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Editor's Letter

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Welcome to the 54th issue of our journal, where we present diverse research articles that delve into contemporary issues across various fields. This issue combines empirical studies and theoretical explorations, illuminating different aspects of business, tourism, food preferences, and organizational culture. We aim to provide insightful analyses and foster a deeper understanding of these multifaceted topics.

Vish Iyer, Moe Manshad, and Daniel Brannon wrote the first article, "A Value-Based Approach to AI Ethics: Accountability, Transparency, Explainability, and Usability." In this study, the authors propose a value-based approach to AI ethics, focusing on four key principles: accountability, transparency, explainability, and usability. By examining these principles, providing real-world examples, and discussing implementation challenges, we contribute to the ongoing discourse on responsible AI development and offer practical insights for stakeholders across various industries.

The second article is Complement and Substitution Effects of Internal Migration on Foundational Competitiveness in Mexico. Amilcar Orlian Fernández Domínguez and Michael Demmler wrote it. This article analyzes how internal migration among Mexican states relates to their competitiveness level. The authors contribute to the literature by assessing an innovative concept of competitiveness – foundational competitiveness – which better reflects the population's welfare in an economy. Furthermore, findings imply that an influx of working-age migrants may potentially contribute to the economic competitiveness of the destination state depending on differences in education levels of migrants and natives, i.e., whether immigrant human capital complements or substitutes that of the native population.

Mohd Irfan Rais wrote the third article: Empirical Study of Social Media Marketing's Impact on Brand Image and Loyalty in Retail, Muscat. This study explores SMM's influence on brand image and loyalty in the retail industry of Muscat. The study employs the quantitative method as it ensures valid and reliable results. The findings of this research will illuminate the significance of SMM and identify factors that encourage SMM in the retail sector. The outcomes provide valuable insights into SMM initiatives that aid in increasing Muscat's brand reputation and image in the retail industry. This study's implications will benefit retail organizations in attaining a competitive advantage in the market.

The fourth paper is Consumer Happiness in the Purchase of Electric Vehicles: a Fuzzy Logic Model. Its authors are Fernando Lámbarry-Vilchis, Aboud Barsekh Onji, Leticia Refugio Chavarría López, and Paola Judith Maldonado Colín. This research analyzes customer happiness in acquiring an electric vehicle, considering pleasure as an ambiguous language term that conventional models have inadequately incorporated. This research was conducted using a fuzzy Delphi method survey targeting a specific consumer group and two fuzzy inference systems: a multi-input single-output FIS model and an FIS Tree employing a hierarchical fuzzy inference structure, which leverages the survey's training data to optimize the models using different machine learning algorithms. The FIS tree model demonstrated superior efficacy in predicting the consumer satisfaction index, achieving an average forecast error of 0.65%. This approach could assist automobile agency marketers in creating accurate predictions to evaluate the purchasing decision-making process.

The fifth and last article is Identifying Factors Motivating Users to Post Reviews on Online Travel Review Platforms: A Factor Analysis Study. Animesh Kumar Sharma and Rahul Sharma identify the factors motivating users to post reviews on online travel review platforms (OTRPs). This study highlights several pivotal factors encouraging users to engage in this review-sharing phenomenon. Three key factors, social recognition and connection, enhancing travel experiences, and social validation, were identified as motivating users to write online reviews. Among these, the innate desire for social connection, the building of social capital, and the inclination to offer peer support emerge as the predominant motivations driving users' intentions to create travel-related reviews on online platforms. By analyzing the complex interplay of psychological, social, and support-based incentives, this study not only contributes to adds body knowledge to the literature of motivation theories but also offers practical guidance to online travel agencies (OTAs) managers in their pursuit of providing exceptional customer experiences and marketing strategies in an era of expanding online travel. This study assists OTAs in understanding customer experiences, tailoring services to meet travelers' expectations, and delivering enriching customer interactions.

We hope these articles spark meaningful discussions and provide valuable perspectives in their respective fields. We thank the authors for their rigorous research and contributions. We welcome feedback and encourage readers to use these studies to advance knowledge and practice.

Sincerely,
Dr. José Sánchez Gutiérrez
Editor

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A Value-Based Approach to AI Ethics: Accountability, Transparency, Explainability, and Usability

Un Enfoque Basado en Valores para la Ética de la Inteligencia Artificial: Responsabilidad, Transparencia, Explicabilidad y Usabilidad

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ABSTRACT

As artificial intelligence (AI) becomes increasingly prevalent, ensuring its ethical development and deployment is paramount. This paper proposes a value-based approach to AI ethics, focusing on four key principles: accountability, transparency, explainability, and usability. By examining these principles, providing real-world examples, and discussing implementation challenges, we contribute to the ongoing discourse on responsible AI development and offer practical insights for stakeholders across various industries.

Keywords: Artificial Intelligence Ethics, Accountability, Transparency, Explainability, Usability

JEL code: O30, K24, D63

RESUMEN

A medida que la inteligencia artificial (IA) se vuelve cada vez más omnipresente en la sociedad, garantizar su desarrollo e implementación ética es fundamental. Este documento propone un enfoque basado en valores para la ética de la IA, centrándose en cuatro principios clave: responsabilidad, transparencia, explicabilidad y usabilidad. Al examinar estos principios a través de una revisión bibliográfica exhaustiva y proporcionar ejemplos del mundo real, contribuimos al discurso continuo sobre el desarrollo responsable de la IA y ofrecemos ideas prácticas para las partes interesadas de diversas industrias.

Palabras clave: Ética de la Inteligencia Artificial, Responsabilidad, Transparencia, Explicabilidad, Usabilidad.

Código JEL: M21.

INTRODUCTION

The rapid advancement and integration of artificial intelligence (AI) into various aspects of society have brought unprecedented opportunities and challenges (Bostrom, 2014). As AI systems increasingly influence decision-making processes in critical domains such as healthcare, finance, and governance, ensuring their ethical development and deployment has become crucial (Jobin et al., 2019). This paper proposes a value-based approach to AI ethics, focusing on four fundamental principles: accountability, transparency, explainability, and usability.

The potential impacts of AI on society are profound. As Bostrom and Yudkowsky note, advanced AI systems could have far-reaching consequences on human life, potentially reshaping economies, social structures, and humanity's future. Therefore, we must develop and deploy AI systems that align with human values and ethical principles (Bostrom & Yudkowsky).

THE VALUE-BASED APPROACH TO AI ETHICS

A value-based approach to AI ethics entails grounding AI systems' development, deployment, and use in core ethical values (Dignum, 2018). This approach aims to create AI systems that are not only technically proficient but also aligned with societal values and moral standards. By prioritizing accountability, transparency, explainability, and usability, we can foster responsible AI usage and mitigate potential risks associated with AI technologies.

The European Commission's High-Level Expert Group on Artificial Intelligence emphasizes the importance of this approach, stating that trustworthy AI should be lawful, ethical, and robust. They argue that ethical AI is crucial for ensuring that AI systems respect fundamental rights, societal values, and ethical principles (European Commission's High-Level Expert Group on Artificial Intelligence).

THEORETICAL FRAMEWORK: VALUE-BASED AI ETHICS

Conceptual Foundations

A value-based approach to AI ethics transcends traditional technological considerations, embedding ethical principles into the core of technological design. As Hagendorff (2020) critically evaluates, existing AI ethics guidelines often need to provide comprehensive ethical frameworks, necessitating a more nuanced approach to technological governance.

Ethical Landscape and Global Perspectives

Drawing from an extensive analysis of international research, we identify four fundamental ethical principles. Wong and Cheung's (2022) comparative study of global AI regulation underscores the importance of developing adaptable, context-sensitive ethical approaches to navigate the complex international technological landscape.

Accountability

Accountability in AI refers to the responsibility of individuals and organizations for the outcomes of AI systems. It involves establishing clear governance structures, conducting ethical impact assessments, and implementing continuous monitoring mechanisms (IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems). Accountability ensures that AI developers and deployers are answerable for their systems' decisions and actions, promoting trust and responsible innovation.

Example of Accountability in AI

Consider the case of an AI-powered hiring system used by a large corporation. To ensure accountability:

The company establishes a transparent chain of responsibility, designating specific teams and individuals responsible for the AI system's decisions. Regular audits are conducted to assess the system's performance and identify any biases in hiring decisions. The company implements a mechanism for candidates to contest decisions made by the AI system, ensuring human oversight and the ability to correct errors. The development team regularly reports to a diverse ethics board that includes external stakeholders, ensuring broader societal perspectives are considered.

This approach aligns with the recommendations of Gupta et al. (2018), who emphasize the importance of verifiable claims about AI systems' behavior and impact to build trust and accountability (Gupta et al., 2018).

Accountability in AI extends beyond traditional responsibility mechanisms. Selbst and Powles (2018) highlight the critical importance of developing meaningful information disclosure frameworks that enable genuine understanding and oversight.

Key accountability strategies include Transparent decision-making processes, Comprehensive impact assessments, and Mechanisms for Algorithmic Contestability.

Transparency

Transparency in AI involves making AI systems' functionality, decision-making processes, and potential biases accessible and understandable to stakeholders (European Commission's High-Level Expert Group on Artificial Intelligence, 2019). This principle is crucial for building trust in AI technologies and enabling meaningful oversight. Transparency includes disclosing data sources, algorithmic processes, and potential societal impacts of AI systems.

Example of Transparency in AI

Let us consider a predictive policing AI system used by a city's police department: The police department publicly discloses the data sources used to train the AI, including historical crime data and demographic information. The department clearly explains how the AI system weighs different factors to predict potential crime hotspots.

Regular reports show the system's accuracy rates and any discrepancies in predictions across different neighborhoods or demographic groups. The algorithmic model is available for independent audits by academic researchers and civil rights organizations. This level of transparency allows for public scrutiny. It helps identify potential biases or unintended consequences, as emphasized by Floridi et al. in their ethical framework for a good AI society (Floridi et al., 2018).

Transparency emerges as a crucial mechanism for building public trust. Green's (2019) research on institutional accountability provides insights into how complex technological systems can develop trust through deliberate, comprehensive disclosure mechanisms Green (2019).

Explainability

Explainability pertains to the ability to elucidate and justify the rationale behind AI-generated decisions (Brundage et al., 2018). This principle is particularly critical in high-stakes domains where AI-informed choices can have significant consequences. Explainable AI systems allow users and affected parties to understand the basis of AI-generated outputs, facilitating informed decision-making and contestability.

Example of Explainability in AI

Consider an AI system used in healthcare for diagnosing diseases: The AI provides a diagnosis and highlights the specific symptoms, test results, and factors in the patient's history that led to its conclusion. The system uses visualization techniques to show which areas of medical images (e.g., X-rays or MRIs) were most influential in its diagnosis.

The AI provides a confidence score and alternative possibilities for each diagnosis, helping doctors understand the certainty of the AI's decision. The system can generate natural language explanations of its reasoning process, tailored to medical professionals and patients. This approach to explainability aligns with the recommendations of Amodei et al., who highlight the importance of interpretable AI systems in ensuring safety and reliability (Amodei et al., 2016). The challenge of explainability is particularly acute in high-stakes domains. De Vries (2020) examines the critical role of explainability in medical AI, demonstrating how transparent decision-making processes can mitigate potential risks and build professional trust.

Usability

Usability in AI encompasses ensuring that AI interfaces and outputs are user-friendly, intuitive, and effective in meeting the needs of their intended users (Fjeld et al., 2020). This principle is vital for promoting the practical application of AI insights and recommendations. Usable AI systems consider accessibility, inclusivity, and user empowerment, enabling diverse user groups to interact effectively with AI technologies.

Example of Usability in AI

Let us examine a personal finance AI assistant: The AI uses natural language processing to allow users to interact with it using everyday language rather than requiring specific commands. The interface is designed to be accessible to users with disabilities, including screen reader compatibility and voice control options.

The AI adapts its communication style and complexity based on the user's financial literacy level and preferences. The system provides straightforward, actionable suggestions for improving economic health, with step-by-step implementation guidance. Users can easily customize the AI's focus areas and the frequency and type of notifications they receive.

This focus on usability aligns with the "Designing AI for Social Good" principles outlined by Fjeld et al. (2020), emphasizing the importance of inclusivity and user empowerment in AI systems (Fjeld et al., 2020). Usability transcends traditional interface design. Van Dijck and Poell's (2021) research on social media platforms illustrates how AI-driven technologies transform contemporary societal interactions, emphasizing the need for inclusive, adaptable design principles.

Implementing the Value-Based Approach

Implementing a value-based approach to AI ethics requires concerted efforts from various stakeholders, including developers, policymakers, and end-users. Key strategies include: Developing ethical guidelines and governance frameworks operationalizing these principles (Morley et al., 2020).

Incorporating ethical considerations into the AI development lifecycle, from design to deployment and monitoring (Gupta et al. 2018). Fostering interdisciplinary collaboration to address the complex ethical challenges AI technologies pose (Rahwan, 2018). Promoting education and awareness about AI ethics among developers, users, and the general public (Floridi et al., 2018).

Zeng et al. (2021) highlight the complex interplay between technological innovation and ethical considerations, particularly in data-intensive domains like social media and computational intelligence.

CHALLENGES AND FUTURE DIRECTIONS

Implementing a value-based approach to AI ethics faces several challenges, including Balancing the need for complex, high-performing AI models with the imperative for transparency and explainability (Amodei et al., 2016).

Addressing biases embedded within AI algorithms and data sources (Brundage et al., 2018). Navigating the evolving landscape of AI regulations and standards while maintaining innovation (IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems). Engaging diverse stakeholders and incorporating varied perspectives in AI development and deployment (Rahwan, 2018).

Brundage et al. 2018 highlight the potential for malicious use of AI, emphasizing the need for robust governance mechanisms and proactive risk assessment in AI development (Brundage et al., 2018). They underscore the importance of a value-based approach considering AI's intended uses and potential misuse.

Future research should focus on developing practical frameworks for implementing these ethical principles, creating metrics for measuring adherence to ethical standards and exploring the long-term societal impacts of value-aligned AI systems. As Russell argues, we must design AI systems that are not just powerful but fundamentally aligned with human values and preferences (Russell, 2019). Coeckelbergh's (2020) comprehensive examination

of AI ethics provides a critical philosophical framework for understanding the broader implications of technological development.

CONCLUSION

As AI continues to evolve and permeate various aspects of society, adopting a value-based approach to AI ethics is crucial for ensuring responsible development and deployment. By prioritizing accountability, transparency, explainability, and usability, we can harness the full potential of AI while mitigating its risks and fostering public trust. This approach not only enhances the reliability and trustworthiness of AI but also contributes to the ethical advancement of AI technology as a whole, aligning technological progress with human values and societal well-being. The challenges ahead are significant, but as Bostrom notes, "We need to be not just lucky but also good at developing advanced AI systems" (Bostrom, 2014). By embracing a value-based approach to AI ethics, we take a crucial step towards ensuring that the development of AI remains a force for good in society.

As AI transforms societal systems, adopting a value-based approach to AI ethics becomes increasingly critical. Our research demonstrates that by prioritizing accountability, transparency, explainability, and usability, we can:

Mitigate potential risks associated with AI technologies
Foster public trust in technological innovations
Ensure that AI development remains a force for social good

Future research should focus on:
Developing robust metrics for measuring ethical AI performance
Creating more sophisticated frameworks for integrating ethical considerations into AI design
Exploring long-term societal impacts of value-aligned AI systems.

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Complement and Substitution Effects of Internal Migration on Foundational Competitiveness in Mexico

Efectos complemento y sustitución de la migración interna en la competitividad fundacional en México

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ABSTRACT

This study analyzes how internal migration among Mexican states relates to their competitiveness level. The methodology employs longitudinal panel data from 2010 to 2020 to assess how migration influences a state's foundational competitiveness. The study's main results are as follows: First of all, the foundational competitiveness of Mexican states, on average, increased in 2015. However, despite this increase, competitiveness in 2020 was below the 2010 level, showing a general decline experienced in the most recent years of the study sample. Secondly, the econometric results of the present study suggest that greater involvement of a highly educated migrant labor force positively affects foundational competitiveness. Furthermore, findings imply that an influx of working-age migrants may potentially contribute to the economic competitiveness of the destination state depending on differences in education levels of migrants and natives, i.e., whether immigrant human capital complements or substitutes that of the native population.

Keywords: Human capital; labor migration; economic development.

JEL code: O15, O10.

RESUMEN

Este estudio analiza cómo los flujos de migración interna entre las entidades federativas de México se relacionan con su nivel de competitividad. Se contribuye a la literatura sobre el tema al evaluar un concepto reciente de competitividad – la competitividad fundacional – que de acuerdo con los autores refleja mejor el bienestar de la población de una economía, así como estimando un modelo econométrico basado en la teoría macroeconómica de crecimiento endógeno y capital humano. La metodología emplea datos de panel longitudinal de 2010 a 2020 para evaluar cómo influye la inmigración en la competitividad fundacional de un estado. Los principales resultados del estudio son los siguientes: En primer lugar, la competitividad fundamental de las entidades federativas mexicanas, en promedio, aumentó en 2015. Sin embargo, a pesar de este incremento, la competitividad en 2020 se situó por debajo del nivel de 2010, mostrando un retroceso general experimentado en los últimos años de la muestra. En segundo lugar, los resultados econométricos del presente estudio sugieren que una mayor participación de una fuerza laboral migrante altamente calificada afecta positivamente la competitividad fundamental. Además, los resultados implican que el flujo de migrantes en edad de trabajar puede contribuir potencialmente a la competitividad económica del estado destino dependiendo de las diferencias en los niveles de educación de inmigrantes y población nativa, es decir, si el capital humano de los inmigrantes funge como complemento o sustituto del de la población nativa.

Palabras clave: Capital humano; migración de trabajo; desarrollo económico.

Código Jel: O15, O10.

INTRODUCTION

Mexico's development agenda aims to enhance its population's welfare by increasing competitiveness, as the National Development Plan 2019-2024 outlines. However, this may pose a challenge, considering this country shows significant economic disparities across some regions. Still, the literature (OECD, 2022) highlights the relevant role of migration in driving regional competitiveness through various mechanisms. For instance, migration can boost a region's economic performance by influencing regional income convergence (Ozgen et al., 2010), innovation (Pinate et al., 2022; Aldieri et al., 2020), the labor force (Privara et al., 2023), and productivity (Ferragina et al., 2021). However, the impact varies depending on immigrants' regional characteristics and skill levels (Oliinyk et al., 2021; Fratesi & Percoco, 2013). Thus, examining how internal migration has influenced Mexico's regional competitiveness is convenient for better assessing economic development for the 2024-2030 national development agenda.

For this task, assessing an appropriate definition of competitiveness is essential since public policy efficiency depends on adequate measurement (OECD, 2014). Competitiveness is a multifaceted concept central to economic development and is generally regarded as a region's ability to achieve sustained economic performance while enhancing the quality of life of its inhabitants (Rajnoha & Lesnikova, 2022; García-Sánchez et al., 2018; Porter, 1990). However, despite widespread agreement on its desirability, there is no universally accepted definition since it depends on specific goals and purposes. For instance, definitions may focus on the role of institutional structure (WEF, 2014), innovation and industry-specific advantages (Porter, 1990), international economics (Durand et al., 1992), or the capability to attract and retain investments (IMCO, 2024).

Delgado et al. (2012) propose the concept of foundational competitiveness as the expected production level per potential worker, which they argue is a better determinant of a nation's prosperity and quality of life than other indicators. The present study analyzes the effect of migration on foundational competitiveness in Mexico on a state level through an econometric model based on the theoretical foundations of economic growth and migration.

The remainder of this paper is structured as follows. After this introductory section, a literature review will outline in more detail the definition of competitiveness and, specifically, foundational competitiveness proposed by Delgado et al. (2012). Under the characteristics of this concept, the theory of endogenous economic growth is addressed, i.e. an extended growth model of Solow, as well as the theory regarding the effects of migratory flows (specifically state migration in Mexico), to establish a theoretical model that serves as a basis for the econometric model to be estimated (Methodology section). Subsequently,

results are presented, and the empirical evidence is discussed. Finally, the paper presents some concluding remarks.

LITERATURE REVIEW

Assessment of Competitiveness

The concept of competitiveness can be seen and analyzed from different perspectives. In an economic context, one usually refers to the competitiveness of a specific firm, an industry, or a whole geographical area. Concerning geographical regions, some studies analyze competitiveness on a national scale (e.g., Marti & Puertas, 2023; Porter, 1990) or a sub-national (i.e. regional) level (e.g., Grassia et al., 2024; Kouskoura et al., 2024; Carpio et al., 2023). According to the WEF (2001), the general objective of economic development is to increase the standard of living of a nation´s population. In this regard, the literature exposes that greater competitiveness in a locality or region will improve the quality of life of its inhabitants (Rajnoha & Lesnikova, 2022; García-Sánchez et al., 2018; Delgado et al., 2012; Porter, 1990). However, although there exists agreement on the general desirability of increasing competitiveness, there is no uniformly established and accepted concept of competitiveness and its determinants (e.g., Alaimo et al., 2024; Karman et al., 2023), as different organizations propose different definitions.

The Global Competitiveness Report 2014-2015 (WEF, 2014) defines sustainable competitiveness as the combination of institutions, policies, and factors that make a nation productive in the long term while ensuring social and environmental sustainability. From this definition, the concept of competitiveness is linked to greater productivity. In the 2001 report (WEF, 2001), the authors mention that although the most intuitive definition refers to the economic participation of a country in the world market, its implication regarding a zero-sum game does not apply to the economic concept of prosperity. Hence, relating competitiveness to productivity and specialization seems more reasonable, though some authors question the construction of WEF´s Global Competitiveness Index (Benitez-Marquez et al., 2022).

Porter (1990) explains that competitiveness depends on a nation's ability to innovate and improve its industries. In other words, competitiveness depends on a nation's characteristics to create and maintain a competitive advantage in certain industrial sectors. This ultimately translates into greater productivity of labor and capital and, therefore, implies an improvement in the standard of living of the nation's population.

The OECD competitiveness indicator emphasizes international economics. According to Durand et al. (1992), the concept of international competitiveness is related to specific outstanding characteristics (such as productivity and technological innovation) that impact

macroeconomic performance and, therefore, explain a country's trade flows with its trading partners.

Moreover, the Mexican Institute for Competitiveness (IMCO, by its Spanish acronym) defines competitiveness as the ability of a region to attract and retain investments. In other words, an area is competitive whether it offers comprehensive, internationally acceptable conditions that allow, on the one hand, to maximize the socioeconomic potential of the companies and the population and, on the other hand, sustainably increase their level of well-being (IMCO, 2024).

Delgado et al. (2012) propose a definition that refers to the expected production level per individual of working age (potential worker) based on a country´s total quality as a place to do business. This concept relates to macroeconomic (social infrastructure and political institutions; fiscal and monetary policy) and microeconomic (quality of the national business environment; state of cluster development; sophistication of operations and business strategies) factors. Likewise, the concept of foundational competitiveness is a better indicator related to the prosperity of an economy since it originates from its ability to achieve high productivity as well as to mobilize a considerable percentage of the available labor force (Delgado et al., 2012; Gkypali et al., 2019; Ketels, 2017).

Relation to Economic Growth Theory

According to Romer (2006), the endogenous growth and human capital model helps explain differences among economies. Although the Solow model states that physical capital is vital in explaining national GDP variations, it fails to explain these differences among countries based on variations in levels of capital stock (Mankiw et al., 1992). Models that incorporate a microeconomic component to describe the behavior of macroeconomic variables, such as the Ramsey-Cass-Koopman model and the Diamond model, also lack an explanation for the differences in production between countries since they attribute an important role in explaining growth to the exogenous variable "labor efficiency" a specific importance in the explanation of growth (Romer, 2006). The models of endogenous growth and the accumulation of knowledge (reflected in technology) fall short since technology is not exclusive. Therefore, all nations could take advantage of it to achieve output growth.

