution of the circumstances that arise (Accenture, 2006).

Increase in managed volume

Accessing the increase of the managed volume is a very important strategy, attractive for the user and of growth for the entity, since at the moment that it generates innovative services it captures the client's attention, by managing improvements in the investment term it generates benefit for the client, in this way it will be the client who will look for the financial entity for more investment possibilities (Estévez, 2001).

The increase in the volume managed generates guarantee since, by increasing the customer's assets, customers will feel the confidence and pleasure to continue investing in banking,

by being able to increase market share quotas they become more competitive in the financial field (Huerga, 2018).

The level of satisfaction generated by providing a service is considered as a first step we evidence a motivation of customer loyalty to the institution, which allows to establish, promote and maintain long-term relationships that will undoubtedly benefit the level of profitability, linkage and belonging that users present in relation to our institution (Torca, 2010).

Banking institutions increase the volume managed in order to achieve the objective of attracting customers, which allows the correct identification of the user, the determination of their needs and therefore have proposals for improvement that are established as key to their needs (Mathisen, 2011).

Personalized treatment

All private banking entities determine that their main competitive advantage is developed by the provision of personal advisory services, because the person in charge of this area must have adequate and satisfactory training, which manages to capture the attention of customers by obtaining the acceptance and approval of each of the users, thus maintaining customer loyalty and obtaining adequate information with modernized technological tools to perform efficient processes (Accenture, 2006).

With the rapid evolution of technology, it is essential that each of the financial institutions generate operating models that allow them to adapt satisfactorily and without loss of time to

possible changes in the financial market; where they streamline the system to offer a more complete and pleasant service to customers, i.e.; they decide to invest in technology and tools to improve the management of customer service (Mathisen, 2011).

Personalized treatment is an important strategy for banking, because when this strategy is applied by the bank, it achieves customer attraction, as long as the treatment is correct, customer acceptance will be obtained and at the same time customer loyalty will be achieved so that they can invest in banking (Mathisen, 2011).

Maintain a stable link and communication with the customer

The importance of maintaining a link and stable direct communication with each of the customers in the economic activities they perform is a successful strategy for private banking because it is establishing a link with the customer, the customer feels the confidence to make the desired investment with the bank, with the right communication will reach the security of the user generating stability with the financial institution (Mathisen, 2011).

The application of maintaining a link by the financial entity generates a verification of the correct economic analysis for the possible investments that will arise, with the correct communication, the advantage is that the client is informed of all the consequences about the investments to be made, such as the established times of the investment in the banking entity (Accenture, 2006).

Having a perspective of solvency and sustainability in the long term, where the financial entity can ensure each of the operations and continue with the presence of banking finance carrying out a satisfactory and successful connection with customers and stakeholders demonstrating the reliability of the entity for the and of the security of the investments made obtaining benefits accepted by the users (GABV, 2012).

In order to carry out this research project, a descriptive, quantitative research was considered with a study of the multiple linear regression model to respond to the impact generated by the savings and investment strategies in relation to private banking, since it will allow strengthening the relationship generated by each strategy with the dependent variable, which is private banking.

For the identification of the strategies used by private banks, it was based on scientific articles that parts of investigated experiences were supported in the state of the art, the subjects of study considered were the executives and agency heads of private banks with which 48 agencies of the city of Cuenca of the 10 private banks were identified, since there is no statistical information on the number of officials in each entity, based on that, it has been possible to collect 100 surveys to obtain the results of the impact generated by the strategies carried out (Super Intendencia de Bancos, 2022).

The surveys were conducted virtually through Google Forms and were structured with 30 closed questions with the following evaluation criteria with a Likert-type scale where 5 is the maximum value of satisfaction and 1 is the minimum value

of satisfaction, as follows: 5 always, 4 almost always, 3 sometimes, 2 occasionally and 1 being never.

Table 1. *Private banks in Ecuador*

| Large Private Banks | | |
|---------------------------------|----------------------|---------------------------|
| | Private Banks | Number of branches |
| | BP Guayaquil | 7 branches |
| | BP Pacífico | 7 branches |
| | BP Pichincha | 9 branches |
| | BP Produbanco | 5 branches |
| Medium Private Banks | | |
| | BP Austro | 11 branches |
| | BP Bolivariano | 3 branches |
| | BP Internacional | 3 branches |
| | BP Solidario | 1 branch |
| | BP Machala | 1 branch |
| Small Private Banks | | |
| | BP DelBank | 1 branch |
| total de bancos privados | | 48 |

Prepared by: The Author

For the elaboration of the instrument it is necessary to take into account some aspects such as reliability, which seeks the instrument to produce consistent and coherent results (Laeven, 2004).

A two-part questionnaire was elaborated:

In the first part the survey was conducted to selected study subjects with 3 items where the following points are identified in the following table.

With the analysis carried out, we proceeded with the execution of the survey, which was validated with specialists from the Catholic University of Cuenca, it was possible to verify the research with a pilot test to 10 study subjects considering that the data that Cronbach's Alpha was applied came out 0.8 with a high degree of reliability.

The age of each of the participants is of great importance for the research carried out since it allows obtaining information about the experience they have in the senior management departments. As can be seen in Figure 2, 60% of the legal representatives in the bank are between 24 and 34 years old, 20% are between 35 and 40 years old and 20% are between 41 and 45 years old.