In this way, following Romer (2006), the endogenous growth model that incorporates human capital (Equation 1) extends the Solow model.so that the product (Y) at time t is a function of physical capital (K), the effectiveness of work (A) and the productive services provided by the workforce (H):

$$Y(t) = K(t)^{\alpha}[A(t)H(t)]^{\beta} \quad \alpha + \beta = 1 \qquad (1)$$

The relevant aspect in Equation 1 is the inclusion of human capital as the variable *H* (the behavior of *K* and *A* is the same as in the Solow model), which incorporates both the capabilities and acquired abilities of individuals and their behavior. For simplicity, the model first assumes that the human capital variable (*G*) is a function of the years of education invested (*E*). However, it also allows the incorporation of other variables (such as physical capital and human capital of existing workers). Hence, assuming that investment in education is homogeneous among workers, the function of productive services per job can be expressed as in Equation 2:

$$H(t) = L(t)G(E), \quad G' > 0 \tag{2}$$

In equation 2, *L* is the number of workers, and *G(E)* is the human capital per worker. As mentioned previously, human capital is a function of the years of education (which is why it is called the production function of human capital), which assumes an increasing behavior as in Equation 3:

$$G(E) = e^{\phi E}, \quad \phi > 0 \tag{3}$$

According to the model shown by Romer (2006), production per worker follows Equation 4:

$$\frac{Y}{L} = AG(E)y \tag{4}$$

That is, an increase in the years of education per worker—which comprises both natives and immigrants—increments the level of production per worker and, hence, foundational competitiveness in the path of sustained growth, which explains differences in GDP growth between various countries.

Migration

Migration is significant due to its direct relationship with a country's and region's economic development (Vîrjan et al., 2023; Tacoli et al., 2014; He, 2013; Baas & Brücker, 2012). It is relevant for both the government and society due to its impact on income, remittances, provision of public services, demographic dynamics, and knowledge diffusion, among other aspects (Morrison, 2023; OECD, 2022).

Neoclassical theory explains that due to more workers in a locality (due to labor immigration), the marginal product of labor decreases, and, with it, the general salary level. Under the same reasoning, the opposite result happens in a locality where workers emigrate. From this observation, migration analysis can be divided into two aspects: determinants of migration and its effects. In this regard, most existent studies focus on the determinants of

migration, especially international migration to the United States of America (e.g., Pries et al., 2024; Holding et al., 2024).

Regarding the analysis of effects, migration has positive and negative effects on both the place of origin and the destination (Vasyltsiv et al., 2021; Casillas, 2020; Lamy et al., 2019; Loayza-Alarico, 2019; Peri, 2012; Boustan et al., 2010; Ortega & Peri, 2009). For instance, Peri (2012) finds that immigration strongly impacts total factor productivity. Ortega & Peri (2009) demonstrate that immigration positively influences employment but find no evidence of substitution effects, i.e., the authors do not find displacement of natives. Moreover, they find that in the short run, immigration positively influences total GDP of the destination country, with no evidence of adverse effects on average wages and average income per capita. This result is also confirmed by Boustan et al. (2010) concerning the hourly earnings of existing residents. Nevertheless, their study covered the Great Depression and found an effect of immigration on residents who decided to move away or lost weeks of work.

Some studies show that migration influences a region's competitiveness through different mechanisms, mainly by affecting the local labor force. For instance, Oliinyk et al. (2021) show that immigration of highly skilled workers significantly strengthens a country's competitiveness. Also, Tanrikulu (2020) argues that international migration influences a region's competitiveness by fostering innovation and patents and increasing a competitive business environment. Chowdhury (2021) evaluates the potential adverse effects of migration on a city's urban resources but finds that the positive effects exceed by enriching competitiveness in its labor market. These studies suggest that decisions – taken by all economic actors (government, companies, among others) – regarding aspects of competitiveness in a society should consider migration.

For the Mexican case, some studies examine various mechanisms of how migration impacts the country´s competitiveness, especially in the agricultural sector and in economic development in general. For instance, international migration to the United States of America translates into a reduction of the available force in Mexican rural areas, affecting agricultural production and the sector's competitiveness (Navarro & Ayvar, 2009). However, migration also has positive effects through remittances and the contribution to the economic well-being of the households receiving them (García & Cuecuecha, 2020), as these remittances may later translate into investments in machinery and improvements in agricultural production (Navarro & Ayvar, 2009). Also, migrants often return with new knowledge and skills (Wassink, 2020), which can improve the competitiveness of the business and agricultural sector in the long term.

METHOD

Base model

This paper analyzes the relationship between foundational competitiveness and internal migration within Mexico, so the methodology relies on the definition of foundational competitiveness reviewed in section 2.1. Likewise, since this concept of competitiveness relates to an economy's GDP, we base our econometric approach on a general theoretical model, the endogenous growth model presented in section 2.2. Thus, we specify a suitable econometric model to assess the effect of migration on the variable that captures the productive services of the workforce in Equation 2.

Delgado et al. (2012) argue that the best indicator that captures the concept of foundational competitiveness is GDP per working-age worker, so we express this indicator for a Mexican state *i* as Equation 5:

$$FC_i = \frac{Y_i}{WAP_i} \quad (5)$$

FC represents the Mexican state's foundational competitiveness, *Y* is its GDP, and *WAP* is its working-age population. The characteristics of *Y* are similar to those in the endogenous growth and human capital model (Equation 1). However, now, the productive services function of the labor force (Equation 2) considers the specific participation of the migrant labor force. Thus, the working-age population (*WAP*) at time *t* comprises both native (local) and migrant workers, as expressed in Equation 6:

$$WAP_{it} = L_{nt} + L_{mt} \quad (6)$$

Since the literature emphasizes that the migrant force takes advantage of the productive capacities of the place where they arrive, we assume there is an interaction between the productive services of local and immigrant labor, i.e., these services are not independent due to two likely circumstances: At first, migrants primarily move their productive services for labor, so the capital and technology available in economy *pr* are to some extent rival since a given unit of capital or technology can be used by either local or immigrant labor. Secondly, there may be interaction effects from the combination of local and non-local human capital (also assuming that there is immigration of workers with somewhat different levels of human capital). Thus, it is assumed that the function in Equation 2 can be expressed as in Equation 7:

$$H_i(t) = \left(\frac{WAP_m}{WAP_n}\right)^{\gamma} e^{\phi(E_n - E_m)} \quad (7)$$

Equation 7 shows the participation of the migrant labor force relative to the native workforce in the productive labor services in Mexican state *i*. This function is later decomposed in the econometric model to estimate separate effects of resident and migrant *WAP* and their education levels, i.e., the average years of schooling of migrant and native individuals, represented by E_m and E_n, respectively.

Econometric model

As expressed before, the econometric approach does not aim to analyze the microeconomic and macroeconomic determinants of foundational competitiveness in Mexican states, as Delgado et al. (2012) suggested. However, it identifies differences within Mexico regarding the relationship between internal immigration and production. Thus, from Equations 1 to 7, the econometric base model in Equation 8 is established:

$$\ell CF_{it} = \alpha + \beta \ell K_{it} + \gamma \ell \frac{WAP_{mt}}{WAP_{nt}} + \phi(E_{nt} - E_{mt}) + \delta \ell \mathrm{A} + v_{it} \quad (8)$$

ℓCF_{it} is the natural logarithm of the foundational competitiveness indicator of Mexican state *i* in period *t* – real GDP data of the sectors considered in the National Economic Censuses are used to construct this indicator (Equation 8). ℓK_{it} is the natural logarithm of the Gross Fixed Capital Formation of Mexican state *i* in period *t*. $\ell \frac{WAP_{mt}}{WAP_{nt}}$ is the natural logarithm of the ratio of immigrant to native working-age populations (*WAP*) in period *t*. E_{nt} and E_{mt} are cumulative schooling averages of native and immigrant individuals in Mexican state *i* in period *t*. According to the literature on technological progress, it can be assumed that the last term (ℓA) can be depicted by spatial or temporal – fixed or random – effects since it does not change significantly in time and may be regarded as exogenously determined. Moreover, a set of fixed effects captures the effect of unobserved factors (others from technology) that affect output, given the stock of capital and labor. Following Hall and Jones, cited by Romer (2006), we estimate the labor productive services variable *H* considering years of education only, so the variable follows the behavior of Equation 3.

Data

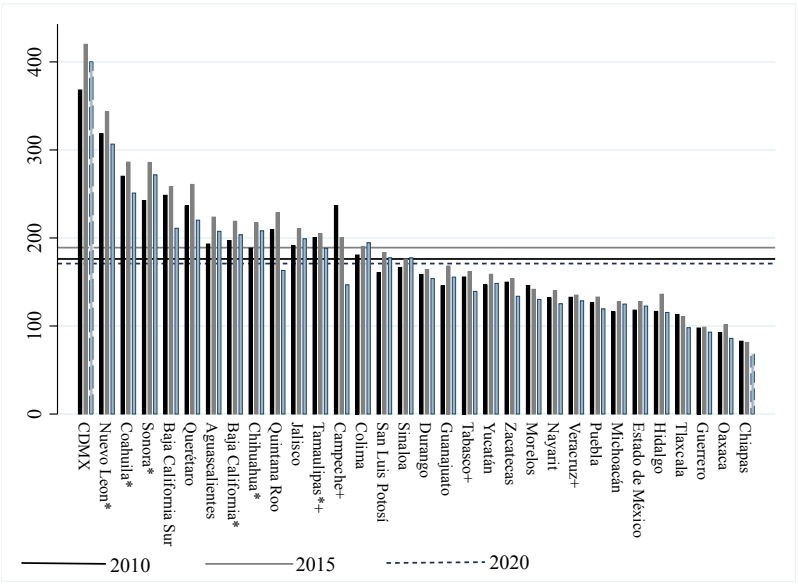
We use state-level longitudinal data for 2010, 2015, and 2020 due to the availability of internal migration data provided by the Mexican National Institute of Statistics and Geography (INEGI by its acronym in Spanish) through censuses (2010 and 2020) and the 2015 intercensal survey. Capital data is obtained from INEGI's economic censuses; we use Gross Fixed Capital Formation (GFCF) data closest to the analysis year. Real GDP data is taken from INEGI's Economic Information Data Bank. Data regarding the average education

and working-age population (individuals between 15 and 64) is taken from the censuses, as mentioned earlier, as well as intercensal surveys. Dichotomous variables are added in the models for the years 2015 and 2020 (temporal fixed effects), as well as indicators for Mexican states that share a border with the U.S. (Tamaulipas, Nuevo Leon, Coahuila, Chihuahua, Sonora and Baja California), or whether it is considered a principal oil producer (Tamaulipas, Veracruz, Tabasco and Campeche).

RESULTS

Figure 1 shows that foundational competitiveness (FC) varies substantially among Mexican states and to a lesser extent in time. Comparisons along temporal and spatial dimensions are informative since real GDP data is used. In this regard, it is interesting to note that only Colima and Sinaloa showed sustained growth in FC in 2010, 2015, and 2020. Still, most of the Mexican states presented an increase in 2015 and then a fall in 2020, possibly reflecting the effect of the COVID-19 pandemic.

Figure 1
Foundational competitiveness ranking by Mexican state and year (2010, 2015, 2020).



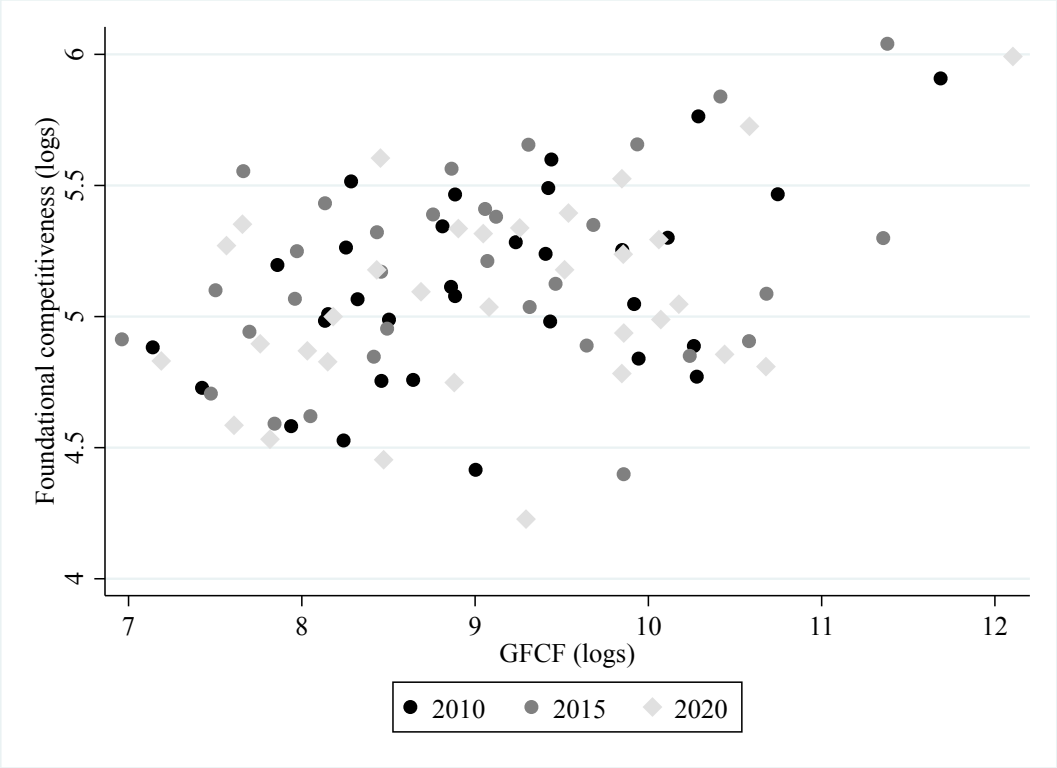
Notes: Horizontal lines refer to national averages for corresponding years. For each state, vertical bars show yearly foundational competitiveness in ascending order. * indicates Mexican states that share a border with the U.S.; + indicates oil producers.
Source: own elaboration.

Figure 1 also shows that national averages did not vary significantly between 2010 and 2020 – they show a slight decline – and only 13 states underwent an increase in foundational

competitiveness. Finally, the figure reflects the renowned regional inequality in the country – since the group of states above the average includes Mexico City, Jalisco, Queretaro, and those that share borders with the U.S. – similar to the ranking shown by other, more complex measures of competitiveness.

On the other hand, Figure 2 shows that the relationship between foundational competitiveness (FC) and real Gross Fixed Capital Formation (GFCF) presents considerable dispersion. The figure suggests a positive correlation, particularly considering the highest values of both variables. However, it raises the possibility that the relationship is more complex, i.e., it may be non-linear.

Figure 2
Foundational competitiveness and real Gross Fixed Capital Formation



Notes: GFCF= Gross Fixed Capital Formation, 2013 prices.
Source: own elaboration.

Considering the longitudinal structure of the data, we proceeded to perform the Hausman test between fixed and random effects to estimators of the base model (Equation 8) and others that incorporate interactive variables, basing the decision of the tests on a 99% confidence level. Column FE1 of Table 1 shows the estimates of the base model, and columns FE2-RE3 show estimates of modified models. Results show that the models are mostly statistically significant at a 99% level. The results of all models show that capital is highly significant, suggesting a U-shaped relationship, i.e., at low levels of GFCF, foundational competitiveness

decreases, but as capital increases, competitiveness increases. Besides, results of the base model (column FE1) suggest that the proportion of immigrants to resident WAP and the education differential between these groups are insignificant (95% level). Thus, there is no evidence that a higher average education or higher participation of immigrants in a state positively affects foundational competitiveness.

However, results vary when controlling for other specifications of WAP ratios and education levels, i.e., when allowing more distinctive, independent effects of covariates on a state's FC. Particularly, modified models may estimate the next: the effects of migrant WAP as a proportion of total WAP in the state, native WAP as a proportion of total WAP in the state, a dichotomous variable equal to 1 if average migrant education is higher than that of the native population; a dichotomous variable equal to 1 if the average education of the native population is higher than migrant education; and interactive variables to capture the possible impact of higher migrant WAP participation that is more or less educated than native WAP.

Table 1
Regression estimates

Variable	FE1	FE2	RE1	RE2	RE3
GFCF	-.3558**	-.3163**	-.3970**	-.3992**	-.3972**
$GFCF^2$	.019**	.017**	.023**	.023**	.023**
Ratio WAP_m/WAP_n	.0571				
Difference $educ_n$-$educ_m$	-.0082	-.0204			
Oil producer			-.0890	-.0913	-.0914
Border with US			.4396**	.4423**	.4448**
Y2015	.0672**	.0473*	.0429	.0408	.0400
Y2020	-.0363	-.0548*	-.0802**	-.0820**	-.0823**
Ratio WAP_m/WAP_i		.1653	.1063	.2356*	.3566
Ratio WAP_n/WAP_i		1.93	2.37	2.47	2.46
Indicator $educ_m > educ_n$			.3660**		
Ratio WAP_m/WAP_i if $educ_m > educ_n$			.1268**		-.1226
Indicator $educ_n > educ_m$				.1684**	.6677
Ratio WAP_n/WAP_i if $educ_n > educ_m$				2.40**	4.39
Chi-sq			159.7**	165.9**	220.1**
F	24.76**	28.48**			
R^2-overall model	.1412	.1313	.4676	.4637	.4629

Notes * p<.05; ** p<.01 (robust standard errors). N=96. GFCF= Gross Fixed Capital Formation. WAP=working-age population. educ= average years of cumulative schooling. Y2015 and Y2020 are dichotomous variables for 2015 and 2020, respectively. Subindexes *i, n*, and *m* indicate the Mexican state *i,* the native population, or the immigrants, respectively. Natural logarithms are used for real GFCF and WAP ratios. Source: Own elaboration.

Column FE2 (Table 1) suggests no evidence of the independent effects of migrant or native WAP – as a proportion of total WAP – on fundamental competitiveness. However, this may be caused by collinearity among the variables. Nevertheless, the models that condition for education differences (columns RE1 to RE3) show some interesting findings. On the one hand, although the magnitude of the difference between the average schooling of migrants and natives does not seem to have a direct effect on foundational competitiveness (FE1 and FE2 show that this difference is not statistically significant at a 95% level), a higher average education of migrants has a stronger positive relationship with FC than a higher average education of natives. Likewise, results show interesting evidence that a higher share of migrant WAP (more educated than native WAP) positively affects FC.

On the other hand, when controlling for higher participation of native WAP (more educated than immigrant WAP), there is a positive effect on FC due to a higher ratio of migrant WAP to native WAP. The last model (column RE3) shows that the positive relationship of higher participation of migrant or resident-educated WAP loses significance when controlling for both. Finally, results of the R1 to R3 models indicate that the Mexican states that share a border with the U.S. present, on average, a higher FC than the rest.

CONCLUSIONS

Competitiveness is a multifaceted concept central to economic development. It is generally regarded as a region's ability to achieve sustained economic performance while enhancing the quality of life of its inhabitants. However, despite widespread agreement on its desirability, there is no universally accepted definition since it depends on specific goals and purposes (e.g., Alaimo et al., 2024; Karman et al., 2023). Thus, evaluating the effects of migration on competitiveness might bring diverse results depending on the definition analyzed.

Some organizations offer varying perspectives on competitiveness. The World Economic Forum (WEF) links competitiveness to productivity and sustainability (WEF, 2014), emphasizing the role of institutions, policies, and factors that drive long-term economic performance while safeguarding social and environmental well-being. Porter (1990) aligns with this view, highlighting the importance of innovation and industry-specific advantages for enhancing competitiveness, productivity, and living standards. Nonetheless, the OECD assesses the relationship between competitiveness and international economics by examining how productivity, technological innovation, and macroeconomic performance influence a country's trade balance (Durand et al., 1992). However, the Mexican Institute for Competitiveness (IMCO) adopts a more regional perspective, defining competitiveness as a

region's capability to attract and retain investments by offering favorable conditions for economic and social development (IMCO, 2024).

In line with studies such as, for example, Grassia et al. (2024), Kouskoura et al. (2024) and Carpio et al. (2023), the present paper analyzes competitiveness on a sub-national (Mexican states) instead of a country level. According to the literature review and the econometric evidence of this study, it is clear that migration has positive and negative effects on the places of destination and origin, and this is no exception when it comes to factors related to foundational competitiveness. Based on an endogenous growth model with human capital, econometric estimations were made for the federal states of Mexico regarding the impact of greater participation of working-age migrants with a relatively higher or lower level of education on the foundational competitiveness of the destination entity. The econometric results suggest that greater involvement of a highly educated migrant labor force positively affects foundational competitiveness, which concurs with Oliinyk et al. (2021).

In general, foundational competitiveness has a non-linear relationship with capital, as measured by actual gross physical capital formation. It may reflect the argument that physical capital is not sufficient to increase the competitiveness of Mexican states since some authors (for instance, Vargas-Hernández & Ramírez, 2018; Solleiro & Castañón, 2012; Jiménez-García et al., 2011) argue that other factors related to total factor productivity – e.g., innovation, business structure – should be considered. Likewise, foundational competitiveness, on average, increased in 2015. However, despite this increase, competitiveness in 2020 was below the 2010 level, showing a general decline experienced in previous years, as Jiménez-García et al. (2011) highlighted.

Furthermore, the econometric results suggest that the foundational competitiveness of the states has a positive relationship with greater participation of migrants when their level of education is relatively higher than that of the residents of the destination entity. On the other hand, when residents' educational level is relatively higher than that of migrants, positive effects are also observed when there is a higher proportion of migrants. Assuming that different levels of education reflect different aptitudes and capacities (differences in human capital), these results seem to suggest that the foundational competitiveness of an entity is most beneficial when the capacities or skills of migrants and residents complement each other.

This seems to be supported by the last econometric model estimated in the present study, which suggests no positive effects on foundational competitiveness when there is a higher participation of migrants and residents have a higher educational level. As a recommendation, future research studies could incorporate factors related to innovation or contrast other competitiveness indicators.

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Empirical Study of Social Media Marketing's Impact on Brand Image and Loyalty in Retail, Muscat

Estudio empírico del impacto del marketing en redes sociales en la imagen de marca y la fidelidad en el minorista, Mascate

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ABSTRACT

This study aims to explore SMM's influence on brand image and loyalty in the retail industry of Muscat. The study employs the quantitative method as it ensures valid and reliable results. The data for the analysis were collected from 150 employees in the retail sector through structured survey questionnaires. The data is analyzed using the SPSS tool through statistical approaches such as ANOVA, Correlation, and Regression. The findings of this research will illuminate the significance of SMM and identify factors that encourage SMM in the retail sector. The outcomes provide valuable insights into SMM initiatives that aid in increasing Muscat's brand reputation and image in the retail industry. This study's implications will benefit retail organizations in attaining a competitive advantage in the market.

Keywords: Social Media Marketing; Digital Marketing; Online Marketing; Brand loyalty; Brand Image; Retail industry; Muscat

JEL code: M31, L81

RESUMEN

Este estudio tiene como objetivo explorar SMM sobre la imagen de marca y la lealtad en la industria minorista de Mascate. El estudio emplea el método cuantitativo ya que garantiza resultados válidos y confiables. Los datos para el análisis se recopilaron de 150 empleados del sector minorista a través de cuestionarios de encuesta estructurados. Los datos se analizan utilizando la herramienta SPSS mediante enfoques estadísticos como ANOVA, Correlación y Regresión. Los hallazgos de esta investigación iluminarán la importancia del SMM e identificarán los factores que fomentan el SMM en el sector minorista. Los resultados proporcionan información valiosa sobre las iniciativas SMM que ayudan a aumentar la reputación y la imagen de la marca en la industria minorista de Muscat. Las implicaciones de este estudio serán beneficiosas para que las organizaciones minoristas obtengan una ventaja competitiva en el mercado.

Palabras clave: Marketing social; marketing digital; marketing online; fidelización de marca; imagen de marca; industria minorista, Mascate

Código Jel: M31, L81

INTRODUCTION

The retail industry is a rapidly developing industrial sector that contributes to the nation's growth (Zhu & Gao, 2019). The retail sector undergoes severe disparity due to the large sum of large-scale retail shops. Traditional marketing has slowly disappeared with the advancement of technology (Kim et al., 2020).