Gender diversity in the city of Cuenca has reached a great variety which has been taken into account at the time of conducting the survey, as shown in Figure 3, 60% of the employees working in private banking are female and 40% are male.

It is important to emphasize the level of study of each legal representative of the bank in which the preparation of each one of them can be identified as shown in Figure 4, 70% have a higher education level such as third level, 20% are in ongoing education and 10% have a master's degree.

Through a generalized analysis of the control variables by means of the survey, it was identified that the age of the legal representatives in the financial institutions is from 24 to 34 years old, 60% are female, and 70% have completed university studies, with a third level of education.

Inferential analysis

The inferential analysis has the objective of reaching valid conclusions based on observations in which generalized results can be obtained, in this research we seek to analyze the results obtained, which was already verified with Cronbach's alpha and where the multiple linear regression model will be applied.

The results of the summary of the model, R of person, and R squared through the application of SPSS, each one of the values determined by the software was analyzed as indicated in table 5, it is observed that in the R of person gives a result of 0.768 which indicates that the variables do affect the strategies elaborated by the bank, which adjusts to the model, R squared corrected 0.59 explains 59% of the variance of the dependent value.

The results of the significance and F that when observing and analyzing the Snedecor's F value which is the overall sig. without the constant = 19.109, the R2 is the overall significance including the constant (0.590).

To conclude, it could be determined that the variables of integral advice (x1) positively influences the strategies elaborated by the private bank and also the customer loyalty

that corresponds to (x3) positively influences the model, being this one as follows:

$$Y = -1.812 + 0.643 * x1 + 0.378 * x3 + \mu$$

Where: variables x1 and x3 generate acceptance in private banking strategies.

X1 = Comprehensive advice variable and X3 = Customer loyalty variable.

According to the author (Accenture, 2006) indicates about the main competitive advantage in the financial entities is the integral advice since they have integrated technological tools, in the research carried out coincides about the importance of the integral advice variable being positive for the banking and generating the success of the same.

According to the author (García, 2001) indicates the importance of the customer loyalty variable since the author considers that as long as efficient communication is established and the customer is captured, customer loyalty can be obtained, while in the analysis carried out the results are positive in favor of the author that if customer loyalty is achieved, an increase in investments and acceptance of the financial entity is obtained.

Conclusions

After analyzing each of the results, it was verified the incidence that exists between customer loyalty and comprehensive advice, which generates a positive impact on the implementation of these strategies by the private bank, which

by generating them lead to the success of the bank, since they are the ones that generate the greatest impact through the results.

The comprehensive advice variable generates a positive impact on private banking as well as the customer loyalty variable, which allows the financial growth of the bank, and directs the achievement of its established objectives and therefore the expected success.

Carrying out this analysis of the strategies for private banking has been of great benefit, since it was possible to verify the variables of greater scope of success for the bank, giving a positive result which could be verified with statistical data such as the SPSS software that led us to find the results in an appropriate way and it was possible to obtain the strategies of greater impact for private banking.

Reference

- Accenture. (2006). *Tendencias y estrategias de la banca privada*. Instituto de Empresa & Morgan Stanley.
- AFI. (2012). *Forward una visión sobre el presente y el futuro del sector*. Obtenido de <http://www.afi.es/afi/libre/pdfs/grupo/documentos/estudio-banca-privada-forward.pdf>
- Andrews. (1979). *Ciencias Económicas* 28-No. 1: 2010 / 247-276 / ISSN: 0252-9521 pag 59.
- Aranda. (2015). *Gestión de Patrimonios*. Obtenido de <http://www.ayg.es/wp-content/uploads/2015/05/17.-Forbes.pdf>

- Banco Mundial. (2022). *Banco Mundial*,. Asobanca. Obtenido de <https://asobanca.org.ec/wp-content/uploads/2022/12/C-399-2022-Anexo-Circular-Nro.-SB-IG-2022-0027-C-Solicitud-informacion-entidades-en-liquidacion-sector-SEPS..pdf>
- Berger, A. (2011). "Bank size, lending technologies, and small business finance",. *Journal of Banking and Finance*.
- Bravo. (2018). "Assessing competition in the private banking sector In Ecuador. Cuadernos de Economía,.
- Castelló. (2010). *Bienes inmuebles, acciones, bonos, productos estructurados, private equity, hedge funds*. Antoni Bosch.
- Comunicarseweb.(2017).Obtenidodehttp://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2073-60612019000200017&lang=es#B6
- Cruz, D., López de León, F., Pascual, L., & Battaglia, M. (2010). *Guía Técnica de producción de hongos comestibles de la especie de Hongos Ostra*.
- Del Valle Zaragoza. (2006). *Gestión Financiera*,. McGraw-Hill.
- Estévez. (2001). *Productos financieros, sus mercados, valoración y estrategias de inversión*. madrid:Empresarial.Obtenidodehttp://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2073-60612019000200017&lang=es.
- Fernández, L. (2013). *La banca y los mercados financieros*. Alianza.
- GABV, A. G. (2012). *Alianza Global para una Banca con Valores*. Alianza.
- García. (2001). *Productos financieros, sus mercados, valoración y estrategias de inversión*.