Recently, the firm has utilized the Internet as an extensive marketing network. Digital marketing (DM) is referred to as the usage of ECT (Electronic Communication Technology) with conventional marketing to attain and offer amenities to customers (Ram et al., 2023). Online marketing (OM) is the most popular term with modern potential and technical services to raise profit via sales and access the vast number of retail customers (Fuchs et al., 2024). It lowers the cost and creates customer engagement through frequent communication, which makes the customer retain.

OM is an effective instrument that helps firms achieve financial performance and growth. E-marketing is not the usage of the Internet but the facilitation of interaction among firms and customers (Carlson et al., 2019).

DM is performed on varied platforms such as email, websites, e-advertisement, Search Engine Optimisation (SEO), and Social Media Marketing (SMM). SEO improves the quality and quantity of traffic from search engines to websites or web pages (Lewandowski et al., 2021). SMM is the only platform enabling firms to attain possible online consumers (Getaruelas & Gnanakumar, 2023).

Firms are capitalizing on technology to uplift their Social Media (SM) availability as marketers anticipate that SM will expand to 71% (Ebrahim, 2020). SMM is the process that allows firms to promote their products, services, and websites via online social platforms to extended communities. SM unites corporations, companies, and service suppliers with a broader audience of consumers (Zollo et al., 2020). Firms can drive website traffic, gain followers, and achieve brand awareness through SMM. Firms strive to increase sales, conversions, and profits and sustain a competitive market via SMM (Dolega et al., 2021). SMM impacts consumer behavior, including shopping behavior, attitudes, opinions, information acquisition, awareness, and communication. SMM contributes to building brand image, brand loyalty, and brand equity for organizations (Al-Haraizah et al., 2020).

Brand image is customers' perceptions of the firm and its products and services based on their experiences and interactions (Tirawani & Matondang, 2024). The company's values and mission also contribute to building brand image. A robust brand image can achieve brand

recognition and loyalty. It influences the customer to differentiate the firm from rival companies (Cheung et al., 2019).

On the other hand, brand equity is consumers' outlook regarding the brand's reputation. It is regarded as a firm's intangible asset (Pham, 2020). The management and augmentation of brand equity gain the confidence of customers to purchase services or goods from the firm (Suharto et al., 2022).

The firm concentrates on brand loyalty as it can influence the customers' shopping intentions (Ceyhan Günay, 2019). Customers who are committed to the brand can show optimistic word of mouth. Further, loyal customers tend to purchase and repurchase with the same brand. Brand loyalty is regarded as the key factor in estimating the value of a brand (Hwang et al., 2021). A firm with a vast loyal customer base can be predicted to have more profits and sales than a brand without a loyal customer base (Johansson & Hiltula, 2021).

Significance of the Study

SMM is rapidly developing in the retail sector of Muscat; comprehending its impact on brand image and customer loyalty is significant for businesses to remain competitive in the digital era (Al Ramadhani, Al Badri, & Rais, 2024). Investigating the association between DM and brand trust of customers can aid in comprehending the efficacy of SMM tactics in forming customer outlooks about the brands and nurturing loyalty across consumers. This knowledge can notify decision-making procedures linked to resource allocation, campaign optimization, and building marketing strategies. By using SMM effectively, firms in the retail sector can influence consumer behavior, drive sales and conversions, and develop brand awareness among Muscat's customers.

Problem Identification

In the digital world, SMMs are the most essential for firms and companies in the retail sector. The growth of the Internet has increased the number of users in the retail industry. Effective business handling through traditional marketing is complex in the competitive market (Irshad et al., 2020). Firms need to improve in embracing DM to avoid loss of customer base, sales, profits, and overall growth. Hence, SMM can aid in establishing brand awareness, brand image, and loyalty in the retail sector (Bernarto et al., 2020). Though much research exists on SMM, there needs to be more research on its impact on brand image, loyalty, and brand equity. Additionally, a study gap must be analyzed to identify the SMM and its impact on Muscat's retail sector. The proposed study investigates the SMM factors and explores their influence, which is valuable to obtaining information regarding their importance and customer trust in the retail industry.

Objectives of the Study

The current research investigates the SMM and its effect on Muscat's brand image and loyalty in the retail sector. The key objectives are deliberated as follows:

To evaluate the significance of implementing OM in the retail industry

To determine the factors influencing the adoption of digital technologies in the retail industry.

To analyze the association of digital marketing and consumer brand trust in the retail industry.

To evaluate the impact of digital marketing on the brand equity and brand loyalty of the consumers in the retail industry.

To recommend the theoretical framework for the effective implementation of OM to elevate brand loyalty in the retail sector.

Paper Organization

The current research is structured consecutively. In section 1, the outline regarding SMM and its effect on retail sectors' brand image and loyalty was deliberated. Furthermore, the introduction covers the background of the research, its significance, problem detection, and the study's objective. Section 2 will discuss the prevailing research associated with the current research. Additionally, the research gap and research hypothesis will be elaborated. Section 3 will elucidate the methodology of the proposed study with the support of utilized methods for data collection and analysis. In section 4, the outcomes of the performed data analysis will be exposed. Section 5 will discuss the results of the preceding research and current research. The limitation of the present research will be mentioned in section 6. Finally, section 7 will emphasize the conclusion and implications of the study.

LITERATURE REVIEW

Online Marketing in the Retail Sector

The Internet gave birth to varied platforms for businesses and other purposes in the 21st century. A successful business depends on various factors, such as marketing, production, and operation. Digitalization significantly impacts marketing functions for organizations in multiple industries (Rossato & Castellani, 2020; Dastane, 2020).

E-marketing offers several benefits for sellers, retailers, and customers in the retail sector, including many market users (Veleva & Tsvetanova, 2020). The OM can influence customers' perceptions and purchasing intentions. Therefore, the conventional study (Kaur et al., 2021) has evaluated several tools and methods utilized in OM. Further, it has extended to investigate the impact of e-marketing tactics on customers' purchasing intention. The research is based on a quantitative approach.

The data has been congregated from both primary and secondary sources. The primary data has been collected from 211 common public through a structured questionnaire distributed online. The secondary data is obtained from websites and published journals. The outcomes have been identified as a positive association between customer shopping behavior and DM. Further, it has been detected that the OM significantly influences customers' purchasing intentions.

Organizations are often striving to attain new consumers and maintain existing customers. In previous days, traditional marketing, such as print, television, and radio, was utilized to connect with people (Othman et al., 2021). The establishment of the Internet has shifted the way of marketing from traditional to digital to meet the potential audience. The prior study (Abdulraheem & Imouokhome, 2021) examined SM sites' impact on customer purchasing behavior in Shoprite Nigeria Limited in Lagos and Ibadan. It has been considered an SM site on YouTube, Google+, Facebook, blogs, and Twitter. The study has been based on a descriptive quantitative research design. The data was collected from 321 respondents through a structured questionnaire using a five-point Likert scale. The results have found that the SM sites significantly impact the shopping characteristics of consumers in Shoprite Nigeria Limited.

OM is the best instrument for retail brands to cheaply connect with a targeted global audience. The prevailing study (UNNISA, 2023) has examined the impact of DM on the retail sector. Further, it has scrutinized the various types of DM and its challenges in the retail sector. The study has considered the responses of fashion retailers. The study detected various DM channels, such as SMM, SEO, email marketing, radio promotion, television advertising, and instant messaging marketing. It has been found that advanced promotions are the common DM challenges in the retail industry. Further, the outcome has been recognized as DM significantly impacting the retail sector. The DM has created rapport with customers, brand loyalty, and increased sales and conversion. Therefore, DM's contribution is significant to the retail industry.

Decisive Factors for using digital technologies

Retailing is experiencing a significant revolution because of recent advancements in technology. Digitalization has made the retail sector embrace digital technologies for marketing decisions and sales. The retail sector has adopted digital technologies in its various operations, such as marketing, production, and supply chain. The preceding study (Arango-Botero et al., 2021) investigated the factors that promote the use of SMM in retail firms.

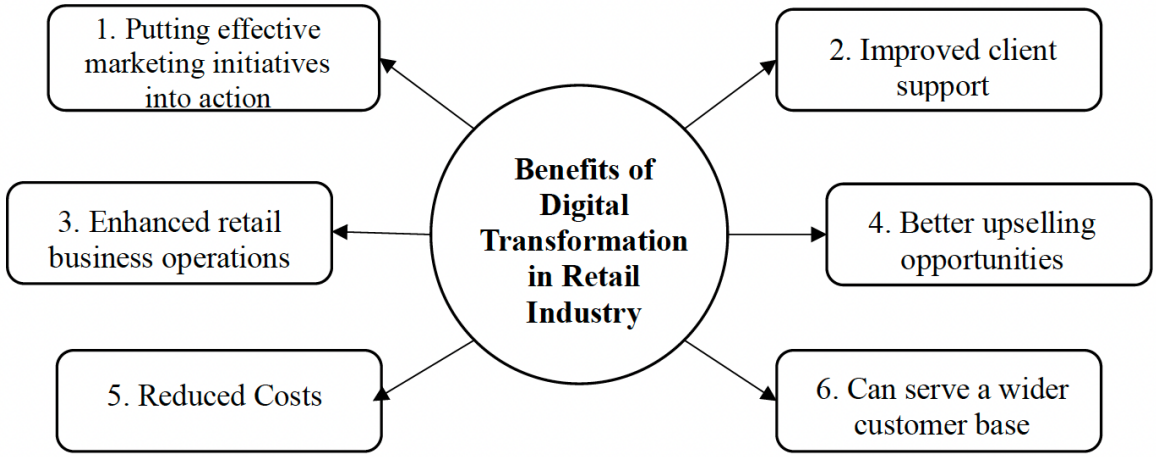
The research has been based on field, cross-cutting, and quantitative probing techniques. The data has been gathered from 421 managers in the marketing department of Medellin's retail

industry. The data has been congregated via a questionnaire. The results have detected that perceived usefulness, perceived ease of use, and trust are the factors that increase the usage of SMM in the retail sector. The outcomes have revealed that, through SMM, the firm can attain a competitive advantage in the market.

The SM is one of the leading digital platforms utilized as a medium for business marketing. Traditional research (Razak & Latip, 2016) has examined the factors that influence the use of SM in marketing across SMEs (Small and medium enterprises) in Malaysia. The results show that factors such as perceived usefulness, enjoyment, and ease of use have positively impacted the usage of SM as a marketing tool for SMEs in Malaysia. The usefulness is the belief level of SMEs that utilizing SMM can uplift productivity and performance. Ease of use is the belief level of SMEs that employing SMM is a simple practice. Further, enjoyment is considered in the prevailing study as SMM does not require any obligation, as people love to enjoy using SM.

Figure 1

Benefits of digital transformation in the retail sector (Thakker, 2023)



Source: Own elaboration.

Figure 1 illustrates the benefits of the digital revolution in the retail industry. Digital technologies in the retail sector have benefits for marketing initiatives, enhanced client support, business functions, sales, reduced costs, and offering services to a broad consumer base.

Digital marketing on brand equity and brand loyalty

Currently, SM is a popular platform for transferring information. For business purposes, OM has a high potential to reach more audiences. Firms concentrate on achieving brand image, trust, and loyalty from the customer to sustain themselves in the competitive market. The characteristics of brand trust are the positive outlook of customers about the product based on their experiences and satisfaction (Seo et al., 2020). On the other hand, brand loyalty is

the customer's relationship with the brand. Thus, the prior research (Haudi et al., 2022) has determined the impact of SMM on brand trust, brand equity, and brand reliability.

The study has utilized a quantitative research approach. The data has been collected from 450 respondents through online questionnaires using Google Forms. The study considered the participants who had used SM for at least six months. The results have identified that the SMM significantly positively impacts brand equity, brand loyalty, and brand trust. Furthermore, it has been recognized that brand equity, brand loyalty, and brand image significantly impact the performance of SMEs.

The growth of the Internet has transformed marketing practices, where SMM is the novel practice in DM. Firms are targeted to achieve sustainability in the competitive market. To accomplish this purpose, comprehending how to develop and govern brand equity is significant to establishing a competitive advantage across rival firms. The traditional study (Hafez, 2022) has inspected the influence of SMM practices on brand equity via brand experience as a moderating factor. The research has been based on quantitative research techniques.

The data has been gathered from 222 bank clients through an offline survey questionnaire. The outcomes have been detected as SMM activities have an optimistic and significant influence on brand equity. Additionally, the brand experience has mediated the association between SMM practice and brand equity. The perceived uniqueness slightly impacts the relationship between brand equity and SMM practices.

RESEARCH GAP

Even though the existing studies have strived to examine SMM and its effect on brand loyalty and brand image in the retail sector, there is scope for additional advancements in data collection. For example, the study (Haudi et al., 2022) collected many responses. The large amount of data can result in biases in the data and outcomes.

The research (Kaur et al., 2021) has gathered data from secondary sources, which can reduce the reliability of research results. Hence, it is necessary to concentrate on sample size and data collection method to gain ideal results. Although there are numerous endeavors in traditional studies, several facets still need to be included.

For instance, the research (Hafez, 2022) has disregarded the aspect of brand trust and loyalty.

The study (UNNISA, 2023) has ignored the association of DM with customer trust in the retail sector. Similarly, few studies have yet to offer recommendations about the theoretical framework for effectively implementing DM to elevate brand loyalty.

Thus, considering several features can augment the organization's decision-making, performance, and productivity. More research studies on SMM in Muscat's retail sector are needed. Hence, the proposed study embraces the analysis of SMM in Muscat's retail sector. Further, the proposed study reveals the impact of SMM on brand loyalty and brand equity.

Research Hypothesis

The research hypotheses of the present study are addressed as follows:

$H_1$1: Online marketing has a significant impact on the retail sector

$H_0$1: Online marketing has no significant impact on the retail sector

$H_1$2: The factors significantly influence the adoption of digital technologies in the retail industry.

$H_0$2: The factors do not significantly influence the adoption of digital technologies in the retail industry.

$H_1$3: Digital marketing has a significant relationship with the brand trust of the customer in the retail sector

$H_0$3: Digital marketing has no significant relationship with the brand trust of the customer in the retail sector

$H_1$4: Digital marketing has a positive effect on the brand equity and brand loyalty of the consumer in the retail sector

$H_0$4: Digital marketing has a negative effect on the brand equity and brand loyalty of the consumer in the retail sector

METHODOLOGY

Study Area

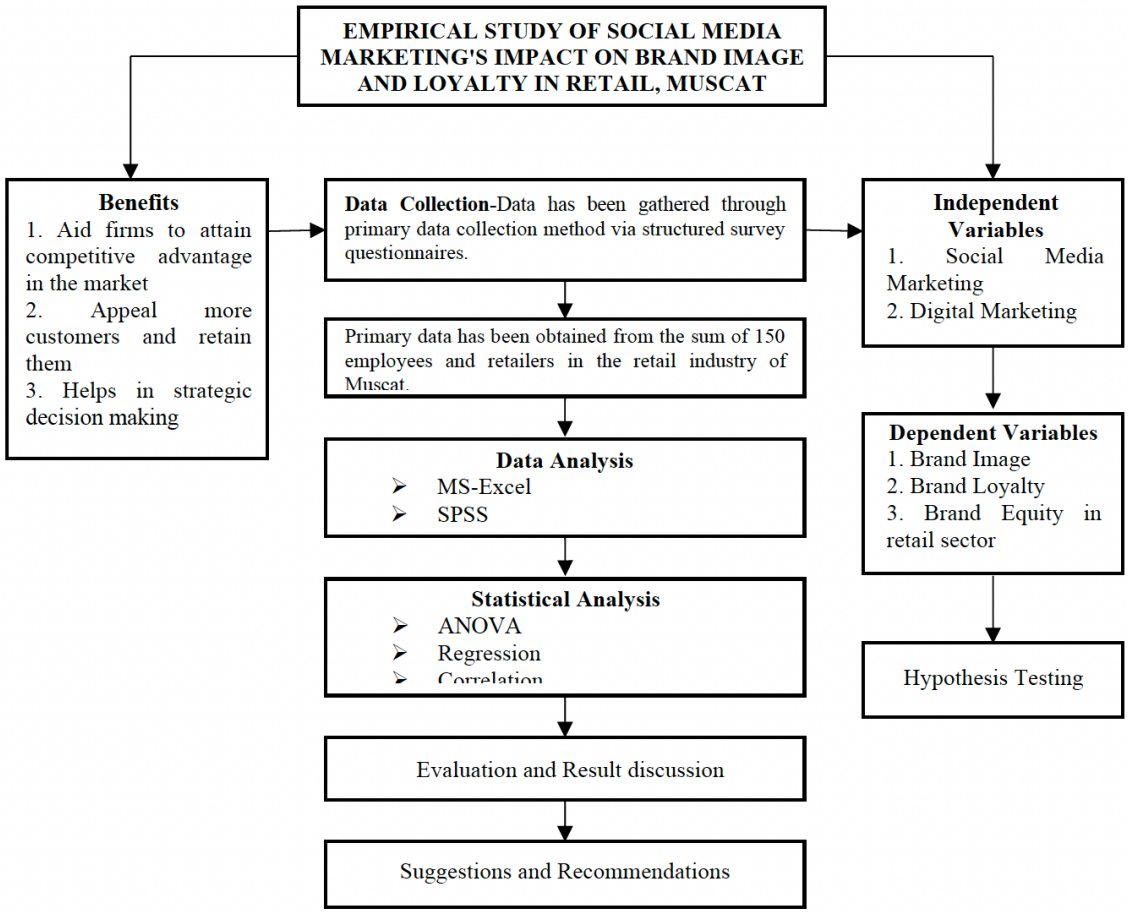
The research is performed among retailers and employees of retail firms in Muscat, Oman. The survey is conducted with the support of a researcher. The participants were explicitly selected from the Muscat area, enhancing the study's relevance and simplifying the data collection process.

Research Design

The proposed study employs a quantitative research method to analyze congregated data. This approach focuses on collecting numerical data that can be measured using mathematical methods. This technique offers statistics on how, what, how much, when, and where. The quantitative technique is grounded in logic and objectivity, making it an innovative approach

for investigating specific research objectives and gathering quantifiable participant data. Additionally, it evaluates the data using statistical analysis. It utilizes questionnaires and surveys to collect data from the selected respondents. The results derived from quantitative data are considered accurate and reliable. It allows the collection of data rapidly and secures respondents' data. Therefore, this study utilizes quantitative research techniques to gather data through a structured questionnaire.

Figure 2
Research Design



Source: Own elaboration.

Figure 2 illustrates the comprehensive research design of this study. Initially, primary data are collected from 150 employees and retailers in Muscat's retail sector. The data are gathered through a structured interview questionnaire. Concurrently, the study assesses brand image, loyalty, and equity in retail firms determined through SM marketing and DM. Following this, the research hypotheses are tested. Later, the SPSS tool is used to analyze the congregated sample data. Statistical analysis such as ANOVA, Regression, and Correlation are performed.

ANOVA (Analysis of Variance) is a statistical tool employed to evaluate variations in means across three or more groups to distinguish remarkable discrepancies among them (Potvin, 2020). Regression is a statistical technique used to analyze and model the connection between dependent and multiple independent variables (Alita et al., 2021). Correlation is a numerical evaluation that indicates the intensity and alignment of a connection between two factors (Jebli et al., 2021). Finally, the results obtained from the analysis are interpreted and discussed. Based on the results, relevant suggestions and recommendations are provided.

Sampling Method and Participants

The sampling technique is vital for collecting specific data from a population rather than focusing on the entire population. Selecting an appropriate sample size is essential, as it impacts the reliability of the results. The present study utilizes a purposive sampling method to select an appropriate sample from the population. It is one of the non-probability sampling methods. In this method, researchers can choose the defendants according to their knowledge and judgment. Selecting respondents is designed to yield precise and accurate data for the study.

The primary reason for opting for purposive sampling over other techniques is that it adheres to specific rules in the sample selection process. The rules in this process provide detailed outcomes. The data are collected from the 150 retailers and employees of retail firms in Muscat. The study focuses on enthusiastic participants willing to volunteer to participate in the survey, ensuring the validity of the research and its findings.

Research Instruments

The current study utilizes a primary data collection technique to gather data relevant to its research objectives. The present research will collect data through a structured questionnaire from the retailers and employees in retail firms in Muscat. It is the easiest technique for acquiring data from respondents compared to other approaches, such as indirect interviews, in-depth interviews, or informal discussions. The data was collected from their experience, knowledge, practice, and observation of the firm in the retail sector in Muscat.

Quantitative Analysis

Quantitative data analysis systematically gathers and applies computational, statistical, and mathematical methods. It employs subjective inference to measure values based on non-quantifiable data. Quantitative analysis collects data from a population using sampling techniques to produce results relevant to the research purposes. The outcomes of quantitative analysis are expressed numerically, whereas the outcome of qualitative analysis is determined descriptively. The results of these analysis methods are used to build the future of the study and create relevant adaptations.

The quantitative data analysis technique uses a structured questionnaire from sample respondents. The gathered data are loaded in MS Excel for quantitative analysis to expose the study variables. Subsequently, the data are analyzed using SPSS software. The research results are evaluated with the help of ANOVA, regression, correlation, and demographic analysis. The data are gathered from selected respondents, such as retailers and employees in retail firms. Utilizing SPSS in this research provides efficient calculation of the relevant values. The collected data was assessed through MS Excel and the SPSS tool.

Analysis techniques such as ANOVA, correlation, and reliability tests are employed to test research hypotheses. The data assessment occurs in three levels; in level 1, Excel compiles demographic details and creates frequency distributions. It is used to list the collected data via statistics to forecast the mean (M), median range (MR), and standard deviation (SD) of several study variables in the proposed research. In level 2, the SPSS tool is employed to analyze the study variables of the present study. In level 3, correlation, ANOVA, and regression are conducted to evaluate the research hypotheses.

Ethical Consideration

The primary data collected was used for the study. It was assured that the information was strictly for the objective of education and that all the details would be kept confidential. Before the survey, the respondents' demographic details will be collected. The demographic details comprise name, age, gender, marital status, education, work experience, and other personal details. They will be kept securely for each participant contributing to the survey process.

RESULTS

Demographic Data of Respondents

The 150 retailers and employees working in Muscat's retail sector are the sample participants for this research. The demographic details of these participants are presented in Table 1. Table 1 represents the demographic details of the employees and retailers in the retail sector of Muscat who participated in the survey. According to the table, 86% of respondents are 25 years old, while the age groups of 26-40 years, 41-60 years, and above 60 years account for 10%, 3%, and 1%, respectively. The data indicates that 70% of participants are female and 30% are male. Most respondents are single, with a value of 79%, while only 21% are married.

Table 1
Demographic Data

Demographic Factor	*Parameter*	*No. of. Respondents*	*Percentage (%)*
Age	Up to 25 Years	129	86 %
	26-40 Years	14	10 %
	41-60 Years	5	3 %
	Above 60 Years	2	1 %
	Total	**100**	**100** %
Gender	Male	45	30 %
	Female	105	70 %
	Total	**100**	**100 %**
Marital Status	Single	119	79 %
	Married	31	21 %
	Total	**100**	**100 %**
Education	Under Graduate	102	68 %
	Post Graduate	40	27 %
	Doctorate	8	5 %
	Total	**100**	**100 %**
Work Experience	1-5 Years	117	78 %
	6-10 Years	7	4 %
	11-15 Years	16	11 %
	More than 15 Years	10	7 %
	Total	**100**	**100 %**
Employment Status	Trainee	105	70 %
	Temporary	11	7 %
	Contract Basis	15	10 %
	Permanent	19	13 %
	Total	**100**	**100 %**

Source: Own elaboration.

Most participants completed undergraduate studies with a value of 68%; in contrast, those with postgraduate and doctoral degrees make up 27% and 5%, respectively. The data shows that 78% of participants have work experience between 1-5 years, while 4% have experience ranging from 6-10 years. The respondents with job experience of 11-15 years and more than 15 years account for 11% and 7%, respectively. 70% of respondents are trainees, and 7% of defendants are temporary employees. On the other hand, only 10% of defendants work on a contract basis, and 13% of respondents are in permanent employment status.

Reliability Test

Tables 2 and 3 present a case processing summary and the Cα value from the reliability test. The calculated Cα value is 0.738, indicating a high level of internal consistency for the reliability scale within the defined sample.

Table 2

Case Processing Summary

		N	%
Cases	**Valid**	150	100.0
	Excluded[a]	0	.0
	Total	150	100.0

Source: Own elaboration.

Table 3

Reliability Statistics

Cronbach's alpha (Cα)	N of Items
.738	24

Source: Own elaboration.

$H_1$1: Online marketing has a significant impact on the retail sector.
$H_0$1: Online marketing has no significant impact on the retail sector.

Regression

Table 4 demonstrates the model summary of the regression analysis related to the hypothesis. The R square value is 0.511, which is above 0.50.

Table 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.740[a]	.511	.425	.706

Source: Own elaboration.

Table 5

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	**Regression**	15.149	3	5.050	13.769	.000[b]
	Residual	53.545	146	.367		
	Total	68.693	149			

Source: Own elaboration.

Table 6 presents the result of the regression analysis. It highlights the impact of OM in the retail sector. The p-value in the results is below 0.05. Consequently, the outcomes of the regression test confirm that OM has a significant effect on the retail sector. Therefore, the first hypothesis is accepted.

$H_1$2: The factors have a significant influence on the adoption of digital technologies in the retail industry.
$H_0$2: The factors do not significantly influence the adoption of digital technologies in the retail industry.

Table 6
Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	.704	.194		3.620	.000
	The integration of appropriate and blended marketing strategies, which are necessary to reach as many potential clients as possible and develop brand loyalty and awareness	.222	.071	.260	3.130	.002
	Well-designed Omni channel experiences can capture the attention of their target audience and increase customer loyalty	.155	.072	.179	2.154	.033
	Personalized communication permits retailers to influence purchase decisions effectively at the right moment of the customer journey	.249	.065	.281	3.811	.000

Source: Own elaboration.

Table 7
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
The advantages of adoption depend on the organizations compatibility to use the technological innovations	Between Groups	6.101	3	2.034	3.110	.028
	Within Groups	95.472	146	.654		
	Total	101.573	149			
The expansion of readily available digital technologies, such as computers, cell phones, and e-commerce platforms, are one of main causes of the emergence of digital marketing	Between Groups	5.670	3	1.890	3.390	.020
	Within Groups	81.403	146	.558		
	Total	87.073	149			
Organizations worldwide are facing a market pressures which are forcing them to undertake digital transformation projects or initiatives	Between Groups	13.776	3	4.592	9.435	.000
	Within Groups	71.057	146	.487		
	Total	84.833	149			
Top management support is important for resource allocation and influences organizational readiness	Between Groups	13.597	3	4.532	6.030	.001
	Within Groups	109.737	146	.752		
	Total	123.333	149			

Source: Own elaboration.

ANOVA

Table 7 illustrates the results of an ANOVA analysis assessing the impact of triggering factors on the adoption of digital technologies. The p-value is below 0.05. The results of the

ANOVA test reveal that market pressure, firm readiness, compatibility, and widespread use of technology significantly influence the adoption of digital technologies in the retail industry. Therefore, the second hypothesis is accepted.

$H_1$3: Digital marketing has a significant relationship with the brand trust of the customer in the retail sector.

$H_0$3: Digital marketing has no significant relationship with the brand trust of the customer in the retail sector.

Table 8
Correlations

		Well-designed Omni channel experiences can capture the attention of their target audience and increase customer loyalty	Customers put their faith in particular brands, market researchers which strengthen customer relationships	Flawless design presented by retailers attract consumers to navigate easily and find all the information they need to make a purchase
Well-designed Omni channel experiences can capture the attention of their target audience and increase customer loyalty	Pearson Correlation	1	.229**	.213**
	Sig. (2-tailed)		.005	.009
	N	150	150	150
Customers put their faith in particular brands, market researchers which strengthen customer relationships	Pearson Correlation	.229**	1	.315**
	Sig. (2-tailed)	.005		.000
	N	150	150	150
Flawless design presented by retailers attract consumers to navigate easily and find all the information they need to make a purchase	Pearson Correlation	.213**	.315**	1
	Sig. (2-tailed)	.009	.000	
	N	150	150	150

Source: Own elaboration.

Correlations

Table 8 presents the correlation results. The test is utilized to determine the significant relationship between DM and brand trust. The p-value of the correlation is less than 0.005. Thus, the correlation results confirm that OM has a significant association with customer brand trust in the retail industry. Therefore, the third hypothesis is accepted.

$H_1$4: Digital marketing has a positive effect on the brand equity and brand loyalty of the consumer in the retail sector.

$H_0$4: Digital marketing has a negative effect on the brand equity and brand loyalty of the consumer in the retail sector.

Table 9
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Through digital media companies constantly improve themselves and try to create a good image about the product.	Between Groups	11.542	3	3.847	9.828	.000
	Within Groups	57.152	146	.391		
	Total	68.693	149			
Digital media provides the marketers a mechanism through which they can interact and communicate effectively and cheaply	Between Groups	9.008	3	3.003	5.557	.001
	Within Groups	78.885	146	.540		
	Total	87.893	149			
Customers put their faith in particular brands, market researchers which strengthen customer relationships	Between Groups	15.582	3	5.194	7.651	.000
	Within Groups	99.111	146	.679		
	Total	114.693	149			
The integration of appropriate and blended marketing strategies, which are necessary to reach as many potential clients as possible and develop brand loyalty and awareness	Between Groups	18.061	3	6.020	11.449	.000
	Within Groups	76.773	146	.526		
	Total	94.833	149			
Well-designed Omni channel experiences can capture the attention of their target audience and increase customer loyalty	Between Groups	18.552	3	6.184	12.270	.000
	Within Groups	73.588	146	.504		
	Total	92.140	149			

Source: Own elaboration.

Table 9 displays the results of the ANOVA analysis to determine the impact of OM on brand equity and loyalty among retail industry customers. The p-value is below 0.05. Therefore, the results of the ANOVA test demonstrate that DM has a significant impact on both brand loyalty and brand equity in the retail industry. Thus, the fourth hypothesis is accepted.

DISCUSSIONS

Investigating the aggregated data from participants, analyzed using SPSS, has led to several significant interpretations in the present study. The results indicate that SMM significantly affects Muscat's brand image and loyalty within the retail sector. Additionally, the outcomes of ANOVA and regression analysis confirm that OM has a significant impact on brand equity and brand loyalty among customers in the retail industry. The correlation results reveal that e-marketing and brand trust among consumers are positively associated. The results of the ANOVA test have revealed that market pressure, firm readiness, compatibility, and widespread use of technology are the factors that decide the adoption of digital technologies in the distribution industry.

The prevailing study (Moslehpour et al., 2021) investigated the association between SMM practices and purchase intention with mediating factors such as brand image and trust. The outcomes have shown that SMM's trust and brand image significantly impact customers' buying behavior. Likewise, the present study also analyses the association between DM and customers' trust. The results illustrate that customer trust in the retail sector is essential in e-marketing to attain brand loyalty.

The preceding research (Cheung et al., 2024) has analyzed the impact of SMM components on customer brand engagement and awareness. The study has regarded elements such as electronic word of mouth, trendiness, interaction, entertainment, and customization. The outcomes have been recognized as trendiness; electronic word of mouth and interaction significantly impact customers' brand loyalty and awareness. Similarly, the current research examines the effect of SMM on brand equity and brand loyalty. The results determined that organized Omni-channel experience, integration of relevant marketing strategies, communication, and trendiness have aided firms in increasing equity and attaining brand loyalty in the retail sector.

The conventional study (Haudi et al., 2022) has explored the effect of digital marketing, social media marketing, and electronic word-of-mouth (EWOM)'s influence on purchase intention, with brand equity acting as a moderating factor, signifying that substantial brand equity enhances the positive effects of marketing techniques on consumer purchase decisions. Similarly, the present study assesses the importance of adopting Omnichannel marketing (OM) in the retail sector, indicating that a unified OM approach boosts customer interaction and loyalty towards the brand. It also recognizes essential elements that impact the acceptance of digital technologies, highlighting their contribution to building brand trust and enhancing brand equity. Ultimately, the research suggests a theoretical model for successful OM execution to increase brand loyalty in the retail industry.

The existing study (Behera et al., 2024) investigated how artificial intelligence in e-marketing affects customer engagement, emphasizing the importance of AI technologies for e-retailers to succeed in Retail 4.0. The research indicates that incorporating customer data and personalized marketing tactics improves customer interaction and brand performance. In the same way, the recent study looks into the importance of integrating Omni-channel marketing (OM) in the retail sector, with a specific focus on the factors that affect the adoption of digital technology, the connection between digital marketing and brand trust, and the overall effects on brand equity and loyalty. The results indicate that a carefully implemented OM plan can improve customer connections and increase brand devotion in a fast-changing retail environment.

LIMITATIONS

Every study has its limitations when it comes to achieving accuracy in research results. The current research also has a few boundaries, such as focusing only on Muscat's retail industry. Hence, the outcomes may limit the generalizability. It is limited to SMM only. However, the insights gained from this present research could be valuable for enhancing SMM strategies and improving brand reputation among retail firms in Muscat.

CONCLUSIONS

The study of SMM's impact on brand image and loyalty in Muscat's retail industry highlights its important theoretical and practical consequences. The demographic analysis shows that most of the workforce is young, with 86% of those surveyed being under 25, suggesting that younger consumers are incredibly open to social media marketing tactics.

The high proportion of individuals who are not in a relationship (79%) illustrates fluctuations in brand loyalty and buying choices, strengthening theories on relationship marketing. The research affirms that online advertising significantly impacts brand loyalty and equity, backing up previous theories that highlight the crucial role of online visibility in establishing brand confidence. Moreover, market pressure, firm readiness, compatibility, and technology usage are essential factors recognized for adopting digital technologies and following technology acceptance models.

The study focuses on how social media marketing (SMM) can improve brand trust, equity, and loyalty in the retail industry. It emphasizes that successful digital marketing can boost sales, profits, and customer loyalty in a challenging market. Practically, retailers in Muscat need to tailor their social media marketing tactics to connect with the younger audience and launch specific campaigns for female customers, who comprise 70% of survey participants. Investing in employee training programs can improve their ability to use social media efficiently, increasing customer interaction. Establishing consumer loyalty requires creating trust in a brand through open communication and user-generated content.

Retailers should also embrace digital technologies to enhance operational efficiency and customer experiences. It is crucial to constantly monitor market trends to adjust strategies according to changing consumer behaviors and technology usage. In general, these results offer an important understanding of the influence of social media marketing on brand reputation and customer loyalty, as well as valuable suggestions for industry players to gain a competitive edge in the market. Future research could investigate marketing tactics in various industries like finance, education, healthcare, and banking to enhance this study area.

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Consumer Happiness in the Purchase of Electric Vehicles: a Fuzzy Logic Model

Felicidad del consumidor en la compra de vehículos eléctricos: un modelo de lógica difusa

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ABSTRACT

This study analyzes customer happiness in acquiring an electric vehicle, considering pleasure as an ambiguous language term that conventional models have inadequately incorporated. This research was conducted using a fuzzy Delphi method survey targeting a specific consumer group and two fuzzy inference systems: a multi-input single-output FIS model and an FIS Tree employing a hierarchical fuzzy inference structure, which leverages the survey's training data to optimize the models using different machine learning algorithms. The FIS tree model demonstrated superior efficacy in predicting the consumer satisfaction index, achieving an average forecast error of 0.65%. This approach could assist automobile agency marketers in creating accurate predictions to evaluate the purchasing decision-making process.

Keywords: Fuzzy Logic; Consumer happiness; Fuzzy logic models; Decision-making.

JEL code: C65, D81, M31.

RESUMEN

Esta investigación analiza la felicidad del consumidor en la compra de un vehículo eléctrico, desde la perspectiva de la felicidad como una variable lingüística ambigua que los modelos tradicionales no han integrado eficazmente. Para ello, se aplicó el método Delphi difuso a un grupo específico de consumidores y se desarrollaron dos modelos difusos: uno de múltiples entradas y una salida y otro de árbol jerárquico optimizados con algoritmos de aprendizaje automático. Se concluye que el modelo de árbol es más efectivo para pronosticar la felicidad del consumidor con un error promedio del 0.65%. Este modelo ayudaría a los especialistas y gerentes de marketing para realizar predicciones confiables y analizar el proceso de toma de decisiones de compra de vehículos eléctricos.

Palabras clave: Lógica difusa; Felicidad del consumidor; Modelos de lógica difusa; Toma de decisión.

Código Jel: C65, D81, M31.

INTRODUCTION

Over the past ten years, happiness has expanded beyond traditional academic boundaries, enhancing comprehension of consumer behavior. Historically, happiness has been defined in various ways, evolving. Experts commonly associate it with well-being or subjective well-being, often describing satisfaction. In contemporary society, happiness is strongly related to pleasure and fulfillment (Dutta & Kumar, 2021).

In marketing literature, the term happiness is used interchangeably with subjective well-being, life satisfaction, and welfare (Easterlin, 2001), so happiness in this research refers to an emotional state of well-being and contentment, that impacts customer purchase intent and loyalty (Bettiga & Lamberti, 2020; Kim & Yoon, 2023; Razmus et al., 2022).

Consequently, marketers have initiated efforts to expand and deepen their research (Barbosa, 2017; Dunn et al., 2011; Mogilner, 2010). According to the tenets of neoclassical economic theory, there is also a direct and positive correlation between consumption and happiness (Wang et al., 2019).

Today, consumers seek to buy brands for what they represent and the emotional experiences they offer (Bhattacharjee & Mogilner, 2014; Dutta & Kumar, 2021). Consumers, while purchasing items, not only derive pleasure from them but also strive to attain experiences that enhance their happiness (Van Boven & Gilovich, 2003). Similarly, other consumers appreciate simple and extraordinary experiences, such as moments that bring them happiness (DeVoe & House, 2012), resulting from their direct and indirect interactions and encounters with brands (Bruhn & Schnebelen, 2017; Schmitt, 1999).

However, a subset of customers actively pursue the acquisition of experiential goods, which, in contrast to tangible objects, elicit a heightened state of happiness (Bhattacharjee & Mogilner, 2014; Nicolao et al., 2009).

Insufficient effectiveness in incorporating the drivers of consumer happiness into traditional models for analyzing decision-making processes and user behavior can be attributed to their ambiguous nature. Users express many of these factors through expressions and linguistic variables, which challenge their integration into computational models. Artificial intelligence (AI) methodologies and technologies, such as fuzzy logic (Chaturvedi, 2010) and Machine Learning algorithms, have significantly transformed the landscape of this field of study.

The current study uses fuzzy logic to construct two inference models in MATLAB, FIS unique and FIS tree. It proceeds by conducting a Fuzzy Delphi Method (FDM) survey on a

specific sample and utilizes the survey's training data to tune the models using distinct machine-learning techniques. Subsequently, following the validation of the models, researchers proceeded to analyze the outcomes and the associations between happiness and its many determinants.

Section 1 of this paper presents a comprehensive theoretical framework that explores the topic of happiness in the literature and the various applications of fuzzy logic. Section 2 provides a thorough explanation of the proposed research methodology. Section 3 presents the results of the various stages of the method and the inference processes carried out using different algorithms. Section 4 presents the study's conclusions and limitations.

This study contributes to scientific advancement in understanding the various dimensions of the concept of happiness by examining the components and clusters of factors that impact happiness in the purchase of electric vehicles on the Mexican market. In addition, the suggested model assists automobile organizations in accurately forecasting consumer happiness based on their expressed preferences for economic, social, technological, and environmental aspects.

OVERVIEW OF THE ELECTRIC VEHICLE MARKET

Within the automotive industry sector, vehicle manufacturers, in addition to public officials in regulatory entities, are paying more attention to electric vehicles (EVs), including their different technologies: Hybrids (HEVs), Plug-in Hybrid PHEVs, Battery Electrics (BEVs), and Fuel Cell Electrics (FCEVs). Likewise, opportunities have been facilitated to contribute to both zero-emission transportation and energy transition of cities and countries (World Resource Institute, 2023).

Consequently, worldwide sales of electric vehicles have increased from 4% in 2020 to 14% in 2022. Overall sales in 2023 are projected to reach nearly 14 million units, marking a 35% increase compared to 2022 (International Energy Agency, 2023).

According to the Mexican Association of the Automotive Industry, the sales figures for Mexico from January to December 2022 amounted to 1,094,728 units (Asociación Mexicana de la Industria Automotríz, 2023). Among these units, 51,065 were electric vehicles, representing approximately 4.6% of the total automobile sales. Furthermore, there has been a significant increase of 82.82% in EV acquisitions from 2016 to 2022.

The primary factor contributing to sustained growth in sales can be attributed to the implementation of economic incentives by the government of Mexico, as stated by the National Commission for the Efficient Use of Energy- Secretary of Energy in 2023

(Comisión Nacional para el Uso Eficiente de la Energía-Secretaría de Energía, 2023). It should be noted that most automotive agencies in Mexico provide a minimum of one EV model, constituting a market segment characterized by a unit price of USD 25,800 in the mid-range segment, exceeding USD 205,900 in the luxury segment.

THEORETICAL FRAMEWORK

Consumer happiness

Obtaining a physical product signifies a distinct transaction that provides a satisfying encounter for the consumer associated with holding it (Barbosa, 2017; Nicolao et al., 2009). Consequently, marketers have started incorporating this aspect into their purchasing procedures, aiming to deliver a contextual experience that enhances customer happiness (Dutta & Kumar, 2021).

In a competitive market, companies must go beyond consumer happiness and focus more on their happiness. Academic evidence indicates that good customer experiences positively impact brand loyalty (Barbosa, 2017; Khan & Hussain, 2013) and their commitment to the company (Dutta & Kumar, 2021).

Most marketing research has focused primarily on purchasing and consumption scenarios (Bruhn & Schnebelen, 2017). However, there is a relatively new area of study that involves the evaluation of consumer happiness, specifically in the purchasing process. This is primarily due to the subjective nature, uncertainty, and ambiguity associated with accurately measuring a concept as abstract and elusive as happiness (Martínez, 2012). In addition, there is a challenge in identifying and prioritizing the factors that influence the contextualization of joy, considering the significant importance of this index in marketing.

In line with this, marketers have successfully developed a connection between fuzzy logic methods and strategic decision-making processes. This connection allows them to express the linguistic levels of a variable, thereby bridging the gap between mathematical models and their interpretations (Bojanowska & Kulisz, 2023; Meier et al., 2017; Meier & Donzé, 2012). However, this aspect of consumer theory has not been extensively explored.

Customers increasingly exhibit heightened expectations in the competitive landscape of brands, and many elements influence their long-term happiness (Lin et al., 2020; Nicolao et al., 2009). Consumer happiness refers to an individual's subjective evaluation of their overall well-being and quality of life resulting from their interactions with a product or service (Gong & Yi, 2018). These interactions, occurring during and after the purchase, are crucial in shaping a positive experience (Rawson et al., 2013).

People desire to assess every factor they see as contributing to their overall well-being and regard any aspect of the consumer journey as integral to their pleasure. Consumers enjoy consuming products or services that align with their preferences, as they include desired traits (Reena & Dangi, 2023). Consequently, companies can capitalize on this by increasing their buying intention (Kim & Lee, 2019).

From different perspectives, happiness has been measured; from the economic perspective, global happiness is valued through six factors that play an important role: income, health, social support (having someone to consider), having a sense of freedom to make key decisions in life, generosity, and the perception of corruption (Helliwell et al., 2023). From the psychological and sociological perspectives, popular scales stand out to measure it through emotional elements (Bruhn & Schnebelen, 2017), such as the Affect Balance Scale (Bradburn, 1969), the Positive Negative Affect Schedule (PANAS) [Positive and Negative Affect Schedule] (Bradburn, 1969), the Memorial University of Newfoundland Happiness Scale (MUNSH) (Kozma & Stones, 1980), the Affect meter (Kammann & Flett, 1983), and the Happiness Questionnaire from Oxford (Oxford Happiness Questionnaire OHQ) (Hills & Argyle, 2002).

In both marketing and consumer research, there exists a range of happiness metrics that encompass multiple items. These metrics consider the frequency and intensity of positive emotions, the absence of negative feelings, and the overall level of happiness (Argyle & Crossland, 1987). Furthermore, these metrics are associated with spiritual reflection, care for others, and financial detachment (Cherrier & Lego, 2007). Moreover, happiness can be assessed by considering factors such as joy, vigor (Bruhn & Schnebelen, 2017), pride, and tranquility, which are influenced by technological, social, economic, environmental, and organizational forces (Kumar, 2021).

Other studies have established that happiness exhibits a temporal dimension that varies throughout an individual's lifespan. This variability is influenced by ordinary and extraordinary experiences, which are contingent upon the consumer's age or level of maturity (Bhattacharjee & Mogilner, 2014; Mogilner et al., 2012). In addition, happiness is found to be influenced by the socioeconomic status of the consumer. Specifically, people from lower socioeconomic backgrounds tend to derive greater enjoyment from material purchases rather than experiential ones (Thomas & Millar, 2013).

Consumer happiness can be predicted by various factors, such as the attitude of service employees (Söderlund et al., 2011; Söderlund & Rosengren, 2010), service quality (Gong & Yi, 2018), duration and quality of customer visits (Thomas & Millar, 2013), and personalized experiences (Kim & Lee, 2019). Companies must identify these factors and assess their significance based on customer needs (Liang et al., 2021).

Similarly, previous research has indicated that different forms of consumption, such as the acquisition and ownership of a car, contribute to feelings of happiness (Bettingen & Luedicke, 2009; Robertson, 2016). According to Srivastava and Kaul (2016) and Prentice et al. (2019), vehicle firms already provide a range of complimentary service perks to incentivize customers to routinely visit their workshops and avail themselves of preventative and/or corrective maintenance services (Srivastava and Kaul, 2016; Prentice et al., 2019).
Consumer happiness in the purchasing process: A fuzzy logic approach

The development of fuzzy sets aimed to mathematically capture the concepts of uncertainty and vagueness while offering formalized methodologies for addressing the inherent flaws in verbal explanations of diverse problems. Fuzzy logic is a highly effective method for organizing and representing cognitive systems (Emrouznejad & Ho, 2017). also, Fuzzy logic replicates the mental process by which individuals examine situations and make judgments based on ambiguous or inaccurate values rather than depending on absolute facts or falsehoods (Rosário et al., 2023).

Many methodologies in a fuzzy inference system aim to elucidate the significance of confusing factors in diverse circumstances. Some research utilizes a multi-input, single-output Mamdani Fuzzy Inference System (FIS) to address the conventional Failure Mode and Effect Analysis (FMEA). This novel methodology addressed significant challenges, including data uncertainty and the diverse array of unclear input values (Geramian & Abraham, 2021).

Furthermore, MahmoumGonbadi et al. (2019) implemented a fuzzy system using a two-step approach. In the first stage, clients were ranked based on four factors, including customer loyalty, using a FIS (Fuzzy Inference System). The ultimate priorities of the clients were determined in the second stage using another FIS based on the results of this stage and the waiting time. In two scenarios and across five system statuses, they also showcased the superior performance of their methodology compared to the FIFO (First in, First out) and TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) methodologies.

Current buyer decision-making models need to be better suited for real-life circumstances that are unpredictable and imprecise. Therefore, it is necessary to create a new conceptual and quantitative model (Sadikoglu & Saner, 2019). Consequently, fuzzy logic has emerged as a significant component within the scientific domain of marketing, highlighting the benefits of using membership functions rather than precise values (0,1).

Fuzzy logic and fuzzy reasoning are employed most effectively in the social sciences, particularly in the context of marketing models (Enache, 2015), aligning with this assertion.

In their recent publication, Shaopei and Guohua (2023) have presented a collection of recommendations on utilizing management-oriented fuzzy approaches, as proposed by Meier and Donzé (2012), within the domains of marketing and customer relationship management.