- Hatten. (1987). *Ciencias Económicas* 28-No. 1: 2010 / 247-276 / ISSN: 0252-952.
- Hernández, V. (2010). *Aprende a ahorrar, a invertir y a multiplicar tu dinero*. Gestion 2000.
- Huerga. (2018). *Private Banking and Wealth Management Services Offered by Banks*. Obtenido de Private Banking and Wealth Management Services Offered by Banks.
- Izarra. (2013). *Gestion financiera*. McGraw-Hill.
- Johnson&Scholes. (1993). *Ciencias Económicas* 28-No. 1: 2010 / 247-276 / ISSN: 0252-9521.
- Laeven. (2004). "What drives bank competition? Some international evidence",. *Credit, and Banking*.
- León. (2014). *scielo*. Obtenido de http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2073-60612019000200017&lang=es
- Levinson, M. (2008). *Guía de mercados financieros*. Inversor.
- Marín.(2009).*Labancaprivada*.Obtenidode<http://www.publicacionescajamar.es/pdf/publicaciones-periodicas/mediterraneo-economico/8/8-118.pdf>
- Mathisen. (2011). *Competition and efficiency in banking*. Working Paper.
- Miles&Snow. (1978). *Ciencias Económicas* 28-No. 1: 2010 / 247-276 / ISSN: 0252-952.
- Miller. (2005). Evidence from the lending practices of large and small banks. *Journal of Financial Economics*,.
- Morales. (2018). Customer orientation in highly relational services: antecedents and consequences (Doctoral dissertation, University of West London).
- Nita. (2009). *Ciencias Económicas* 28-No. 1: 2010 / 247-276 / ISSN: 0252-9521 . pag 59.

- Pérez. (2009). *Tendencias y estructuras organizativas en la Banca Privada y la Banca Personal*. Obtenido de <http://es.slideshare.net/jperezga/bcaprivadapersonal2009>
- Rahman. (2020). *retention strategies for enhanced job satisfaction in a highly competitive job market: A study with private banking sector in Bangladesh*. Obtenido de International Journal of Social Sciences Perspectives: <https://www-scopus-com.vpn.ucacue.edu.ec/results/results.uri?sort=plf-f&src=dm&st1=bank+private&sid=7fb426a0fb49d50461d9c2438378bbec&sot=b&sdt=cl&sl=27&s=TITLE-ABS-KEY%28private+AND+banking+AND+strategies%29&origin=resultslist&editSaveSearch=&sessionSearc>
- Rodríguez. (2008). *Productos financieros, sus mercados, valoración y estrategias de inversión empresarial*.
- Super Intendencia de Bancos. (2022). *Asobanca*. Obtenido de <https://asobanca.org.ec/wp-content/uploads/2022/12/C-399-2022-Anexo-Circular-Nro.-SB-IG-2022-0027-C-Solicitud-informacion-entidades-en-liquidacion-sector-SEPS..pdf>
- Torca. (2010). *Cómo entender las finanzas de hoy*. Antoni Bosch.
- Zaragoza, D. V. (2013). *Gestión financiera*. McGraw-Hill.

Importance of the agricultural sector in the Ecuadorian economy

Econ. Víctor Quinde Rosales, MSc.

Docente-Investigador, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
vquinde@uagraria.edu.ec
<https://orcid.org/0000-0001-9617-8054>

Ing. Rina Bucaram Leverone, PhD.

Docente-Investigadora, Facultad de Economía Agrícola
Universidad Agraria del Ecuador
rbucaram@uagraria.edu.ec
<https://orcid.org/0000-0003-4456-7095>

Introduction

Ecuador's economy is heavily influenced by the agricultural sector, which is considered the backbone of the country due to its important contribution to economic growth. The research question driving this study is: Is there a causal relationship between money supply and Ecuador's agricultural exports? To answer this question, this study aims to examine the relationship between agricultural exports and economic growth using a vector autoregressive (VAR) model to determine whether or not there is a causal effect between these variables.

Several key topics will be covered in this chapter. First, the historical and current importance of the agricultural sector in the Ecuadorian economy will be analyzed. It will also consider how industrialization and migratory movements have impacted the sector and provide the necessary information for

the authorities to generate policies that benefit this sector. In addition, the methodology used in this study will be described in detail, explaining the empirical analysis approach and the application of the VAR model, as well as the logic of variable selection and the evaluation process stopped by the extended Dickey-Fuller test.

This chapter contributes to the literature by providing a comprehensive understanding of the relationship between agricultural exports and economic growth in Ecuador. The results of the analysis indicate that there is no Granger causality between agricultural exports and economic growth, suggesting that other factors, such as oil exports and tax collection, may have a greater impact on the country's economic growth. These findings highlight the need to diversify economic growth strategies and policy formulation in Ecuador, creating a solid foundation for future research and solutions in the agricultural sector.

Problem, research question and hypothesis,

Ecuador's agricultural sector is a historical and contemporary bastion of the country's economic future, not only a source of livelihood for millions of people but also a fundamental pillar in the construction of a national and environmentally sustainable identity. Ecuador's economy has been characterized as agricultural, a fact that has led it to focus on the production and marketing of primary products as the basis of its economy (Cantos, Guzmán, Ordóñez and Trelles 2021). From its origins, when indigenous agricultural methods coexisted with colonizing practices, to its modern evolution as a key driver of the global economy, agriculture has created a

tapestry of diversity in production, culture and progress in Ecuador.