The literature also presents various applications of fuzzy logic in consumer studies. For example, it examines using FIS to forecast customer purchasing behavior (Nayak et al., 2013). Sadikoglu and Saner (2019) provide guidance on applying fuzzy logic in consumer decision-making and purchasing. Ulyanov (2020) develops a model to analyze purchasing behavior and the resulting hedonic happiness. Lastly, Bojanowska and Kulisz (2023) focus on applying fuzzy logic in customer relationship management.

Other researchers have also used FIS to quantify consumer loyalty within the context of a customer relationship. Fuzzy logic has recently started to be developed and employed in the context of happiness, comparable to its early application in marketing. The study conducted by Tadi et al. (2016) suggests assessing individual happiness by considering psychological factors and life happiness. Similarly, Bahreini et al. (2019) employ a facial emotion recognition model to identify various indicators of an individual's happiness. Kumar (2021) examines the determinants of customer happiness in authorized automotive service workshops to improve customer retention. The fuzzy Delphi method and the fuzzy analytic hierarchy process (FAHP) were used to determine the weighting index of each factor. These analysis approaches are commonly used in diffuse-type research.

Fan, Gou, and Weng (2024) have recently proposed a novel fuzzy feature generation technique to predict happiness based on behavioral and emotional data. They employed IF-THEN fuzzy rules to enhance feature selection and improve model accuracy. Their conclusions indicate that the fuzzy approach shows improved prediction accuracy compared to traditional methods, highlighting the adaptability of fuzzy models in emotion prediction tasks.

However, some research provides information on how fuzzy logic models can be applied to understand and improve consumer happiness and decision-making in the electric vehicle market. Gupta and Gupta (2024) used the fuzzy analytic hierarchy process (FAHP) and concluded that consumer trust and environmental benefits were the most influential factors in consumer intentions to purchase green vehicles.

Eti, Dinçer, Yüksel, and Gökalp (2024) proposed a fuzzy decision-making model to address customer satisfaction issues in the charging infrastructure of electric cars, highlighting the importance of technological improvements and increased charging stations. Aungkulanon, Atthirawong, and Luangpaiboon (2023) applied the FAHP to evaluate decision criteria influencing EV adoption. They used fuzzy numbers to capture imprecision in stakeholder

input and determined that cost-effectiveness and environmental benefits were the critical drivers in the adoption.

For its part, Kang and Zhu (2022) explored the use of fuzzy logic in the design of hybrid electric vehicles that improve consumer emotional satisfaction and purchase intent through fuzzy linguistic variables (energy efficiency, affordability, and aesthetics) and concluded that enhancing emotional satisfaction through design and functionality increases purchase intentions. Hussain et al. (2020) used fuzzy inference systems to increase user satisfaction and operational efficiency in charging power among multiple EVs. Jena (2020) analyzed consumer sentiment toward EVs, identifying price, maintenance, and safety as key concerns, and Yogi (2016) employed fuzzy logic to evaluate consumer satisfaction with product quality. Both directly impact the purchase intention of electric vehicles.

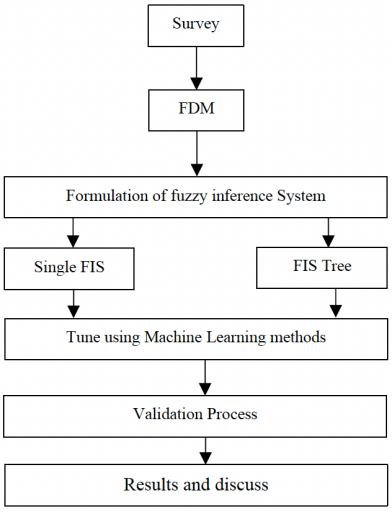
RESEARCH METHOD

First Stage: happiness metrics

This quantitative research was developed in five stages described in the following (figure 1). The first stage is happiness metrics and survey application to a targeted sample.

Figure 1

Methodology of this research



Source: own elaboration.

The survey was initially produced using the Delphi method within a fuzzy universe (Aliev & Ahmedov, 2004) to represent the linguistic variables and factors. These variables and factors were derived from the Saaty scale (Saaty, 1987), which was adjusted to have a beginning value of one and a final value of ten. At first, the factors considered were those suggested by Kumar (2021). After a review by five experts, only characteristics relevant to the electric car

purchasing process were selected (Table 1). Only factors with a mode statistic Mo≥ 3 were chosen.

This study resulted in selecting 27 elements, consisting of 5 questions focused on sociodemographic data, 21 elements related to the elements that drive happiness, and an additional element representing the happiness index, which is the model's output. This study examines the correlation between the 21 characteristics and the happiness score.

The research sample consisted of 52 current consumers who have expressed interest in owning an electric car in any of its variants and technologies. These participants were voluntary users of electric or hybrid cars in Mexico. From November 13 to December 23, 2023, the survey was conducted using Google Forms.

Table 1

Drivers of happiness in the EV purchasing process

	Drivers of happiness *	Validated Happiness Boosters **	Source
Technological	Delivery quality	Vehicle delivery time	(Gong & Yi, 2018)
	Adherence to the process	NA	NA
	Guarantee Benefits	Vehicle Guarantee Benefits	(Tu & Hsee, 2016)
	Profitable development	NA	NA
	Workshop installations	Agency facilities	(Gong & Yi, 2018; Srivastava & Kaul, 2016)
	Washing Quality	NA	NA
	Service Reliability	Vehicle Reliability	(Tu & Hsee, 2016)
	Proximity to service center	Proximity to service center	(Gong & Yi, 2018)
Social	Personalized attention	Personalized attention	(Goldsmith, 2016; Söderlund & Rosengren, 2010)
	Staff behavior	NA	NA
	Time required for service	NA	NA
	Service reminder process	Service reminder process	(Gong & Yi, 2018; Kumar et al., 2017)
	Reservation process	NA	NA
	pick-up and delivery service	NA	NA
	Workshop schedule	NA	NA
	Post-service follow-up	NA	NA
	Delivery time for complaint resolution	Complaint response time	(Söderlund & Rosengren, 2010)
	CRM program	NA	NA
	Brand image	Brand prestige	(Tu & Hsee, 2016)
Environmental	Access path to the workshop	NA	NA
	Parking installation	Ease of parking at the agency	(Goldsmith, 2016; Gong & Yi, 2018)
	Client room	Attention room	(Gong & Yi, 2018; Srivastava & Kaul, 2016)
	Parts Availability	NA	NA

	Pollution level	Free of vehicle CO2 emission pollution	(Tu & Hsee, 2016)
	Waste disposal process	NA	NA
	Empathy	NA	NA
	Communication	NA	NA
	Market focus	NA	NA
	Internal cleaning	NA	NA
Economic	Number of free services	NA	NA
	Discounts on services and spare parts	Maintenance service cost	(Srivastava & Kaul, 2016)
	High repair cost	Repair cost in case of breakdown	(Srivastava & Kaul, 2016)
	Service frequency	Temporal interval between maintenance services	(Söderlund & Rosengren, 2010)
	Transparent Billing	Cost of spare parts	(Srivastava & Kaul, 2016)
	Cashless claims service	EV's price	(Srivastava & Kaul, 2016; Tu & Hsee, 2016)
	Parts life	Lifespan of vehicle components	(Kumar et al., 2017)
	Service promotion	Maintenance service promotions	(Söderlund & Rosengren, 2010)
Organization governance	Supervisor's competence	Supervisor Attention	(Söderlund et al., 2011; Srivastava & Kaul, 2016)
	Trained staff	Staff training	(Söderlund et al., 2011; Srivastava & Kaul, 2016)
	Culture	NA	NA
	Teamwork	NA	NA
	Customer Focus	NA	NA
	Employee empowerment	NA	NA
	Leadership	NA	NA
	Participation of the workers	NA	NA

Source: own elaboration * Happiness drivers proposed by Kumar, (2021) ** Happiness drivers from the cited authors and validated by 5 experts. NA: Not applicable.

Second stage: application of the fuzzy Delphi method

The Delphi method is utilized in a fuzzy universe (FDM) to determine the factors that influence consumer happiness. This is achieved by using fuzzy sets of three linguistic variables: "low," "medium," and "high" importance, as indicated by the findings of the initial stage. The FDM was used in this study in the following form: Initially, the interviewers assessed the elements using a modified Saaty linguistic scale ranging from 1 to 10 (Table 2). The outcomes are then provided based on each linguistic variable's fuzzy triangular number (FTN) (Chaturvedi, 2010).

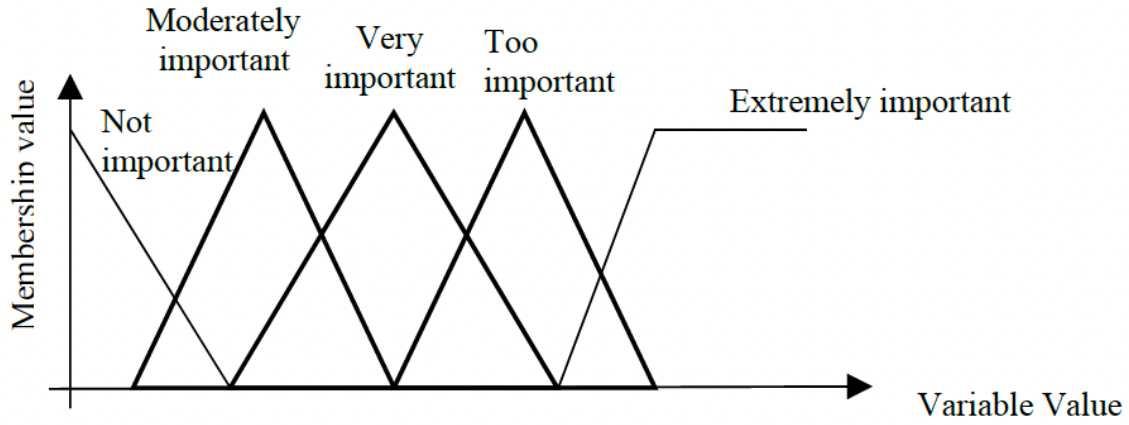
Table 2
Measurement scale for the FDM survey

Comparison index	Score	FTN
Extremely important	10	(0.7, 0.9, 0.9)
Too important	8	(0.5, 0.7, 0.9)
Very important	6	(0.3, 0.5, 0.7)
Moderately important	4	(0.1, 0.3, 0.5)
Not important	2	(0.1, 0.1, 0.3)

Source: own elaboration.

At this stage, the FTN triangular numbers are generated by splitting the range [0,1] between the five values of the comparison index according to the triangular format (a, b, c). Each of these numbers corresponds to one of the points in the triangle (Figure 2). It is important to note that the initial values will undergo modifications later in the machine learning process, wherein their bounds will be adjusted based on the consumers' expressed experiences, as indicated in the survey.

Figure 2
The FTNs for the FDM survey



Source: own elaboration.

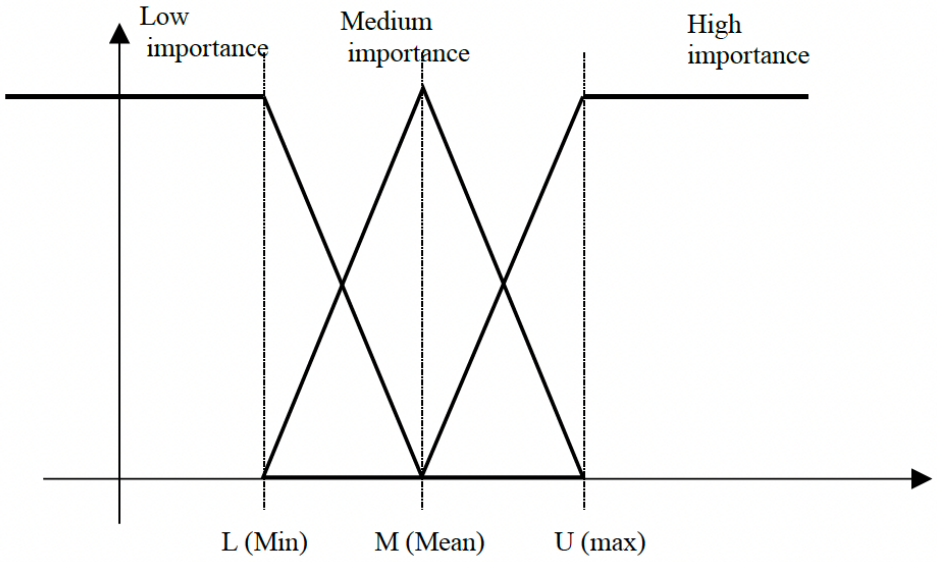
Afterwards and based on the results of the first survey, a single fuzzy set ($\tilde{a}_{ij}$) was generated for each factor, using equation 1:

$$\tilde{a}_{ij} = (l_{ij}, m_{ij}, u_{ij}) \qquad \text{Equation (1)}$$

Where: $\tilde{a}$ is the fuzzy number for factor j according to interviewer i, considering that $i = 1,2,\ldots,n$ and $j = 1,2,\ldots.m$.

From the fuzzy numbers of the factors and using equations (2) to (5), the main indices of the fuzzy set were obtained for each factor (l_j, m_j, u_j), as well as the fuzzy average (S_j), where figure 3 displays the fuzzy number of a factor with its three linguistic levels.

Figure 3
Formation of the fuzzy set of each variable based on the survey data



Source: own elaboration.

$$l_j = min_i(l_{ij}) \quad \text{Equation (2)}$$

$$m_j = \frac{1}{n\sum_{i=1}^{n} m_{ji}} \quad \text{Equation (3)}$$

$$u_j = max_i(u_{ij}) \quad \text{Equation (4)}$$

$$S_j = \frac{(l_j + m_j + u_j)}{3} \quad \text{Equation (5)}$$

Where: *j=1, 2….n* are the number of factors studied.

In this stage, the comparison process is applied as part the methodology used by Naghadehi et al., (2009) to analyze the importance of the factors. Accordingly, the factor $B_1 = (l_1, m_1, u_1)$, expressed as a fuzzy set, is compared with $B_2 = (l_2, m_2, u_2)$, applying equations (6) and (7) and so on with the rest of the factors.

$$V(B_1 \geq B_2) = sup_{y \geq x}[\min(\mu_{B1}(x), \mu_{B2}(x))] \quad \text{Equation (6)}$$

$$V(B_i \geq B_j) = \begin{cases} 1 & if\ m_j \geq m_i \\ 0 & if\ l_i \geq u_j \\ \dfrac{l_i - u_j}{(m_j - u_j) - (m_i - l_i)} & for\ other\ cases \end{cases} \quad \text{Equation (7)}$$

Once this comparison of B_1 with all the other factors is made, the weight of factor B_1 is calculated by applying equation (8).

$$d'(B_i) = \min V(B \geq B_i) \quad \text{Equation (8)}$$

Where $d'(B_i)$ is the importance value of B_i.

Third stage: formulation of fuzzy correlation models

Based on the findings from the previous stages, the fuzzy expressions of the factors are employed to construct two distinct models to establish a correlation between the driving forces and customer happiness.

The initial model was constructed using Mamdani multi-input single-output FIS (MISO), including the 21 inputs and the only output variable (happiness). This type of FIS is useful for input-to-output relationship mapping where there is data uncertainty (Geramian & Abraham, 2021)

The second model is a hierarchical fuzzy system (named FIS Tree), wherein the components are organized into distinct FIS to minimize the number of inference rules and enhance the model's tuning process. Categorization is performed based on the data shown in Table 1.

A hierarchical fuzzy system is a decentralized and structured depiction of a unified FIS comprising numerous FISs, each characterized by a reduced rule base. Therefore, utilizing an FIS tree facilitates comprehension of the inference procedure and enables expedited performance enhancement with a reduced number of adjustable parameters in contrast to a monolithic FIS.

As the amount of input to a fuzzy system escalates, there is an exponential growth in the number of rules. The extensive rule base reduces the computing efficiency of the fuzzy system. Additionally, it complicates the comprehension of the fuzzy system's functioning and adds complexity to the adjustment of rule and membership function parameters. A large rule base diminishes the generalizability of tuned fuzzy systems due to the restricted availability of training data in many applications.

The high-level fuzzy systems utilize the outputs of the low-level fuzzy systems as inputs within a tree structure. An FIS tree's computational efficiency and comprehensibility surpass those of a MISO FIS with an equivalent number of inputs.

In both models, the research has information about the input and output variables; however, there is no information about the inference rules. That is why, in both models, the formation of the rules is left to the next stage, which involves different types of machine learning algorithms.

Fourth stage: optimization and validation of the model

Developing an effective fuzzy inference system to comprehend the correlation between various membership functions poses a significant challenge, mainly when dealing with many

membership functions (MF) and other characteristics. Therefore, at this stage, multiple machine learning algorithms were utilized to optimize both FIS in this study.

This research uses the Fuzzy Logic Toolbox of MATLAB to adjust both models. Various optimization algorithms are used during the tuning process to develop potential sets of FIS parameters (Table 3). To include possible parameters in the FIS, a cost function is employed with the input/output training data obtained from the survey.

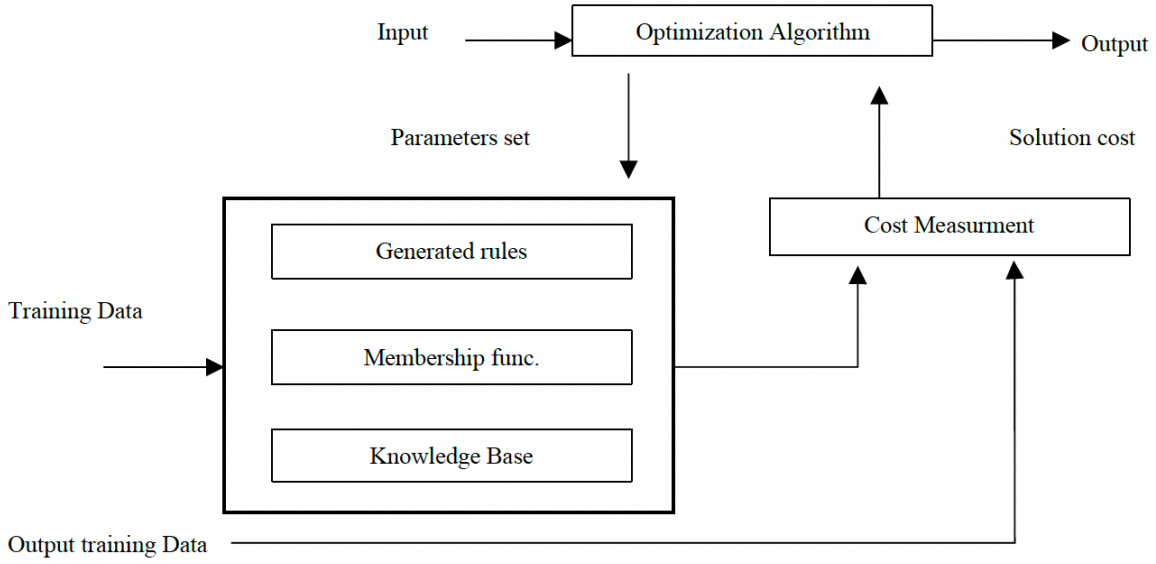
Table 3
Algorithms used

Algorithm	Description	References
Genetic Algorithm (GA)	This tool is well-suited for investigating a wide variety of parameter combinations in the FIS MISO model. It aids in avoiding local optima and identifying resilient solutions.	(Hooke & Jeeves, 1961)
Particle Swarm Optimization	The FIS Tree's parameters can be effectively adjusted by utilizing particle movements to converge towards favorable configurations.	(Hooke & Jeeves, 1961; Kennedy, 2011)
Pattern Search	This method is valuable for improving local solutions within the parameter space of the FIS Tree model without the need for derivative information.	(Hooke & Jeeves, 1961; Kennedy, 2011)
Simulated Annealing	This method is beneficial for improving local solutions within the parameter space of the FIS Tree model without the need for derivative information.	(Lin et al., 2022)

Source: own elaboration.

A two-stage tuning method was implemented to enhance the learning efficiency of FIS models (Hooke & Jeeves, 1961), as depicted in Figure 4.

Figure 4
The tuning process applied in this research



Source: own elaboration.

The first step involved learning the rule base while maintaining the constant input and output MF parameters. The second step involved modifying the parameters of the input/output MFs and rules. The initial stage is more cost-effective regarding computer resources, as it involves a limited number of rule parameters. Additionally, it rapidly achieves convergence towards a fuzzy rule base during the training process. Using the rule base obtained in the first phase as an initial condition in the second step facilitates rapid convergence of the parameter tuning process. Given that the FIS tree has already acquired knowledge from the training data, employing a local optimization technique will rapidly converge the parameter values. Optimizing the FIS tree parameters requires a more significant number of iterations compared to the previous rule-learning process.

During optimization, the maximum number of rules for each Fuzzy Inference System (FIS) is limited to 20 in the initial step. The number of optimized rules in each FIS may be lower than the limit due to eliminating duplicate rules during the tuning process. To prevent becoming stuck in a local minimum when navigating through the parameters of a hierarchical fuzzy inference tree (HFIT), two optimization techniques that do not rely on derivatives, namely particle swarm optimization (PSO) and pattern search (PS), have been examined in this two-step tuning procedure.

It is important to note that, throughout the inference procedures, the Sugeno fuzzy inference approach was chosen over Mamdani to achieve more accurate outcomes. This decision was made based on the scenario that produced the most favorable findings, as Nayak et al. (2013) and Widjaja et al. (2002) specified. The model's dependability was assessed using the Cronbach alpha coefficient and the correlations between the survey findings and those derived from the fuzzy model.

A hierarchical tuning process is employed for each tree FIS. Subsequently, the complete FIS Tree set is tuned up by excluding the outputs of each factor group and concentrating exclusively on the production of happiness.

Fifth stage: comparison and discussion of the results

During the final stage, a comparative analysis is performed between the projected outcomes of the models and the training output data to assess the prediction error margins of both models. In addition, several sides of the relationship between the determinants of happiness are examined to gain a deeper understanding of electric vehicle users in Mexico.

RESULTS

According to the survey results on a targeted sample of consumers of electric or hybrid cars, Table 4 shows the diffuse parameters of each factor according to the equations of stage 1.

Table 4
Matrix of numerical results of the evaluation of factors expressed in fuzzy sets

Factor B_j	Min l_j	mean m_j	Max u_j
B1	5	8.91	10
B2	2	8.09	10
B3	5	8.18	10
B4	5	8.36	10
B5	5	7.73	10
B6	5	8.55	10
B7	3	7.09	10
B8	7	9.68	10
B9	4	7.91	10
B10	5	8.09	10
B11	7	9.23	10
B12	2	7.86	10
B13	3	8.27	10
B14	1	6.50	10
B15	1	8.41	10
B16	1	7.27	10
B17	3	8.14	10
B18	1	7.73	10
B19	1	6.68	10
B20	1	8.86	10
B21	2	8.23	10

Source: own elaboration according to the applied survey.

Both models were developed using the Fuzzy Logic Toolbox in MATLAB, employing the Sugeno approach, as previously stated (Nayak et al., 2013; Widjaja et al., 2002). The initial FIS model (with a MISO FIS) was derived from 21 inputs and one output. This model allows for the visualization of fuzzy sets representing the inputs and the output. The fuzzy number values for each entry are derived from the preceding stage (Table 3). However, the behavior of each factor is depicted in the three levels of importance (low, medium, and high). It is observed that certain factors exhibit a wider range of values for medium importance compared to other factors.

Based on the methodology proposed and according to stage 2, the weight of each of the 21 factors influences customer happiness. It has been discovered that, when considering aspects in isolation, the reliability component is most important in enhancing the enjoyment of electric car consumers in Mexico. The guarantee factor is closely followed, while the pricing factor ranks third in importance. In contrast to prevailing assumptions, pricing does not hold

paramount significance. This is likely because electric vehicle prices are predominantly regarded within the upper economic range. As a result, the user prioritizes other variables, such as reliability, as more significant in determining their level of enjoyment (Table 5).