Since the eighteenth century, agriculture and livestock as productive activities were strengthened and came to be considered one of the most solid economic structures in the country (Viteri and Tapia, 2018). Quinde-Rosales et al. (2018), agree with Viteri and Tapia (2018) and describe that, during the last century, the agricultural sector has become the center of the country's productive dynamics, supplying the domestic market generating income and giving way to the export of its products, thus integrating rural Ecuador into the global productive system.

Salami and Noori (2012) add that agriculture is a mainstay of the Ecuadorian economy, due to its significant contribution to several aspects, including: GDP growth, reduction of the trade balance deficit, generation of jobs at the national level and the country's food security.

According to data provided by the last National Agricultural Census carried out in 2000, 40% of the population was located in rural areas, which is made up of two thirds of the families associated with agricultural activities that live on the land they produce. The Ministry of Agriculture and Livestock (MAG, 2022), states that currently about 25% of Ecuadorians are focused on the agricultural sector and approximately 62% work in agriculture.

The National Institute of Statistics and Census (INEC, 2019), states in the labor indicators collected by the National Survey of Employment, Unemployment and Underemployment

(ENEMDU) that the activity of agriculture, livestock, hunting, forestry and fishing concentrated in 2019 the largest share of rural employment, contributing 29.4% of the national EAP, this being higher than trade and manufacturing with 17.9% and 10.3% respectively in the same year.

However, during the last decades, the adoption of industrialization has provoked migratory movements internally and externally, among the most evident is the migration of the rural population to urban areas in search of better opportunities, leaving behind the pejorative living conditions of the countryside (Lara, Argothy, Martínez and Mejía, 2022). The Food and Agriculture Organization of the United Nations (FAO, 2016), mentioned that the migration problem is something detrimental for countries that base their economy on primary activities, for such reason, governments should implement plans to decrease the migration of farmers to large cities, governments should ensure the social protection of agricultural workers and promote the development of the agricultural sector.

Along the same lines, Boza (2013) explained that public spending is a very important item to solve, to a certain extent, the needs of disadvantaged and vulnerable groups by investing resources, through the provision of infrastructure and quality services. Cuadras-Berrelleza, Peinado-Guevara, Moreno-López, Beltrán-Lúgo and Peinado-Guevara(2024) mentioned that governments should allocate part of the general state budget to the development of the agricultural sector in order to finance rural infrastructure projects, restrict

imports, stimulate agricultural exports and scientific research to safeguard food security.

Benítez, Herrera and Herrera (2021) stated that, despite the importance of the agricultural sector in the national economy, the state's contribution to the development of the sector has been decreasing over time; however, agriculture continues to generate an important contribution to the country's economic growth. Given this perspective, Quinde-Rosales (2011) adds that the Ecuadorian state must understand the importance of the agricultural sector in terms of production for domestic consumption and its contribution to the economy through exports, over and above the country's other economic sectors.

Freire, Govea and Arguello (2018), state that in the different economies of the world the Central Bank is the entity in charge of increasing or decreasing the money supply by printing money, but in the case of Ecuador this is impossible, since the Central Bank of Ecuador lost such capacity when the country became dollarized. Reyes (2017) referring to the subject mentioned that, in the Ecuadorian case, the Central Bank is conditioned by the decisions taken by the different governments, generating that this entity sees its technical and decision-making capacity diminished, making it impossible for it to act in the generation of money supply in the economy.

Yancha (2023) described money supply as the total money circulating in a country's economy and is mainly composed of highly liquid demand or bank deposits held by the public. Authors such as Gharehgozli and Sunhyung (2022), state that the money supply is closely related to the country's inflation;

therefore, increasing the amount of money circulating in the country generates an increase in the price of the country's products and services. In this context, Vallejo-Mata, Torres-Sánchez, Pinilla-Rodríguez and Moreno-Miranda (2019), point out that the Ecuadorian money supply is determined by several factors, among which are foreign trade operations, the amount of deposits in the national financial system and external financing sources.

While it is true that agriculture in the country has had a history of success, it is also marked by ongoing challenges that threaten the stability and sustainable growth of the business. The gap between rural and urban areas deepens with each wave of migration to urban centers, leaving rural communities impoverished and abandoned. Economic dependence on the agricultural sector, while undeniable, is often constrained by lack of access to resources, technology and competitive international markets.

In this complex and contradictory context, the main question that motivates the research arises: Is there a causal relationship between the money supply and Ecuador's agricultural exports? This question not only aims to explore the cause and effect relationship between agricultural exports and economic growth.

Based on this question, the following hypothesis is posed: there is no significant causal relationship between money supply and agricultural exports in the economy under analysis. This hypothesis guides the research, allowing us to systematically and rigorously evaluate the relationship

between agricultural exports and economic growth, exploring the underlying mechanisms that drive this relationship.

By delving deeper into this research, one can better understand how Ecuador's agricultural sector functions, how it affects the country's economy, and what it means for the nation's future. The work strives not only to identify the problems and challenges facing the industry, but also to gather valuable information to help policymakers develop effective policies that will boost Ecuador's economy and improve the well-being of Ecuadorian society.

The research design of the document established a 32-year study period of the variables that make up the typology of the agricultural sector, understanding exports as stimulants for the country's economic growth, in terms of foreign currency generation. The research determined by means of an inductive reasoning under an empirical-analytical approach. For the development of the research a unimethod process was carried out based on the positivist paradigm according to Ricoy (2006), this type of paradigm contributes to test a hypothesis by means of statistical processes and models.

The research methodology is oriented towards an analysis that determines the stationarity of the variables through the use of the Augmented Dickey-Fuller test. In order to avoid spurious results, we proceeded to generate a VAR model that captures any type of causality in the Granger sense, understood as the existence of a relationship between variables.

The development of this study focuses on determining the relationship between Ecuador's agricultural exports and the

money supply, in order to establish the importance of agriculture in the Ecuadorian economy, so that the analysis of the background of the agricultural sector focuses on its evolution and how it promotes an increase in national economic growth. Table 1 below shows the characterization of the variables studied.

Table 1. *Characterization of the study variables.*

| Agricultural Sector | |
|---------------------|----------------------------|
| • | Agricultural Exports (X_A) |
| • | Economic Growth (OM) |

Prepared by: Authors.

We proceeded to evaluate the relationship between both variables using the autoregressive vector model, as mentioned above. The following equation was used as a representation:

$$Y_t = \beta_0 + \lambda_1 Y_{t-1} + \dots + \lambda_p Y_{t-p} + \alpha_0$$

Therefore:

$$Y_t = \beta_0 + b_1 Y_{t-1} + b_2 Y_{t-2} + b_3 Y_{t-3} + b_4 X_{t-1} \dots + b_p X_{t-p} + \varepsilon_1$$

$$X_t = \beta_0 + b_1 Y_{t-1} + b_2 Y_{t-2} + b_3 Y_{t-3} + b_4 X_{t-1} \dots + b_p X_{t-p} + \varepsilon_2$$

The variables that were selected for the VAR model are detailed below:

Y_t = Economic Growth (Money Supply)

X_t = Agricultural exports

Ecuador is a country internationally recognized for basing its production mainly on agriculture, making this sector indispensable for maintaining the country's economy. It should be noted that despite the importance of the sector, it has not been properly exploited, because poverty is concentrated in rural areas, which are mostly agricultural areas.

To determine the deterministic or stochastic trend criterion, the Augmented Dickey-Fuller test (DFA) was performed. The result of this test shows that both the OM variable and X_A pass the null hypothesis, concluding that the aforementioned variables are series that have a unit root and are non-stationary (Table 2).

Table 2. *Stationarity test of series in level.*

| Variable | Order of Integration | T-statistic | Prob. |
|----------|----------------------|-------------|--------|
| OM | 0 | 0.091802 | 0.9957 |
| X_A | 0 | 0.082536 | 0.9591 |

Prepared by: Authors.

A modification of the variables was generated taking them to their first difference; the variables were modified in first difference (establishing the difference between each data and the previous one) establishing a new variable:

$$D_x = X_t - X_{t-1}$$

The DFA test on the first difference variables allowed us to reject the null hypothesis proposed by the test, establishing that these variables for the period under study are stationary or are series that do not have a unit root (Table 3).

Table 3. *Stationarity test of series with integration order.*

| Variable | Order of Integration | T-statistic | Prob. |
|----------|----------------------|-------------|--------|
| OM | 1 | -6.394472 | 0.0001 |
| X_A | 1 | -5.653445 | 0.0001 |

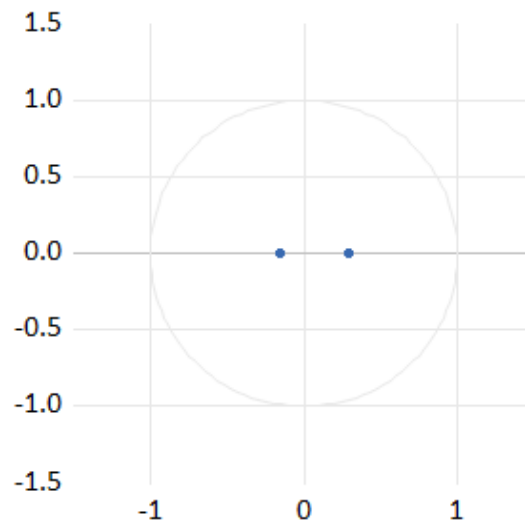
For the estimation process of the autoregressive vector (ARV) it is necessary to establish the maximum lag length over which the relationship of the variables under study is determined, understanding this criterion as the optimal lag. For this purpose we will use the likelihood ratio test, the Final Prediction Error criteria and the Akaike, Schwarz and Hannan-Quinn statistics. To prioritize the prediction we will select the first lag as the optimal one, this selection promises a model parsimonious and robust enough to capture the dynamics of the study variables (Table 4).