Table 5
Numerical results of factor evaluation

Factor	Description	$d'(B_i)$	Factor	Description	$d'(B_i)$
B4	Reliability	1.0000	**B8**	Agency facilities	0.6535
B7	Guarantee	0.8684	**B13**	Maintenance service cost	0.6535
B10	EV's price	0.7952	**B16**	Proximity to service center	0.6286
B5	Pollution	0.7857	**B1**	Personalized attention	0.6226
B21	Lifespan of vehicle components	0.7253	**B2**	Supervisor Attention	0.6055
B14	Brand prestige	0.7021	**B9**	Temporal interval between maintenance services	0.6055
B12	Repair cost	0.6947	**B6**	Ease of parking at the agency	0.5546
B20	Vehicle delivery time	0.6804	**B15**	Maintenance service promotions	0.5366
B3	Staff training	0.6735	**B19**	Attention room	0.5000
B11	Cost of spare parts	0.6667	**B17**	Service reminder process	0.4853
B18	Complaint response time	0.6600			

Source: own elaboration.

The development of the second model using the FIS Tree model is motivated by simplifying the tuning process since the categorization of factors aids in the classification of inference rules. The FIS Tree model (Figure 5) comprises five distinct fuzzy inference systems: FIS economic, FIS social, FIS technological, FIS environmental, and finally FIS happiness. Both models undergo a tuning process in the following steps:

The Genetic Algorithm is utilized in the MISO FIS model, employing a validation tolerance of 0.05, a maximum rule number of 100, and a learning optimization type. Given the multitude of input variables and the intricate nature of their associations with the happiness index, the model will need to produce 100 rules to achieve results with a minimal margin of error. It should be noted that the efficacy of the MISO FIS model progressively improves with the amplification of training data.

The tuning process for the second model, FIS Tree, was conducted by the subsequent steps:

- The tuning method involved the application of numerous stages. Specifically, a minor tuning process was implemented on the sub-FIS, which consisted of FIS_Eco, FIS_Env, FIS_Soc, and FIS_Tech, to learn the rules.
- The data training process involved tuning each FIS in the global Tree FIS with all the previously generated rules.
- The Tress FIS underwent two tuning processes. The first phase involved learning new rules using Particle Swarm Optimization (PSO), while the second step involved modifying the parameters of the FIS Tree using the Pattern Search Method.

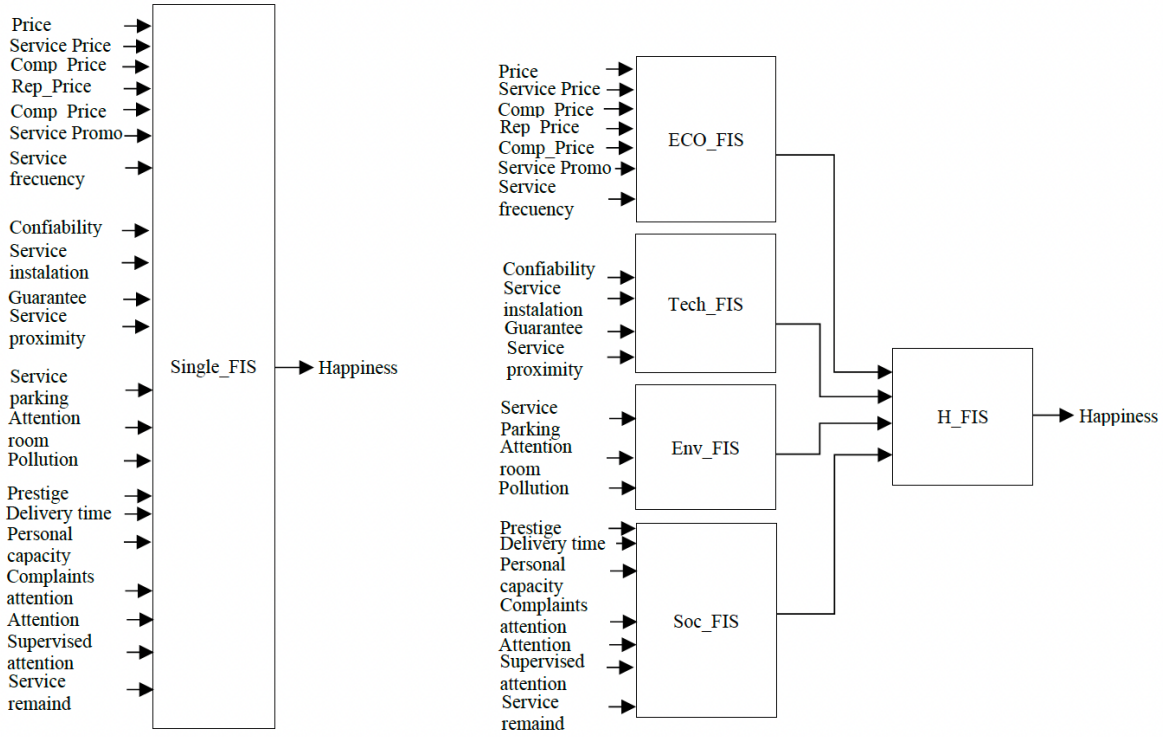
After completing the optimization processes for both models, the input variable data is utilized to compare the model's output data and assess the accuracy of the forecast provided

by each model about the survey's output data. The comparison demonstrates the superior forecast effectiveness of the FIS tree model compared to the MISO FIS model (Table 6).

In contrast, the use of Fuzzy Logic modeling helps facilitate comprehension of the interplay between multiple driver factors and the happiness index, e.g.: when analyzing the fuzzy set generated by the first model for the "price" factor, it is observed that the triangle representing the "average" fuzzy value exhibits a wide range of values from 5 to 10. This range reflects consumers' perceptions and aligns with the actual conditions of the electric vehicle market. Prospective purchasers of these automobiles are cognizant of the substantial financial commitment involved. Hence, the criterion for deeming a price as "low" is elevated compared to other factors. This is due to the high initial cost of electric vehicles.

Figure 5

Single FIS model and FIS Tree model



Source: own elaboration based on MATLAB software.

Table 6
Degree of inaccuracy in the prediction of each model

Output training Data	Output MISO FIS	Output FIS Tree	$\Delta E_{single}\%$	$\Delta E_{Tree}\%$
10	9.88	9.98	1.2	0.2
10	9.76	9.79	2.4	2.1
10	9.81	9.88	1.9	1.2
9	9.4	9.03	-4.44	-0.33
7	5.4	6.88	22.86	1.71
10	9.98	9.98	0.2	0.2
10	9.55	9.97	4.5	0.3
10	9.94	9.89	0.6	1.1
10	9.81	9.89	1.9	1.1
10	9.82	9.79	1.8	2.1
9	8.2	8.91	8.89	1
10	9.42	9.88	5.8	1.2
10	9.83	9.87	1.7	1.3
10	9.99	9.99	0.1	0.1
8	8.34	8.05	-4.25	-0.625
9	8.86	9.11	1.56	-1.22
7	7.43	7.19	-6.14	-2.71
10	9.65	9.89	3.5	1.1
7	5.99	7.22	14.43	-3.14
1	2.34	1.32	-134	-32
10	9.89	9.99	1.1	0.1
5	5.43	4.98	-8.6	0.4
10	9.85	9.97	1.5	0.3
8	8.31	7.98	-3.875	0.25
10	9.04	9.85	9.6	1.5
8	8.03	8.02	-0.375	-0.25
3	4.45	2.97	-48.33	1
10	9.88	9.99	1.2	0.1
10	9.59	9.87	4.1	1.3
10	9.32	9.88	6.8	1.2
		Average	**-3.74%**	**-0.65%**

Source: own elaboration.

Similarly, it is noted that the model considered a significant margin in terms of dependability, with a relatively high threshold for low reliability. In other words, people are expressing their desire to convey their level of happiness with the car's dependability. The classification of an electric vehicle as "highly" reliable is contingent on its ability to satisfy many fundamental criteria for its consumers.

When comparing the reliability and price factors with the guarantee factor, it is evident that the "low" importance curve exhibits a similar decline as observed in the case of reliability. However, the diffuse relationship of "high" in the case of the guarantee factor demonstrates greater tolerance, breadth, and inclusivity. It starts to increase from approximately 10, indicating a higher level of demand. This phenomenon can be attributed to the narrower width of the "high" curve compared to the other factors.

In another example, the second Tree FIS model is utilized to comprehend confusing linkages, such as the impact of service frequency on the economic aspects that influence happiness. In this case, customers have a higher degree of joy due to economic factors when the frequency of service is moderate. In contrast, customer happiness notably decreases as the interval

between car service visits increases. This illustration is provided to underscore the importance of the suggested model in understanding the equivocal facets of the correlation between the determinants of pleasure among electric vehicle users within the Mexican setting.

CONCLUSIONS

Customer happiness is a complex and challenging concept to measure, yet it is essential to marketers since it significantly impacts customer behavior and purchasing decisions. Due to the inherent ambiguity and significant uncertainty surrounding this topic, fuzzy logic is proposed as an emerging yet auspicious instrument for its examination.

This research develops two fuzzy inference models, the MISO FIS and Tree FIS, which examine the determinants of electric car consumers' happiness in Mexico from distinct viewpoints. Upon conducting a thorough study and deliberation of both models using the implemented machine learning methods, the following results are put forth:

- The MISO FIS model encounters challenges when confronted with many input values, as it necessitates formulating numerous inference rules. However, this model helps to understand the importance of each element, regardless of the happiness index.
- The efficacy of the FIS Tree model in forecasting happiness levels is superior when considering input values associated with the driving forces; the average forecast error for the FIS tree is -0.65%, while it is -3.74% for the MISO FIS model.
- The FIS Tree model facilitates comprehension of the indeterminate connections between user happiness and the clusters of factors that impact it. In addition, it can provide a comprehensive understanding of the degree of happiness based on economic, social, technological, or environmental aspects.
- The study found that reliability, guarantee, and EV price have the most individual influence on consumers' happiness index when purchasing electric vehicles.
- The proposed happiness index is a new and useful technique for predicting the preferences of potential customers of electric car automobile companies, given the specified characteristics.

This methodology enables marketers to conduct a more precise analysis of consumers' buying choices and their subsequent bond with a particular brand. However, it is vital to understand the limitations of the research. There is a potential limitation in the number of surveys conducted, as it may not adequately cover the diverse range of customer ideas and

preferences. In addition, obtaining expert perspectives on the consumption of a particular product within a certain market poses challenges.

This research's conclusions possess considerable theoretical and practical implications. The application of fuzzy logic models to investigate customer happiness in the acquisition of electric vehicles constitutes an innovative advancement in marketing and consumer behavior research. This method facilitates the systematic and measurable modeling of intricate and subjective notions, such as happiness, hence broadening the scope of consumer behavior study through the incorporation of artificial intelligence techniques inside social and economic frameworks.

This study's results offer significant resources for marketers and automotive agency managers. The FIS Tree model identifies reliability, guarantee, and pricing as primary determinants of consumer satisfaction, informing the development of more effective commercial tactics. Companies can emphasize enhancing the perceived reliability of electric vehicles and modify their warranty policies to improve customer satisfaction and loyalty. The suggested model enables more precise predictions of client preferences, optimizing decisions about service customization and communication strategies.

This research enhances the comprehension of customer happiness in Mexico's growing electric vehicle market and offers a methodological framework applicable to other markets and industries.

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Identifying Factors Motivating Users to Post Reviews on Online Travel Review Platforms: A Factor Analysis Study

Identificación de factores que motivan a los usuarios a publicar reseñas en plataformas de reseñas de viajes en línea: un estudio de análisis factorial

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ABSTRACT

This research paper aims to identify the factors motivating users to post reviews on online travel review platforms (OTRPs). A non-probabilistic sampling technique, purposive sampling, was employed for data collection. Exploratory Factor Analysis (EFA) was conducted on a dataset of 1,313 observations. This study highlights several pivotal factors encouraging users to engage in this review-sharing phenomenon. Three key factors, social recognition and connection, enhancing travel experiences, and social validation, were identified as motivating users to write online reviews. Among these, the innate desire for social connection, the building of social capital, and the inclination to offer peer support emerge as the predominant motivations driving users' intentions to create travel-related reviews on online platforms. By analyzing the complex interplay of psychological, social, and support-based incentives, this study not only contributes to adds body knowledge to the literature of motivation theories but also offers practical guidance to online travel agencies (OTAs) managers in their pursuit of providing exceptional customer experiences and marketing strategies in an era of expanding online travel. This study assists OTAs in understanding customer experiences, tailoring services to meet travelers' expectations, and delivering enriching customer interactions.

Keywords: online reviews, online travel review platforms, online travel agencies, OTA, motivation.

JEL code: M15, M31.

RESUMEN

Este trabajo de investigación tiene como objetivo identificar los factores que motivan a los usuarios a publicar reseñas en plataformas de reseñas de viajes en línea (OTRP). Para la recopilación de datos se empleó una técnica de muestreo no probabilístico, el muestreo intencional. Se realizó un análisis factorial exploratorio (EFA) en un conjunto de datos de 1313 observaciones. Este estudio destaca varios factores fundamentales que alientan a los usuarios a participar en este fenómeno de compartir reseñas. Se identificaron tres factores clave, el reconocimiento y la conexión social, la mejora de las experiencias de viaje y la validación social, como motivaciones de los usuarios a escribir reseñas en línea. Entre estos, el deseo innato de conexión social, la creación de capital social y la inclinación a ofrecer apoyo de pares surgen como las motivaciones predominantes que impulsan las intenciones de los usuarios de crear reseñas relacionadas con viajes en plataformas en línea. Al analizar la compleja interacción de los incentivos psicológicos, sociales y basados en el apoyo, este estudio no solo contribuye a agregar conocimiento a la literatura de las teorías de la motivación, sino que también ofrece una guía práctica para los gerentes de agencias de viajes en línea (OTA) en su búsqueda de brindar experiencias de cliente excepcionales y estrategias de marketing en una era de expansión de los viajes en línea. Este estudio ayuda a las OTA a comprender las experiencias de los clientes, adaptar los servicios para satisfacer las expectativas de los viajeros y ofrecer interacciones enriquecedoras con los clientes.

Palabras clave: Reseñas en línea, plataformas de reseñas de viajes en línea, agencias de viajes en línea, OTA, motivación

Código Jel: M15, M31.

INTRODUCTION

Online reviews provide consumers with a platform to interact with one another and share their opinions of goods or services in an online medium (Xu, 2020). They are an information source growing in importance as a purchasing decision-influencing element for consumers (Le et al., 2022).

Online customer reviews have proliferated all over the Internet, and they now offer evaluations for various goods and services, from hotels to funeral services, from beauty items to music CDs. Review websites frequently assert that they are democratic since they give consumers honest thoughts a voice (Marine-Roig & Huertas, 2020).

Online reviews offer honest feedback on products and services, making them a practical promotional approach in the age of technology. While favorable feedback can boost revenue and build a business's trust, negative or missing reviews might have an adverse impact (Talwar et al., 2020).

Many studies have investigated the consequences of web-based reviews, which may be broadly classified into three areas: sales of goods, processes for making decisions, as well as information source evaluation, considering the substantial role that online reviews play in the travel and tourism sector (Park et al., 2020).

Given the importance of online reviews in tourism and hospitality, numerous academics have investigated the effects of customer reviews, mostly on product sales and the decision-making process. Online reviews positively impact revenue growth and aid decision-making (Moriuchi & Moriyoshi, 2024).

Online users prefer to gather comprehensive and current information about travel-related products and read second-hand accounts to make better decisions (Su et al., 2022). In the digital era, online travel review platforms (OTRPs) have become essential resources for travelers seeking advice, suggestions, and information on their destinations and lodging (Álvarez-Carmona et al., 2022). These networks provide abundant user-generated reviews, significantly impacting how tourists make decisions. Research in academia and industry practitioners must comprehend why users contribute to these platforms.

Though OTRPs are becoming more and more popular, there is still a lack of academic research on the driving forces behind people actively publishing reviews on these platforms, particularly in the context of Delhi and the NCR (National Capital Region) area, which included Gurugram, Faridabad, Noida, Greater Noida, and Ghaziabad in India. Existing

research provides insights on motivations for online reviews generally applicable across diverse countries and cultures, including self-enhancement, altruism, reciprocity, and social impact. However, the relevance and prominence of these aspects may change. Therefore, to better understand user engagement dynamics in this setting, it is necessary to investigate the distinct motives driving review posting behavior in India's Delhi-NCR region.

This research aims to identify and analyze the motivational factors influencing users' participation in posting reviews on OTRPs within the Delhi-NCR region of India. The study will then provide recommendations for OTRP operators and stakeholders in this region to enhance user engagement and the quality of user-generated content on these platforms. The study is further organized into the following sections: Review of Literature, Research Methodology, Results and Analysis, Discussion, Implications, Conclusion, Limitations, and Future Research Directions.

REVIEW OF LITERATURE

Various studies have been done on motivational factors in posting online travel reviews on travel portals. In various research paper studies, it has been found that there are different motivating factors for posting online travel reviews on OTRP (online travel review portals). e-WOM can be done for various reasons, such as elevating one's social status, seeking advice, resolving issues for other consumers, expressing emotions, and having concern for consumers in the future (Bhatti & Alshiha, 2023). Users were motivated to write reviews When they had a good or bad experience. Users are encouraged to publish reviews online for external and societal reasons. These incentives represent a remarkable aspect of an equity relationship. These include social comparison, information exchange, altruism, self-improvement, and social attachment (Oliveira et al., 2020).

Enjoyment

The motivation for the enjoyment or hedonic benefits of the companies is the main factor in writing reviews online. In altruism, reviewers provide material online to enhance community benefits and aid others without anticipating payment (Kaur & Singh, 2021). As a result, community-related motives are another definition of altruistic motivation. Li et al. (2023) found that Altruistic motivations have been shown to impact individuals' intentions to engage in online communities actively. Perceived enjoyment on social media is a motivating factor for sharing their experiences in the online travel community (Arica et al., 2022). When making travel decisions before, during, and after a vacation, there was a correlation between the degree of influence that social media had on those decisions (Singh & Yadav, 2018; Nguyen & Llosa, 2023). Users who enjoy sharing their experiences with others are more likely to post reviews (Aknin & Whillans, 2021).

Social Concerns

Previous studies have demonstrated that social reasons may influence consumers' motives to submit online reviews. Many theories that fall under "social causes" can impact consumers' propensity to post online evaluations. Some customers primarily submit reviews for charitable purposes, such as wanting to assist others, including other customers and businesses (hotels and restaurants in particular) (Fu et al., 2017; Yang, 2017). Other visitors are more driven by egotistical motives, such as the desire to relive the experience and/or exact retribution to hotels and restaurants. Sometimes, travelers show eagerness to offer suggestions to assist businesses in improving the quality of their service by writing reviews (Mitropoulos et al., 2021).

Economic incentives

Economic benefits mainly affect customers' desire to write online product reviews. Financial incentives are a key driver of consumers' decisions to participate and express their thoughts through online evaluations (Kumar & Purbey, 2018). Personal and community benefits motivate travelers to post reviews on different online travel platforms (Bakshi et al., 2021). Receiving financial benefits, such as a discount coupon, for submitting a review can increase consumers' intentions to write online product reviews. Economic incentives, including discount codes, reward points, coupons, etc., are any financial advantage customers can get in exchange for leaving an online review. This means customers who contribute by writing reviews online are somehow compensated (Hussain et al., 2018).

Some users may be motivated to post reviews on online travel review platforms because they receive monetary rewards, such as discounts or vouchers, in return (Liang et al., 2022). Hotels, airlines, and travel companies often incentivize users to post reviews on their platforms (Bravo et al., 2021).

Incentives are among the most frequently cited factors motivating users to post reviews. These incentives can be monetary or non-monetary (Marine-Roig, 2019). Various studies have found that financial rewards, such as discounts and vouchers, can increase the likelihood of users posting.

Incentives are also a factor that drives users to write reviews on online travel review platforms. This suggests that incentives can effectively encourage users to post reviews and enhance engagement on these platforms (Tsiotsou, 2021). Moreover, studies indicate that travelers like to give online reviews if they receive a discount or reward. Users were interested in writing reviews if they received a discount or reward for doing so (Qiao et al., 2020). This suggests businesses can incentivize users to post reviews by offering discounts or rewards (Rialti et al., 2023).

Venting out negative feelings

One of the key variables influencing customers' inclination to write online reviews has been identified as their need to express their emotions after a consumption experience. Obeidat et al. (2017) found that Online reviews are written to seek public retribution, especially when services are poor. Online reviews are another way customers can express unhappiness with subpar service (Kwak et al., 2023). Strong emotional motivations, such as annoyance, wrath, or disappointment, drive consumers' intention to post online reviews (Li et al., 2023). Users who have had negative experiences with travel may post reviews to vent their frustrations and seek social support from others (Bakshi et al., 2021).

Expressing positive feelings

Writing reviews online requires the motivation to express positive feelings. A positive attitude influences consumers' inclination to post online reviews (Zainal et al., 2017). "People ought to sound wealthy and high-status when discussing wearing a Rolex." Luxury companies consequently cause more controversy (Ruiz-Mafe et al., 2020). Brand attachment may affect customers' propensity to provide online reviews (Le et al., 2022).

Consumers' willingness to post online reviews is heavily influenced by their overall attitude about sharing their experiences online, or more specifically, by how well they can compose online reviews (Lis & Fischer, 2020). Egoistic participants in online reviewers take part in both tangible/financial and intangible/non-financial benefits and prizes. Users post in online reviews to showcase their knowledge, improve their reputation, and draw attention to themselves (Li et al., 2024)

Self-enhancement

The motive of self-improvement companies is also a role in writing evaluations online. Someone's intellectual or emotional attitude can influence consumers' intent to submit online reviews. (Zainal et al., 2017). Different phrases that can be used to describe people's sentiments can act as powerful motivators for consumers who are inclined to write online reviews (Aghakhani et al., 2018). People don't want other people to have the same lousy consumer experiences they did. These people find stimulation in keeping others from having these destructive emotions.

Helping others

Online reviews are written with consideration for other users in mind. Participation is, therefore, motivated by concepts of social support and pride in helping others achieve their goals (Fu et al., 2017). One of the main factors affecting consumers' desire to write online reviews is their propensity to want to assist others (Xiang et al., 2018). Users post reviews on online travel review platforms to help others (Yu et al., 2024). The authors argue that this

motivation is related to the concept of altruism, which refers to how individuals act to benefit others without expecting anything in return.

Desire for self-expression

Another motivation for users to post reviews on online travel review platforms is the desire for self-expression and identity management (Roy et al., 2024). Other factors that motivate users to post reviews include the perceived usefulness of reviews, social influence, reciprocity, emotion, and reputation. Understanding these motivations is essential for travel businesses to effectively engage with customers and manage their online reputations (Marine-Roig, 2022).

The factors motivating users to post reviews on online travel review platforms are diverse and complex. Users may be motivated by personal benefits, altruism, social influence, perceived usefulness and satisfaction, trustworthiness and credibility, and demographic factors (Chih et al., 2020). Understanding these factors is crucial for travel review platform managers and marketers to develop effective strategies to encourage user-generated content and improve the quality of reviews. Several factors motivate users to post reviews on online travel review platforms, including altruism, social recognition, experience sharing, and incentives (Guerrero-Rodriguez et al., 2023).

Desire to connect with other

Another factor that motivates users to post reviews on online travel review platforms is the desire to connect. Users may perceive their reviews as a means of connecting with other travelers who share their interests and preferences. The authors suggest that this incentive is related to social identity, which relates to how people understand their identities in connection with people (Yan et al., 2018). Users may perceive their reviews to establish and maintain social connections with other travelers, hotel staff, or platform operators (Kim et al., 2021). A few research studies on the factors motivating the posting of reviews on online travel platforms are summarized in Table 1 below.