Table 4. *VAR order selection criteria.*

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| 0 | -374.9409 | NA | 5.89e+11 | 32.77747 | 32.87621 | 32.80231 |
| 1 | -368.1029 | 11.89217* | 4.62e+11 | 32.53069 | 32.82691* | 32.60519 |
| 2 | -365.6201 | 3.886149 | 5.33e+11 | 32.66262 | 33.15631 | 32.78678 |
| 3 | -359.7582 | 8.155779 | 4.65e+11 | 32.50071 | 33.19188 | 32.67454 |
| 4 | -353.7466 | 7.318451 | 4.09e+11* | 32.32579* | 33.21444 | 32.54928* |
| 5 | -350.8179 | 3.056021 | 4.88e+11 | 32.41895 | 33.50507 | 32.69210 |
| 6 | -350.2144 | 0.524740 | 7.47e+11 | 32.71430 | 33.99790 | 33.03712 |
| 7 | -342.3265 | 5.487285 | 6.55e+11 | 32.37621 | 33.85729 | 32.74870 |
| 8 | -337.7567 | 2.384220 | 8.67e+11 | 32.32667 | 34.00523 | 32.74882 |

We proceeded to examine the inverse root of the autoregressive polynomial of the VAR (Figure 1). This acts as a stability check of the estimated model. The graphical representation of the eigenvalues shows that all values lie within the unit circle. This result indicates that there is a common trend, so only one cointegrating vector is to be expected.

Figure 1. Inverse roots of the autoregressive polynomial VAR.

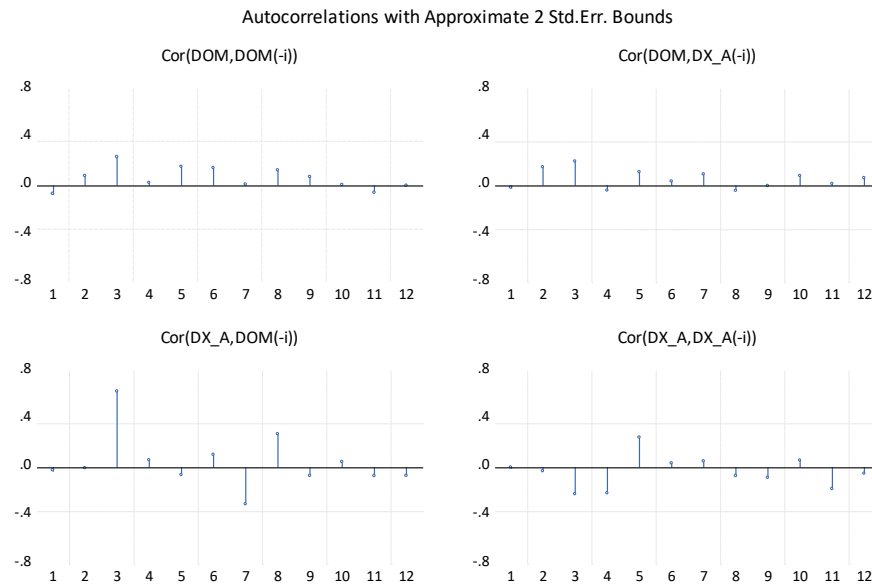


Prepared by: Authors.

Under the use of the cross-correlogram - Q statistic of the estimated residuals in the VAR for a given number of lags, a test of residuals will be established to establish the existence or not of autocorrelation. Figure 2 shows no significant autocorrelation. The null hypothesis of no autocorrelation is

approved by finding that 95 % or more of the bars fall within the confidence interval.

Figure 2. Residual test-Correlogram.



Prepared by: Authors.

The White's Heteroscedasticity test without Cross Terms allows us to establish whether the model errors are homoscedastic or heteroscedastic. The test results show that the residuals are homoscedastic (Table 5).

Table 5. Heteroscedasticity test.

| Chi-sq | df | Prob. |
|----------|----|--------|
| 7.331076 | 12 | 0.8350 |

To establish causality, a Granger test was performed and the results show that there is not enough evidence to reject the

null hypothesis of no causality in both directions between the variables DOM and DX_A. The variable Agricultural Exports does not cause in the Granger sense the Monetary Supply, because the p-value is 0.2538 being greater than the significance level of 0.05, on the other hand, the variable Monetary Supply does not cause in the Granger sense the Agricultural Exports since the p-value is 0.4018 also greater than the significance level (Table 6). (Table 6).