Table 1

Literature Review

NO.	AUTHOR(S)	METHODOLOGY	CONCLUSION
1	Yang (2017)	This study examined three predictors to eWOM intentions in an integrative framework, using the popular restaurant review website Openrice.com as an example: the experience factor (restaurant satisfaction), the knowledge sharing factors (egoistic and altruistic needs), and the technology acceptance factors (perceived usefulness and perceived ease-of-use).	The findings of this study for eWOM are people's altruistic needs lead to positive eWOM; the website's perceived usefulness significantly influences eWOM intentions; and the perceived usefulness significantly moderates the relationships between eWOM intentions and satisfaction/egoistic needs.
2	Candi et al. (2017)	An online program was used in this study analyzed the online customer reviews.	The result of this study shows that depending on the degree of product participation, the efficiency of each of the three design elements varies.

3	Zainal et al. (2017)	An online survey was used to gather 280 questionnaires from respondents.	The results of this study show that attitudes toward and intentions to follow electronic word-of-mouth (eWOM) are significantly influenced by trust in the integrity, skill, and kindness of eWOM sources.
4	Teng et al. (2017)	This study looks at how eWOM communications are interpreted by Chinese and Malaysian users and how they make decisions about continuing their studies abroad.	This study shows that the highest famous social networking website among the Malaysian users are Facebook, whilst QQ Qzone is the most popular among Chinese users. The study also finds that the attitudes and intentions of Chinese and Malaysian users to pursue their studies overseas were influenced differently by argument quality, source credibility, source attractiveness, source perception, and source style.
5	Gonçalves et al. (2018)	This study's research methodology was an online survey combined with fuzzy-set qualitative comparative analysis.	Users are more likely to publish reviews when they receive both monetary and non-monetary incentives. The many causal combinations of motivations (personal, social benefit, social concern, and consumer empowerment) and demographic traits (gender and age) that result in hotel eWOM are identified in this study.
6	Vilnai-Yavetz and Levina (2018)	This aim of this research to find the reason behind users' dissemination of commercial content on social networking websites. First, we conducted interviews with Internet users (n = 409) to map their sharing habits and usage of SNS.	These results show a discrepancy between the self-reports, in which sharing was motivated primarily by internal factors, and the experimental manipulation, in which sharing was motivated more by external (financial) incentives.
7	Yusuf et al. (2018)	This study examined the impact of eWOM involvement on customers' purchase intentions in s-commerce using the elaboration likelihood model, the theory of reasoned action, and social support theory. In this study a total 218 valid users have taken to anlazye the suggested model using SmartPLS.	The empirical findings show that technological advancements, consumer behavior, and information features all positively impact consumers' intentions to make purchases. The relationships among eWOM engagement, website quality, innovativeness, information credibility, and attitude toward eWOM are all noteworthy. Additionally, customer purchase intention is significantly positively impacted by eWOM participation. However, there is no meaningful correlation found between eWOM involvement and the quality of the content and social support.
8	Shin et al. (2019)	This study investigates the behavior of this relationship in two distinct scenarios: temporal distance and risk-benefit inclination.	The findings indicate that the review concreteness main effect is considerable; however, the interaction effects of temporal distance and risk-benefit tendency are not, contrary to theories' predictions and relevant studies' findings.
9	Berhanu and Raj (2020)	The aim of this study is to know how reliable social media platforms are as sources of information about travel and tourism. Convenience sampling and a cross-sectional study design were utilized. Version 23 of the Statistical Package for Social Science was used to calculate the mean, one-way Analysis of variance, independent sample T-test, and one sample T-test. To determine the impact size or amount of the mean difference, eta squared was computed. The effective sample size for this study was 310.	The results showed that travelers' opinions of social media's reliability as a source of travel information were generally favorable. Travelers between the ages of 18 and 35 are more likely to agree that social media travel information sources are reliable. The mean scores of visitors fall slightly with increasing age, with visitors over 46 having the lowest mean ratings.

10	Assaker (2020)	A sample of 200 UK citizens who had traveled for pleasure at least once in the previous year and had looked up travel-related information in advance on travel review websites were included in the study to evaluate the model.	The result of this study shows that the utilization of Perceived Ease of Use was most strongly correlated with female travelers and older passengers; however, it had no significant effect on male travelers or younger travelers. Expertise was not as important for senior travelers as it was for younger ones. The findings contribute further insights into how age and gender affect online travel reviews, which will benefit theory and practice alike.
11	Jung et al. (2021)	This study used two randomized experiments in the context of mobile gaming to determine which kind of referral reward structure maximizes word-of-mouth. This study specifically looks at the impact of three incentive schemes: equal split (50-50 split), generous (invitee gets all reward), and selfish (inviter gets all reward). We find that pro-social referral incentive schemes - generous and equal-split schemes - tend to outperform simply selfish schemes in generating word-of-mouth (WOM) across both tests.	The result shows that reward points and discounts work well to entice consumers to provide evaluations. The mechanism-level analysis demonstrates that both generous and equal-split schemes greatly increase the invitee's likelihood of accepting referrals, which we further show is partly because of more targeted and selective referrals, leading to a higher number of conversions. Our findings add to our knowledge of the best ways to create online referral programs and have significant ramifications for creating digital referral reward systems.
12	Marder et al. (2021)	Through four controlled tests (N = 1,282), this study examines how both types of aesthetics, either separately or in combination, impact a destination's visual attractiveness and travelers' intent to book.	Travel companies must comprehend user motivations to effectively manage their online reputation. The findings demonstrate that although amateur aesthetics might provide "messy" beauty, professional aesthetic images enhance the visual attractiveness of a site and eventually encourage bookings.
13	Guerrero-Rodriguez et al. (2023)	Two methods of Natural Language Processing are used to analyze online travel reviews (OTRs): Jaccard Coefficient and Mutual Information Rating. The most typical themes and the primary subjects from each polarity within the OTRs are quantified and extracted using these.	Consequently, there were two persistently unfavorable motifs or subjects that emerged from this analysis: "cleanliness" and "prices." The absence of difference in assessments between domestic and foreign travelers is one unexpected outcome of this research.
14	Natrah Jamaludin et al. (2024)	The research methodology used in this study is based on a careful examination of scholarly published literature, specifically journal articles. It highlights the necessity of developing a research framework, provides an overview of methodological perspectives, and highlights significant trends and constraints in earlier empirical research.	Reviewing methodological stances, it highlights the necessity of developing a research framework and highlights significant patterns and constraints in earlier empirical research.
15	Kumar et al. (2024)	The elements causing unfavorable word-of-mouth (WOM) are found via group judgment approaches and literature reviews. The study creates a structural model that depicts the interactions between components using an interpretive structural modelling approach. Along with the most and least important elements causing eWOM, the model also depicts the factors at various levels.	There are seven factors—spread across three levels—that are linked to bad electronic word-of-mouth. The first level of factors comprises lowering anxiety, asking for guidance, exercising influence on businesses, and receiving social advantages; the second level of factors includes economic rewards and altruism (bad word of mouth). Level three revenge is the most prominent component that has been identified.

Source: Own elaboration.

Research Gap

According to the literature, the influence of online reviews differs depending on whether they are positive or negative, resulting in asymmetrical outcomes in which customers regard extreme ratings (positive or negative) as more helpful and pleasurable than regular reviews. This research paper's literature review provides a comprehensive summary and critical evaluation of existing research relevant to the motivating factors of users to write online reviews. It identifies gaps, inconsistencies, and areas that require more research while providing the background justification for the current study.

RESEARCH METHODOLOGY

The present study was descriptive and was conducted over 6 months from January 2024 to June 2024. This study explored the underlying factors that motivate users to post reviews on online travel review platforms. In this study, respondents were asked to put their responses on a 5-point Likert scale where one strongly disagrees (SD), two disagree (D), three neither disagree nor agree (N), four agree (A), and five strongly agree (SA).

Sample and Procedure

The data was gathered using a predetermined set of questions from users of different online travel agency platforms. Online travel agency users from Delhi and NCR comprised the sample unit, which included 1,313 responses. The number of internet users was used to determine this study's target group. According to TRAI (Telecom Regulatory Authority of India), Delhi and the National Capital Region have India's highest internet penetration rate (DOT, 2018). Moreover, this region of the country is where most flight reservations are made (MOT, 2019).

The sampling unit comprised individuals who utilized these platforms to obtain and research information, plan trips, book hotels, and vacations, or use such services for any travel-related purpose. The sampling unit consisted of online travel agency (OTA) platform users within the study population from the last six months. Purposive sampling, a non-probabilistic sampling approach, was employed to identify the sample from the population under study. Given the Delhi-NCR region's 18.35 million population, a sample size of 1,313 was chosen, with a 95% confidence level and a 7 percent acceptable margin of error (MHA, 2011).

A combination of personal and online approaches was used to administer the final instrument for gathering the responses. In carrying out this research, the researcher utilized a comprehensive strategy that included both online and personal tactics to streamline the administration of the final research instrument. The survey link was shared across various

social networking platforms using the researchers' accounts and their extended networks of friends, followers, and acquaintances. Moreover, focused outreach initiatives were carried out via email and WhatsApp, where contacts were sent customized messages with the survey link exclusively. Following collection, the quantitative data was analyzed with IBM-SPSS version 25, which allowed us to explore respondents' opinions and views about the various services provided by online travel agency platforms. The researcher sought to fully comprehend the topic under research by using this all-encompassing method.

Questionnaire preparation

The survey instrument was organized around the investigation's primary components. This tool included elements aligned with theories about submitting reviews on online travel review sites. The questionnaire was developed using the adapted method, showing the variables from the current study from the past literature.

Preparation of preliminary draft

The questionnaire was created following a thorough review of past scholarly material. The questionnaire used foundational insights from various sources, including peer-reviewed journal publications, academic books, periodicals, news items, and online reports. To ensure the questionnaire's integrity and validity, experts from industry and academia reviewed and validated a preliminary iteration.

Instrument (questionnaire) validity

The initial component of this study entailed determining the research instrument's face validity and content validity. This method began with a thorough analysis of the relevant literature. The instrument was then presented to renowned figures in the field, including industry experts from leading online travel agency platforms such as MakeMyTrip, Yatra, Clear Trip, and Hello Travel, as well as scholarly professionals from academic institutions such as IIM Kashipur and Lucknow University. Six industry experts and five academicians were approached to provide expert opinions on the questionnaire.

After getting feedback from these experts, the instruments were revised based on their suggestions and feedback. Following the necessary changes, the new questionnaire was submitted to the same panel of experts for re-evaluation. Items that passed through the second review step and demonstrated a high level of consistency across the numerous issues under consideration were deemed adequate and included in the final version of the instrument.

Preliminary draft modification

The preliminary version of the questionnaire was refined with feedback from industry experts and academics, culminating in the creation of a validation grid that incorporates their recommendations. In survey research, the validity of a claim, conclusion, or judgment is

determined by its rationality, accuracy, and logical coherence, which indicate whether the study effectively illustrates its intended objective.

To make this easier, a grid question format was developed, which allows the aggregation of diverse question kinds into an organized table. This structure will enable researchers to include a variety of question formats, such as multiple-choice and open-ended questions, in a single grid. A questionnaire or scale is considered validated when it is precisely designed for use with specific respondents. This validation procedure requires using a representative sample to test reliability and validity adequately. Following reviewer recommendations, the researcher finalized the survey instrument for data collection among the target population, which aligned with the research study's objectives.

Profile of users

Tables 2 to 5 provide users' demographic characteristics, including age, gender, occupation, and frequency of travel. These tables contain and analyze 1,313 user profiles.

Table 2

Frequency of Travel

Frequency of Travel	Number of Users	Number of Users (Percentage)
Monthly	218	16.60%
Quarterly	293	22.32%
Half Yearly	363	27.65%
Yearly	439	33.43%

Source: Own elaboration.

Travel frequency

The table presents a breakdown of user distribution depending on the frequency with which they engage in travel activities, displaying the proportional representation of each frequency category among the examined user community (Table 2).

Table 3

Users Age

Age (Years)	Number of Users	Number of Users (Percentage
18-24	191	14.55%
25-40	780	59.41%
41-60	322	24.52%
Above 60	20	1.52%

Source: Own elaboration.

Age Criteria

The table shows the proportional representation of each age group in the analyzed user population (Table 3).

Table 4

Users Gender

Gender	Number of Users	Number of Users (Percentage)
Male	971	73.95%
Female	333	25.36%
Prefer Not to Say	9	0.69%

Source: Own elaboration.

Gender

The table gives an overview of the gender distribution within the user base, emphasizing the proportional representation of male, female, and users who did not identify their gender within the investigated sample (Table 4).

Table 5

Users Occupation

Occupation	Number of Users	Number of Users (Percentage)
Student	94	7.16%
Self Employed	322	24.52%
Service	853	64.97%
Retired	44	3.35%

Source: Own elaboration.

Occupation

The table gives an overview of the user base's occupational variety, displaying the percentage distribution of users across different occupational groups within the analyzed sample (Table 5).

Data collection

The final version of the study questionnaire was used to collect primary data from a predefined demographic sample. Data were collected through both offline and online sources between January and June'24. The purposive sample method was used to elicit responses from the target audience. The survey instrument was widely distributed among people living in Delhi and the National Capital Region (NCR) and was easily accessible to the researcher. During the data collection phase, the researcher used targeted social media advertisements to reach individuals in the study locations, which included Delhi and the NCR. The information was generated from end-users who had used online travel agency platforms to book flights, lodging, vacation packages, or other travel-related services within the previous six months. Furthermore, these users included residents and employees from the Delhi and NCR regions.

Online and offline (structured way)

1,200 questionnaires were distributed to varied online travel users who used online travel agency platforms to book travel services in the Delhi and NCR regions. There were 842

complete responses to these disseminated questionnaires, resulting in a response rate of 70.16%.

For online data collection, the online survey instrument Google Forms was utilized. A preset questionnaire in the form of a 'Google Forms link' was developed and delivered over the researcher's social networking channels, which included Facebook, LinkedIn, Twitter, and Instagram. Furthermore, this questionnaire link was distributed to various travel-related groups on these social networking sites. Over six months, 654 responses were gathered using the online data collection approach.

The overall dataset included 1,496 responses from both online and offline modalities, with 654 coming from the online medium and 842 from the offline form. Following data analysis, eliminating erroneous and outlier entries, a refined dataset of 605 online replies and 708 offline responses was obtained. As a result, 1,313 valid responses were selected for further data analysis.

Measures

Participants in this study were asked to share their opinions regarding the reasons for writing reviews on websites that facilitate online travel. A detailed examination and extensive review of the body of current literature on the subject matter led to the creating of a complete questionnaire with 26 items. This questionnaire gathered diverse explanations for people's participation in review submission activities.

Table 6

Harman's Single-Factor Test

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	% of Variance	Cumulative %
	Total	% of Variance	Cumulative %	Total		
1	11.564	44.478	44.478	11.564	44.478	44.478
2	1.567	6.026	50.505			
3	1.073	4.125	54.630			
4	0.899	3.457	58.087			
5	0.864	3.324	61.410			
6	0.791	3.042	64.453			
7	0.726	2.792	67.244			
8	0.705	2.713	69.958			
9	0.629	2.419	72.377			
10	0.605	2.328	74.705			
11	0.562	2.162	76.867			
12	0.532	2.046	78.914			
13	0.505	1.944	80.857			

14	0.502	1.930	82.788			
15	0.489	1.879	84.667			
16	0.438	1.684	86.350			
17	0.425	1.635	87.985			
18	0.415	1.597	89.582			
19	0.400	1.539	91.121			
20	0.384	1.476	92.597			
21	0.359	1.382	93.978			
22	0.356	1.368	95.347			
23	0.328	1.262	96.609			
24	0.312	1.200	97.809			
25	0.292	1.122	98.931			
26	0.278	1.069	100.000			
Extraction Method: Principal Component Analysis.						

Source: Own elaboration.

Harman's single-factor test was performed using the IBM SPSS tool in this research study to analyze the common method bias in the data. After performing this test, the cumulative percentage was found to be 44.478, less than 50 percent (Table 6). Harman's Single-Factor Test results for the collected data show no standard method bias in the collected data for analysis. Therefore, further statistical analysis was performed.

RESULTS

Extraction Method: Principal Component Analysis.

With a Cronbach's alpha coefficient of 0.941, the analysis's findings demonstrated high reliability and excellent internal consistency among the questionnaire items (Table 7). The thorough validation process increased the confidence of conclusions drawn from survey replies, improving the general caliber and reliability of the study results.

Table 7

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.949	0.948	26

Source: Own elaboration.

ANALYSIS

In this research study, exploratory factor analysis (EFA) was applied to reduce a large set of items into a comparatively small set of factors. Exploratory factor analysis was used in research studies to diminish the big data set into more minor variables and identify the relationship between measured variables (Goretzko & Ruscio, 2024). The value of KMO 0.961 (Table 8) supported the objective of curtailing several variables into fewer factors.

Table 8
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.961
Bartlett's Test of Sphericity	Approx. Chi-Square	14846.5
	df	325
	Sig.	0

Source: Own elaboration.

Communalities perceived as multiple R2s during multiple regression showed the extent to which the variability of things was observed as significant, giving extra signs about the appropriateness of results for interpretation (Table 9).

Table 9
Communalities

Ítem	Initial	Extraction
I put my travel-related reviews on an online travel review platform to share my travel experience relate to hotels, travel agents, taxis, flights, etc. with others.	1.000	0.653
I put my travel-related reviews on an online travel review platform to express my feelings about the journey to the world.	1.000	0.766
I put my travel-related reviews on an online travel review platform to connect with fellow travelers	1.000	0.728
I put my travel-related reviews on an online travel review platform to share my opinion with fellow travelers	1.000	0.615
I put my travel-related reviews on an online travel review platform to make travel service providers realize for any bad service experience	1.000	0.659
I put my travel-related reviews on an online travel review platform to save others from having any unpleasant experience	1.000	0.644
I put my travel-related reviews on an online travel review platform to be seen as an influencer related to travel	1.000	0.623
I put my travel-related reviews on an online travel review platform to tell others about offbeat destinations that are not popular	1.000	0.631
I put my travel-related reviews on an online travel review platform to get rewards/incentives from my travel service provider	1.000	0.659
I put my travel-related reviews on an online travel review platform to tell fellow travelers about the cost of traveling to a particular destination	1.000	0.449
I put my travel-related reviews on an online travel review platform to vent out my travel frustration, anger and anxiety	1.000	0.634
I put my travel-related reviews on an online travel review platform to help other travelers to make an informed decision while choosing a travel destination	1.000	0.446

I put my travel-related reviews on an online travel review platform to help travel companies to improve their products and services	1.000	0.514
I put my travel-related reviews on an online travel review platform to create a bond with fellow travelers	1.000	0.69
I put my travel-related reviews on an online travel review platform to be seen on the internet and build my online reputation	1.000	0.721
I put my travel-related reviews on an online travel review platform to feel a sense of belongingness with other travelers	1.000	0.715
I put my travel-related reviews on an online travel review platform to feel as a part of a larger community of travelers	1.000	0.726
attain good stature in the travel community	1.000	0.735
I put my travel-related reviews on an online travel review platform to say thank you to the travel agency or hotel, guide, or taxi driver	1.000	0.516
I put my travel-related reviews on an online travel review platform to pass the time	1.000	0.703
I put my travel-related reviews on an online travel review platform to impress other travelers	1.000	0.755
I put my travel-related reviews on an online travel review platform to come into contact with likeminded travelers	1.000	0.688
I put my travel-related reviews on an online travel review platform to help reduce uncertainty among peer travelers	1.000	0.679
I put my travel-related reviews on an online travel review platform to feel good by telling others about my trip successes	1.000	0.646
I put my travel-related reviews on an online travel review platform because it is more convenient than writing or calling the travel service provider for sharing my experience	1.000	0.618
I put my travel-related reviews on an online travel review platform because people who are important to me, want me to do so after a trip	1.000	0.653

Source: Own elaboration.

Extraction Method: Principal Component Analysis.

Table 10 shows the total variance findings explained in the current study. Each "Component" is a factor extracted from the data, and the "Initial Eigenvalues" indicate how much variance each factor explains. The "Extraction Sums of Squared Loadings" and "Rotation Sums of Squared Loadings" measure the total variation explained by each factor before and after rotation. The columns "% of Variance" and "Cumulative%" reflect the proportion of total variation explained by each element and the cumulative percentage of variance explained by adding subsequent factors. Together, these three elements were fit to clarify around 64.87% of all the variable variances.

Table 10
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.184	54.552	54.552	14.184	54.552	54.552	7.817	30.066	30.066
2	1.658	6.378	60.93	1.658	6.378	60.93	4.899	18.841	48.907
3	1.025	3.941	64.872	1.025	3.941	64.872	4.151	15.964	64.872

4	0.96	3.693	68.565						
5	0.853	3.282	71.847						
6	0.713	2.741	74.588						
7	0.625	2.406	76.993						
8	0.58	2.229	79.223						
9	0.498	1.914	81.137						
10	0.494	1.899	83.037						
11	0.469	1.805	84.842						
12	0.404	1.554	86.396						
13	0.369	1.418	87.814						
14	0.345	1.329	89.143						
15	0.34	1.309	90.451						
16	0.315	1.21	91.662						
17	0.292	1.123	92.785						
18	0.272	1.044	93.83						
19	0.255	0.981	94.811						
20	0.249	0.956	95.767						
21	0.235	0.903	96.671						
22	0.212	0.815	97.485						
23	0.2	0.768	98.253						
24	0.168	0.647	98.901						
25	0.156	0.599	99.5						
26	0.13	0.5	100						

Source: Own elaboration.

The rotated component matrix in Table 11 shows the principal component analysis (PCA) results on travel-related reviews posted on an online travel review platform. PCA minimizes the dimensionality of data by recognizing patterns and combining variables (in this example, reasons for posting travel-related reviews) into components that explain the most variance.

Table 11

Rotated Component Matrix

	Component		
	1	2	3
I put my travel-related reviews on an online travel review platform to share my travel experience relate to hotels, travel agents, taxis, flights, etc. with others.	0.79		
I put my travel-related reviews on an online travel review platform to express my feelings about the journey to the world.	0.766		
I put my travel-related reviews on an online travel review platform to connect with fellow travelers	0.761		
I put my travel-related reviews on an online travel review platform to share my opinion with fellow travelers	0.735		
I put my travel-related reviews on an online travel review platform to make travel service providers realize for any bad service experience	0.727		
I put my travel-related reviews on an online travel review platform to save others from having any unpleasant experience	0.687		
I put my travel-related reviews on an online travel review platform to be seen as an influencer related to travel	0.67		

I put my travel-related reviews on an online travel review platform to tell others about offbeat destinations that are not popular	0.664		
I put my travel-related reviews on an online travel review platform to get rewards/incentives from my travel service provider	0.658		
I put my travel-related reviews on an online travel review platform to tell fellow travelers about the cost of traveling to a particular destination	0.602		
I put my travel-related reviews on an online travel review platform to vent out my travel frustration, anger and anxiety	0.584		
I put my travel-related reviews on an online travel review platform to help other travelers to make an informed decision while choosing a travel destination	0.563		
I put my travel-related reviews on an online travel review platform to help travel companies to improve their products and services	0.556		
I put my travel-related reviews on an online travel review platform to be seen on the internet and build my online reputation		0.737	
I put my travel-related reviews on an online travel review platform to feel a sense of belongingness with other travelers		0.728	
I put my travel-related reviews on an online travel review platform to feel as a part of a larger community of travelers		0.688	
attain good stature in the travel community		0.614	
I put my travel-related reviews on an online travel review platform to say thank you to the travel agency or hotel, guide, or taxi driver		0.608	
I put my travel-related reviews on an online travel review platform to pass the time		0.534	
I put my travel-related reviews on an online travel review platform to impress other travelers		0.518	
I put my travel-related reviews on an online travel review platform to help reduce uncertainty among peer travelers			0.735
I put my travel-related reviews on an online travel review platform to feel good by telling others about my trip successes			0.609
I put my travel-related reviews on an online travel review platform because it is more convenient than writing or calling the travel service provider for sharing my experience			0.585

Source: Own elaboration.