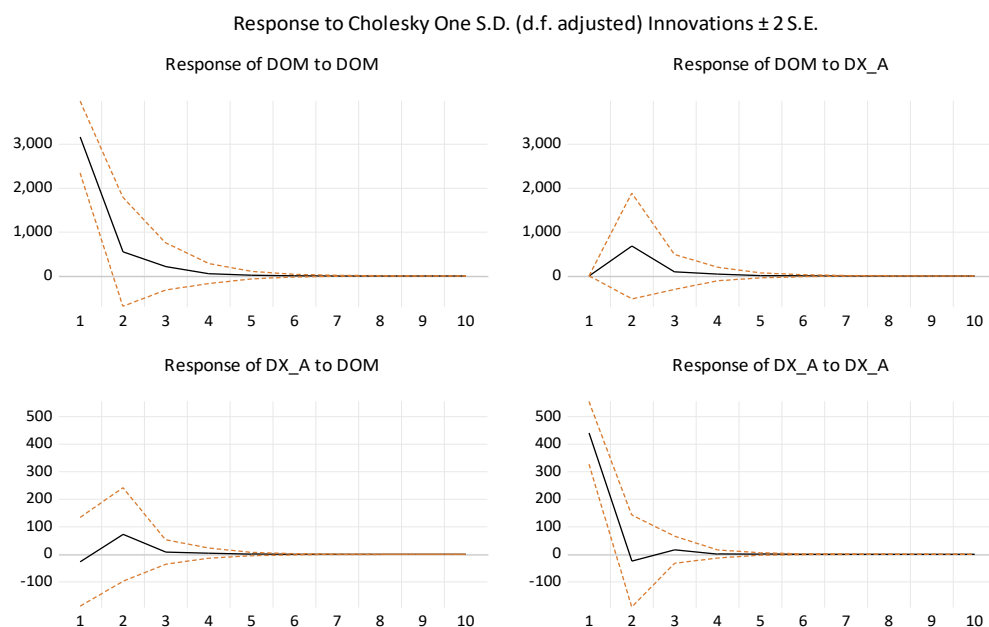
Table 6. *Granger causality test.*

| Dependent variable: DOM | | | |
|--------------------------|----------|----|--------|
| Excluded | Chi-sq | df | Prob. |
| DX_A | 1.302186 | 1 | 0.2538 |
| All | 1.302186 | 1 | 0.2538 |
| Dependent variable: DX_A | | | |
| Excluded | Chi-sq | df | Prob. |
| DOM | 0.703075 | 1 | 0.4018 |
| All | 0.703075 | 1 | 0.4018 |

Prepared by: Authors.

Figure 3 shows that in the long term the confidence intervals tend to shrink and are very close to 0 and the response of the money supply to changes in agricultural exports and vice versa are not very significant; the opposite happens in the short term, where these effects are positive, i.e., when faced with possible changes in exports, the money supply responds immediately to this eventuality.

Figure 3. Impulse response function.



Prepared by: Authors.

Discussion of results

Both Quinde-Rosales et al. (2018) and Salami and Noori (2012) agree that Ecuador's agricultural sector has been a key component of the national economy for an extensive period of time. The agricultural sector has significantly increased GDP, reduced the balance of trade deficit, increased employment opportunities, and improved the country's food security. However, the research results reveal that, contrary to the common assumption, agricultural sector exports do not have a significant impact on Ecuador's economic development. This implies that there is a need to reassess the true contribution of agricultural exports to the country's

economic development and explore other ways in which the agricultural sector can have a positive economic impact.

The study also supports the findings of Lara, Argothy, Martínez and Mejía (2022) and Benítez, Herrera and Herrera (2021), who indicate that a variety of factors have reduced productivity in the agricultural sector. These factors include migration to cities and abroad for better job opportunities. The migration phenomenon has significantly reduced the agricultural labor force, leaving behind the precarious living conditions found in the countryside. These results are supported by our research, which shows a gradual decrease in the amount of agricultural products produced and, consequently, in the amount of products exported. The decline in agricultural production is evidence of the need to implement support policies that can boost the sector.

The Food and Agriculture Organization of the United Nations (FAO) (2016) calls on governments to implement social protection schemes for agricultural workers and boost the growth of the agricultural sector in this context. The relevance of these suggestions lies in the fact that a comprehensive strategy that considers the social welfare of rural workers can minimize the detrimental effects of migration and increase agricultural productivity. The implementation of social protection policies and incentives for rural development has the potential to recover the downward trend in agricultural production and strengthen the sector's resilience to socioeconomic challenges.

The study also analyzes the connection between agricultural exports and the country's money supply. According to Vallejo-Mata, Torres-Sánchez, Pinilla-Rodríguez, and Moreno-Miranda (2019), a wide variety of factors influence Ecuador's money supply, including foreign trade operations, especially those related to oil, the amount of deposits in the domestic financial system, and sources of external financing. These elements are fundamental in determining the money supply and, therefore, the country's economic stability.

The research is supported by our results, which confirm that agricultural exports do not have a significant impact on the country's money supply. This implies that, despite being significant, the agricultural sector does not play a relevant role in determining monetary policy in Ecuador. There is no good connection between the money supply and the agricultural sector, which highlights the country's heavy reliance on other economic sectors, such as oil, to influence its money supply.

Conclusions

In this research, we focused on examining the consequences of agricultural exports on Ecuador's economic growth using an empirical analysis approach based on a vector autoregressive (VAR) model. The causal connection between agricultural exports and the country's money supply during the period 1990-2021 was analyzed. The findings obtained through the VAR analysis have provided interesting conclusions. First, we observed that both agricultural exports and money supply experience favorable fluctuations over time, evidencing a steady increase in both dimensions. However, when examining the causal relationships between

these variables, we find no evidence that agricultural exports produce significant changes in the money supply or vice versa.

This finding shows that, although agricultural exports play a fundamental role in the generation of foreign exchange and the growth of the national economy, their direct impact on monetary demand and, consequently, on economic growth is extremely small. Other factors, such as oil exports and tax collection, could have a more significant impact on Ecuador's economic development.

These findings have significant implications for economic policymaking and planning for agricultural progress in our country. Rather than focusing solely on increasing agricultural exports as a way to boost economic growth, policymakers should consider broader strategies that take into account other relevant factors, such as diversifying the economy and improving infrastructure and institutions.

Ultimately, this study highlights the complexity of the connection between agricultural exports and economic growth in Ecuador, and highlights the relevance of adopting an integrated, multidimensional approach to fostering sustainable and educational development in this nation. As we better understand the elements that influence economic growth, we can commit to a prosperous and sustainable future for all Ecuadorians. .

References

Benítez Narváez, L. B., Herrera Freire, A., & Herrera Freire, A. H. (2021). PRODUCTIVE POTENTIALITIES IN ZONE 7

- ECUADOR, A SUSTAINABLE STRATEGY. *Revista Universidad y Sociedad*, 13(3), 144-149.
- Boza, S. (2013). Incidence of public policies in the evolution of the agricultural-ecological sector the case of Andalusia, Spain. *Cuadernos de Desarrollo Rural*, 10(72), 291-310.
- Cantos Ochoa, M. E., Guzmán Ávila, J. A., Ordóñez Espinosa, C. G., & Trelles Vicuña, D. F. (2021). Agroecological business strategies in the Province of Azuay-Ecuador (Ve). *Revista de Ciencias Sociales*, XXVII(4), 243-258.
- Cuadras-Berrelleza, A. A., Peinado-Guevara, H. J., Moreno-López, E. O., Beltrán-Lúgo, L., & Peinado-Guevara, V. M. (2024). Perception of Public Policies and Sustainability among Agricultural Producers in the Municipality of Guasave. *Sustainability*, 16(7). doi:<https://doi.org/10.3390/su16072678>
- Freire, C. E., Govea, K., & Arguello, J. (2018). Importance of agriculture in a dollarized economy. *Revista Espacios*, 39(16), 1-10.
- Gharehgozli, O., & Sunhyung, L. (2022). Money Supply and Inflation after COVID-19. *Economies*, 10(5), 1-14. doi:<https://doi.org/10.3390/economies10050101>
- National Institute of Statistics and Census (INEC). (December 2019). *Ecuador en Cifras*. Retrieved from https://www.ecuadorencifras.gob.ec/documentos/web-inec/EMPLEO/2019/Diciembre/201912_Mercado_Laboral.pdf
- Lara Haro, D. M., Argothy Almeida, L. A., Martínez Mesías, J. P., & Mejía Chávez, M. A. (2022). The impact of shocks on the performance of Ecuador's agricultural sector. *Revista de Finanzas y Política Económica*, 14(1), 167-186.

doi:<https://doi.org/10.14718/revfinanzpolitecon.v14.n1.2022.7>

- MAG, Ministry of Agriculture and Livestock (2022). *Panorama Agroestadístico*. Ministry of Agriculture and Livestock, Guayaquil. Retrieved from http://sipa.agricultura.gob.ec/descargas/panorama_estadistico/panorama_estadistico.pdf
- Food and Agriculture Organization of the United Nations (FAO). (2016). *Migration, agriculture and rural development*. Retrieved from <https://www.fao.org/3/i6064s/i6064s.pdf>
- Quinde-Rosales, V. (2011). *Evolución del Gasto Público Agropecuario y Rural en el Ecuador Periodo 2000-2009*. Ecuador: Universidad Agraria del Ecuador - UAE.
- Quinde-Rosales, V. X., Bucaram-Leverone, R. M., Bucaram-Leverone, M. R., & Quinde-Rosales, F. A. (April 30, 2018). Investment and financing for Ecuador's agricultural sector: application of a multiple regression model. *Domain of Science*, 4(2), 63-80. doi:<http://dx.doi.org/10.23857/dom.cien.pocaip.2017.4.núm.2.abril.63-80>
- Reyes Baquerizo, A. (2017). Growth of the Ecuadorian economy: effects of the non-oil trade balance and dollarization. *Revista Espacios*, 38(61), 14-28.
- Ricoy Lorenzo, C. (2006). Contribution on research paradigms. *Educação. Revista do Centro de Educação (Santa Maria)*, 31(1), 11-22.
- Salami, H., Sadat Barikani, H., & Noori Naeini, M. S. (2012). Can Agriculture Be Considered a Key Sector for Economic Development in an Oil Producing Country? The Case of Iran. *J. Agr. Sci. Tech.*, 14(1), 1-10.

- Vallejo-Mata, J. P., Torres-Sánchez, Y. A., Pinilla-Rodríguez, D. E., & Moreno-Miranda, C. A. (2019). Business cycle and external sector in Ecuador, 2002-2017. *Revista Espacios*, 40(28), 26-38.
- Viteri Vera, M. d., & Tapia Toral, M. C. (2018). Ecuadorian economy: from agricultural production to service. *Revista Espacios*, 39(32), 30-35.
- Yancha Tuasa, S. E. (2023). ECUADOR: EFFECTS OF DOLLARIZATION ON THE COUNTRY'S ECONOMY. *Iberoamerica*(2), 73-92. doi:10.37656/s20768400-2023-2-04.

ISBN: 978-9942-33-811-2



compAs

Grupo de capacitación e investigación pedagógica



@grupocompas.ec
compasacademico@icloud.com