Having prevalent confirmation of the reasonableness for central component examination, the illustration of what comes about was affirmed. Presently, the Varimax revolution, which is orthogonal, was connected to maximize the fluctuation of the squared loadings of a figure on all things in the calculated framework. In this revolution, each unique variable/item slants towards one of the variables, and each figure means a small number of things driving to rearrangements of translation of comes about. Investigating the pivoted segment matrix proposed that three factors club the variables in a theoretically justifiable way (Table 12).

Table 12
Principal Component Analysis

Component	1 (Social Recognition and Connection)	2 (Enhancing Travel Experiences)	3 (Social Validation)
1 (Social Recognition and Connection)	0.71	0.51	0.486
2 (Enhancing Travel Experiences)	-0.513	0.847	-0.14
3 (Social Validation)	-0.483	-0.15	0.862

Source: Own elaboration.

DISCUSSION

The results obtained from the exploratory factor analysis (EFA) validate that three main components can be used to correctly classify the reasons for publishing travel-related reviews on the Internet. These variables explain a significant portion of the data's variance; the overall cumulative variance explained is 64.87%, suggesting a strong model for comprehending the main themes of motivation. Several distinct but connected factors influence users' motives to share their travel experiences online.

The high Kaiser-Meyer-Olkin (KMO) score of 0.961 indicates that the dataset is very appropriate for factor analysis and supports the sufficiency of the sample. Furthermore, a significant chi-square value from Bartlett's Test of Sphericity confirmed enough correlations between the variables to perform EFA. The data's strong commonalities show that the selected variables substantially explain each identified factor's variation.

Many items reporting commonalities above 0.6 further support the dependability of these findings for collecting and summarizing the underlying motivational factors.

The current study extracted key factors for data analysis. With striking loadings and considerable component determinacy, all three components clarified the motivations for publishing reviews on OTRPs.

The first factor constitutes the items related to being seen on the Internet and building an online reputation, feeling a sense of belongingness with other travelers, attaining good stature in the travel community, feeling like a part of a larger community of travelers, creating a bond with fellow travelers, to impress other travelers, to connect with fellow travelers, to pass the time, to express feelings about the journey to the world, to come into contact with likeminded travelers because people who are essential to users, want them to do so after a trip, to vent out their travel frustration, anger and anxiety and to be seen as an influencer related to travel.

These factors can be combined under the Social Recognition and Connection factor. The second factor comprises items related to making travel service providers realize any lousy service experience, saving others from having any unpleasant experience, sharing my travel experience related to hotel travel agents with others, telling others about offbeat destinations that are not popular, sharing opinions with fellow travelers, getting rewards/incentives from my travel service provider, and helping travel companies improve their products and services.

These items can be clubbed under the factor of Enhancing Travel Experiences. The third factor is the accumulation of related items because it is more convenient than writing or calling the travel service provider to share my experience, to help reduce uncertainty among peer travelers, and to feel good by telling others about their trip successes. All these items can be put under the name of Social Validation. The findings of this study showed that the factors motivating users of online travel agencies on OTRPs in the Delhi and NCR region of India somewhat matched with previous studies (Wang et al., 2024; Gao et al., 2024; Tseng et al., 2024; Dogra & Adil, 2024).

The factor identified in this study, social recognition and connection, aligns with factors such as the desire to connect with others, identified in studies by Yan et al. (2018), Kim et al. (2021), Marine-Roig (2022), Ghaderi et al. (2024), Herasimovich et al. (2024) and Cheng et al. (2024). The other factors of enhancing travel experiences and social validation are similar to factors identified in previous studies by researchers Zainal et al. (2017), Fu et al. (2017), Xiang et al. (2018), Mathieu et al. (2024), Sharafuddin et al. (2024) and Shin et al. (2024).

The rotated component matrix further confirmed these elements' theoretical coherence since the Varimax rotation method made the results easier to understand (Lubinga et al., 2024). By grouping comparable elements under components, the orthogonal rotation better clarified each factor's meaning and improved its interpretive clarity. The model reasonably agrees with the underlying theoretical constructs of social recognition and connection, enhancing travel experiences, and social validation since each item demonstrated substantial loading on one primary element.

IMPLICATIONS

The implications of this study are described below under the theoretical and managerial implications sections.

Theoretical implications

This study significantly enhances knowledge within the frameworks of social exchange theory (SET) and self-determination theory (SDT) by advancing the understanding of the motivations behind online travel review postings (Mishra et al., 2024; Evans et al.,2024). The study's findings contribute to the literature by highlighting specific user motivations and benefits of engaging with travel review platforms, such as connecting with like-minded travelers, sharing opinions, and influencing others' travel decisions.

This study presents a fresh viewpoint by exploring online reviews' underlying motivations and larger context. It emphasizes that people write online reviews primarily for their

purposes, indicating a shift from earlier theories (Ding et al., 2024; Ahen & Park, 2024; Moriuchi & Moriyoshi, 2024; Ozuem et al., 2024; Hossain & Rahman, 2024). This study indicates that customers' intentions to post online evaluations are more heavily influenced by personal reasoning than by social incentives such as recognition or approval from others, as previous research has shown (Natarajan & Periaiya, 2024; Zhang et al., 2024; Román et al., 2024; Alnoor et al., 2024).

This study provides valuable insights into the human behavior behind online review posting. It attempts to decipher the intricate interactions between contextual, social, and individual aspects that influence customers' interactions with online reviews. Moreover, it contributes theoretically by extending the uses and gratifications theory (UGT), which explores how individuals actively seek out and use media to satisfy specific needs (Nguyen et al., 2024; Geng et al., 2024; Alam et al., 2024).

The motivations for travel-related reviews identified here, such as seeking a sense of community belongingness or expressing travel experiences, support the UGT framework by lighting up how individuals use travel platforms for self-expression, information-sharing, and social validation. Factors identified in the current study align well with the principles of social exchange theory, self-determination theory, and extending uses and gratifications theory, where review postings are not only seen as informatory contributions but also as social acts that satisfy the reviewers' intrinsic motivation for community and reputation.

Managerial implications

This research study's managerial implications give businesses a better understanding of the factors that motivate customers to share their travel experiences with other users by posting reviews online. The identified factors of this study allow OTRPs to customize their content and engagement strategies (Yang et al., 2024; Akhtar et al., 2024; Gomez-Suarez et al., 2024). For example, OTRPs can personalize customer experiences by classifying review prompts based on identified motivations, such as "share your story," "help others," or "join the conversation."

This study allows travel service providers to identify patterns in customer complaints and leverage this feedback to improve their offerings and settle repeating issues, potentially amplifying customer allegiance and reducing negative experiences. The current study suggests OTAs make forums or discussion threads based on provided interests or travel targets (e.g., budget travel, eco-tourism), which could help like-minded users interact and feel a sense of belonging. Managers can gain a competitive advantage over their rivals if they comprehend the factors that lead consumers to post online product reviews.

This study found that consumers' motivations affect the reviews they leave for services online. Travel agencies can start points systems, badges, and other recognitions based on the review's quality. This can inspire customers to contribute more vigorously, rewarding informational usefulness and community participation. As a result, they can give incentives to consumers who review services online to encourage them to do so. Another strategy is to connect with the emotional side of consumers, inspiring them to post reviews online to express the emotions they experienced while using their services. Beyond the context of online travel review platforms, this research study provides broader insights into online community dynamics, consumer behavior in the digital area, and persuasive technology design.

Platform designing can improve user engagement and happiness by customizing features and capabilities to cater to the underlying motives for publishing reviews. A similar strategy could be used to appeal to the cognitive or affective attitude of the consumer. Understanding the subtle elements influencing customer behavior while posting online reviews gives managers a distinct advantage over competitors in the market; however, the challenges lie in implementing these strategies effectively. Furthermore, OTA companies should attempt to establish stronger emotional ties with their users by acknowledging the emotional element of the review process and encouraging them to express their emotions and experiences in online review writing. Additionally, managers can create focused tactics to gain insightful input from their client base by appealing to both cognitive and emotive elements of consumer attitudes.

This study offers a practical guideline for travel brands to design marketing campaigns that vibrate with these specific motivations. For example, campaigns focused on offbeat or budgeted destinations can captivate users motivated by cost-sharing, while OTA platforms can feature stories from their users highlighting distinctive experiences. This data-driven strategy could lead to more targeted, impressive marketing content, accelerating engagement and energizing brand reputation. Essentially, managers can proactively shape their marketing and customer engagement strategies to cultivate a positive online reputation, foster customer loyalty, and ultimately drive business success in an increasingly competitive marketplace by identifying and leveraging the underlying motivations behind online review postings.

CONCLUSIONS

The study provides insight into the complex reasons why visitors from Delhi and the National Capital Region (NCR) actively participate in leaving reviews on online travel review platforms. The three identified factors, social recognition and connection, enhancing travel

experiences, and social validation, demonstrate the versatile motivations driving individuals to post reviews on OTRPs. This study contributes to understanding user behavior.

Furthermore, the study emphasizes the importance of spreading reliable information and raising the general caliber of information available on these platforms. Further, travelers use review posting to receive benefits from travel agencies and serve as a resource for other travelers regarding the costs involved in visiting particular locations. Utilizing a careful examination of these driving forces, this research reveals the intricate dynamics present in travelers' interactions with OTRPs, enhancing our comprehension of their actions within the context of digital travel. This research study suggests that online travel agencies should provide options for posting video reviews on their platforms.

Limitations and future research directions

This study has limitations due to the impossibility and simplicity of gathering respondents, so a convenience sample strategy was used. There is a risk that the sample selection procedure may have impacted the validity of the results and the generalizability of the sample of the complete population because the respondents were primarily selected based on availability and not from a specific set of criteria. Future studies may concentrate on other Indian and global regions and evaluate the effects of online reviews on various travel review sites while choosing tour operators and destinations.

Future research could be on the many aspects of users' choices to post reviews on online travel review platforms, including exploring the complex relationships between social influences such as peer pressure. Social norms will highlight how important they play in determining the behavior of review posting, examining ethical issues like fake reviews, deceptive practices, and the influence of incentives on review reliability. Furthermore, knowing the complex interactions between age, gender, and disincentives about intentions and actions related to review posting would advance our understanding of user behavior on these platforms.

Furthermore, clarifying how platform elements like rating scales, social interaction features, and review format affect users' reasons for writing reviews would offer insightful information about how platforms are designed and how to engage users. The paper examines these study avenues to comprehensively understand the complex dynamics that underlie people's interactions with online travel review platforms. Future studies could further explore the implications of the current study's identified motivations in other user-generated content platforms, extending the applicability of findings across varied digital ecosystems.

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FINANCIAL AND ECONOMIC INDICATORS

Evaluation of Companies: Theories, Process and Methods

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Business evaluation is the systematic process of analyzing and assessing the performance of an entity, whether it is a company, organization, or project, about specific previously established objectives. This analysis can be performed at any stage of the business life cycle and covers financial, operational, and strategic aspects.

The economic and financial value of the company minimizes uncertainty and provides a firm basis for shareholders in decision-making. This value must be taken as a basis to adequately determine the profitability and goals demanded by shareholders when it is necessary to sell, buy, merge, co-invest, associate, bypass bypass, divest, or spin off an organization. Entrepreneurs and senior executives must always know, with complete certainty, their companies' economic and financial value.

1. **The main purposes of the evaluation:**

1.1.Determine the viability and financial profitability.
1.2.Measure operational efficiency.
1.3.Analyze strategic alignment against long-term objectives.
1.4.There are several types of business evaluation, among which the following stand out:

a) Financial: Determines the profitability and economic health of the company.
b) Operational: Evaluates the efficiency of internal processes and the use of resources.
c) Strategic: Assesses the sustainability and adequacy of the business model in the long term.

The process begins with data collection through surveys, interviews, observations, and other analytical tools. This data is then analyzed to identify critical success factors and areas for improvement and offer concrete recommendations.

2. **Benefits of Business Assessment**

2.1.The business assessment provides multiple advantages, such as:
2.2.Determine the viability and financial profitability.
2.3.Determine the viability and financial profitability.

2.4. Accurate business valuation: It helps determine the real value of the company and its assets.

2.5. Identifying opportunities for improvement: Reveals areas where it is possible to optimize processes or strategies.

Facilitation in decision-making: It provides a solid basis for deciding whether to continue, expand, or redirect a business.

3. Specific evaluations

3.1. Financial: Analyzes balance sheets, projections, and economic results.

3.2. Operational: Measures efficiency in production, management, and distribution.

3.3. Marketing: Evaluate the impact of advertising strategies and penetration in target markets.

3.4. Environmental, Social, and Ethical: Examines the company's sustainability, social responsibility, and ethical behavior.

4. Process in Business Evaluation

The business assessment process typically includes the following stages:

4.1. Definition of objectives: Determine which aspects will be evaluated and the criteria for success.

4.2. Selection of methods: Choose analytical techniques such as cost-benefit, market, or capacity analysis.

4.3. Data collection: Use tools such as surveys, interviews, or audits.

4.4. Analysis of results: Interpret the information collected to identify trends, problems, and opportunities.

4.5. Reporting: Present findings in a clear and actionable manner.

4.6. Implementation of recommendations: Ensure that the suggested changes are carried out effectively.

5. Tools for Business Assessment

5.1. Data collection and analysis are essential pillars in business evaluation. Some prominent tools include:

5.2. Surveys: Collect feedback from employees, customers, and other stakeholders.

5.3. Interviews: Provide in-depth perspectives on operations and strategies.

5.4. Focus groups: They analyze collective perceptions about products or services.

5.5. Document Review: Evaluate financial reports, performance reports, and regulations.

5.6. Performance audits: Measure key indicators such as efficiency, quality, and customer satisfaction.

6. Challenges of Business Assessment

Despite its benefits, business assessment presents several challenges:

6.1. Selection of appropriate criteria: Identify relevant and measurable factors.

6.2. Contextual interpretation: Considering the specific environment in which the company operates.

6.3. Time and information constraints: Conducting quick assessments with incomplete data can lead to erroneous conclusions.

Overcoming these challenges requires meticulous planning and robust tools and methodologies.

7. Considerations for Choosing an Evaluation Method

When selecting an evaluation method, several factors must be taken into account:

7.1. Type of business: Non-profit companies may require different approaches than commercial enterprises.

7.2. Purpose of the evaluation: To determine whether to evaluate operational performance, strategic value, or social impact.

7.3. Available resources: More complex methods require more significant investments in time and capital.

7.4. Target audience: Ensure that findings are helpful and understandable to key stakeholders.

8. Theories and Approaches That Underpin the Determination of the Value of Companies

Business assessment is based on various approaches and theories that help determine a company's intrinsic and market value. These theories provide the conceptual and methodological basis for accurate and well-founded assessments. The main theories and approaches are described below:

8.1. Discounted Cash Flow (DCF) Approach. DCF is one of the most widely used methods in business valuation and is based on the following economic theories:

a) Net Present Value (NPV) Theory. It holds that a company's value is equal to the present value of its discounted future cash flows at a rate that reflects the opportunity cost of capital.

b) Theory of Time Preference (Fisher, 1930). It establishes that the money available in the present has a more excellent value than the amount available in the future due to its ability to generate returns. The theory, also known as the agio theory of interest or the Austrian theory of interest, explains interest rates in terms of people's preference to spend in the present rather than the future.

This approach assesses the company's ability to generate cash flows in the future and adjusts them to present value by considering risks and the cost of capital. Its importance lies in its ability to synthesize profitability in a single number, simplifying analysis by optimizing financial resource allocation and facilitating organizational decision-making.

8.2. Peer Valuation Approach. Theory of Market Efficiency, (Fama, 1970).

This approach determines the value of a company by comparing it to similar companies operating in the same sector or industry. Key metrics such as:

- Profit multipliers (PER: Price to Earnings Ratio).
- Enterprise value/EBITDA.
- Price/sales ratio.

This methodology assumes that markets are rational and that the valuations of comparable companies reflect fair prices.

8.3.Asset Focus or Substantive Value

This approach is based on the Book Value Theory and evaluates the company by considering the net value of its assets, i.e., the difference between total assets and liabilities. It has two main variants:

a) Book value: Based on the company's financial statements.
b) Liquidation value: Considers the value of the assets in the event of the sale or liquidation of the company.

The theory brought from economics is adapted and developed in accounting practice. The authors of this theory can be grouped and organized into different lines of thought that reflect the affinity of the theory of value for its accounting approaches. The authors Mattessich (2002), Buys (2009), and Sánchez and Arias (2012) can be classified as supporters of the theories of use value and exchange value. Toms and Bowman (2008), Bryer (2014), and Sadowska and Lulek (2016) are more in line with the labor theory of value. Finally, the author Dueñas (2007) can be classified as a critic of the subjective theory of value and affirms that this theory is bilateral to accounting practice.

8.4.Market Value Approach

It is based on the Theory of Supply and Demand (Smith, 1776), which states that a firm's value is the price buyers are willing to pay under free market conditions. This approach is commonly used for public companies listed on stock exchanges (Hurtado, 2003).

8.5.Real Options Approach

Based on Financial Options Theory, this approach recognizes that the company has future opportunities that can be seen as "options." These include:

a) Expansion into new markets.
b) Introduction of new products.
c) Strategic delays in investments.

The value of these real options is calculated using methods such as the Black-Scholes model or Monte Carlo simulations. (Black & Scholes, 1973).

Options theory allows the assessment of strategic opportunities. The quantitative analysis of options, together with the qualitative and strategic analysis of company policy, allows correct and rational decisions to be made about the company's future.

8.6. Agency Theory-Based Approach

The Theory of Agency (Jensen, 1986; Jensen & Meckling,1976) analyzes the relationship between owners (shareholders) and managers. According to this theory, valuation decisions should consider how conflicts of interest influence company management and performance.

8.7.Value Creation Approach (EVA and MVA)

a) Economic Value Added (EVA): Based on the Theory of Economic Surplus (Marx, 1959; 1987; Santarcángelo & Borroni, 2012). It measures the value generated by the company after covering the cost of capital.

b) Market Value Added (MVA): Assesses the company's ability to increase market value above the capital shareholders invest.

8.8. Risk and Return Approach

Based on Portfolio Theory (Sharpe, 1964) and the Capital Asset Valuation Model (CAPM), Harry Markowitz (1952), William F. Sharpe (1964), John Lintner (1965), and Jan Mossin (1966) developed the CAPM method, this approach considers:

a) The systematic and non-systematic risk of the company.

b) The relationship between risk and expected return, adjusting the valuation according to the risk profile.

8.9.Stakeholder Theory Approach

This approach considers that the value of a company is not only determined by its financial performance but also by the impact on its stakeholders (customers, employees, communities, and the environment), proposed by Freeman (1984) and presented in more detail by Fontaine, Haarman, and Schmid (2006). This approach integrates:

a) Theory of Corporate Social Responsibility.
b) Business sustainability approaches (Hart & Milstein, 2003; Elkington, 1997)

Economic and financial indicators are valuable tools that benefit organizations by facilitating timely and appropriate decision-making about their corporate and financial strategies.

Next, the evolution of some economic and financial indicators of the Mexican environment is described and shown to facilitate decision-making related to personal and business strategies in an integral manner.

1. National Consumer Price Index (INPC, Spanish)
2. The Price and Quotation Index of the Mexican Stock Exchange (IPC, Spanish)
3. Exchange rate
4. Equilibrium interbank interest rate (TIIE, Spanish)
5. CETES rate of return
6. Investment units (UDIS, Spanish)

1**. NATIONAL CONSUMER PRICE INDEX (INPC)**

Born in 1995 and reflecting changes in consumer prices, it measures the general price increase in the country. The Bank of Mexico and INEGI calculate it fortnightly (2021). INPC is published in the Official Gazette of the Federation on the 10th and 25th of each month. The reference period is the second half of July 2018.

Table 1

Accumulated inflation in the year (Base: 2nd. half of July 2018=100 with data provided by *Banco de México*)

Period	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024

January	**0.79**	**0.90**	**-0.09**	**0.38**	**1.70**	**0.53**	**0.09**	**0.48**	**0.86**	**0.59**	**0.76**	**0.89**
February	**1.46**	**1.15**	**0.09**	**0.82**	**2.29**	**0.91**	**0.06**	**0.90**	**1.50**	**1.43**	**1.24**	**0.99**
March	**1.99**	**1.43**	**0.51**	**0.97**	**2.92**	**1.24**	**0.44**	**0.85**	**2.34**	**2.43**	**1.51**	**1.28**
April	**1.81**	**1.24**	**0.25**	**0.65**	**3.04**	**0.90**	**0.50**	**-0.17**	**2.67**	**2.98**	**1.49**	**1.48**
May	**0.95**	**0.91**	**-0.26**	**0.20**	**2.92**	**0.73**	**0.21**	**0.22**	**2.88**	**3.17**	**1.27**	**1.29**
June	**1.12**	**1.09**	**-0.09**	**0.31**	**3.18**	**1.12**	**0.27**	**0.76**	**3.43**	**4.04**	**1.37**	**1.68**
July	**1.14**	**1.42**	**0.06**	**0.57**	**3.57**	**1.66**	**0.65**	**1.43**	**4.04**	**4.81**	**1.86**	**2.74**
August	**1.31**	**1.73**	**0.27**	**0.86**	**4.08**	**2.26**	**0.63**	**1.82**	**4.24**	**5.54**	**2.42**	**2.75**
September	**1.61**	**2.18**	**0.27**	**1.47**	**4.41**	**2.69**	**0.89**	**2.06**	**4.88**	**6.19**	**2.88**	**2.80**
October	**2.77**	**2.74**	**1.16**	**2.09**	**5.06**	**3.22**	**1.44**	**2.68**	**5.76**	**6.79**	**3.27**	**3.37**
November	**4.57**	**3.57**	**1.71**	**2.89**	**6.15**	**4.10**	**2.26**	**2.76**	**6.97**	**7.41**	**3.93**	**3.06**
December	**5.21**	**4.08**	**2.13**	**3.36**	**6.77**	**4.83**	**2.83**	**3.15**	**7.35**	**7.82**	**4.66**	

Source: Own elaboration (INEGI, 2024). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general

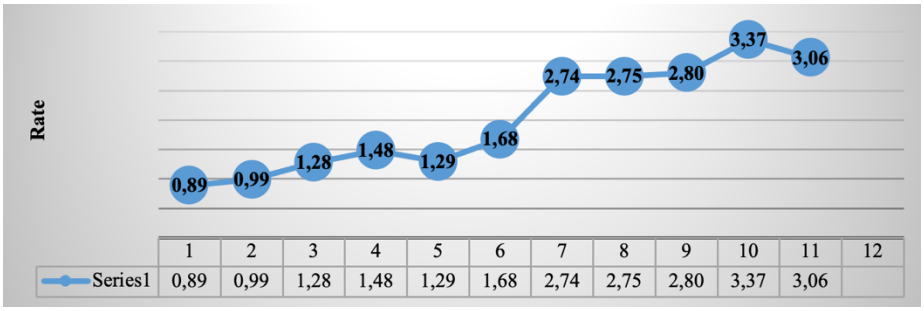
Graph 1

Inflation in Mexico (2013-2023 accumulated at the end of the year)

Source: Own elaboration (INEGI, 2024). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general

Graph 2

Inflation in Mexico (accumulated January-November 2024)



Source: Own elaboration (INEGI, 2024). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general

2. THE PRICE AND QUOTATION INDEX OF THE MEXICAN STOCK EXCHANGE (IPC)

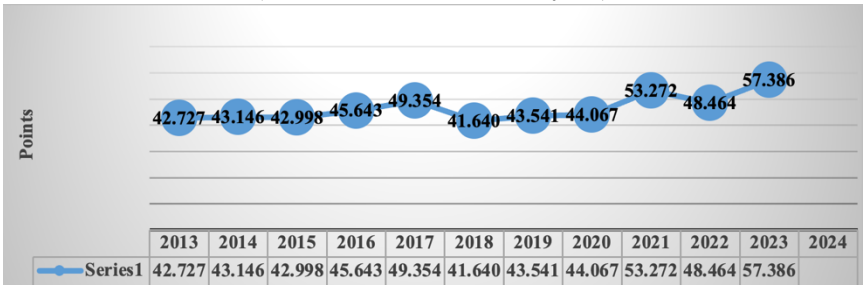
Represents the change in the values traded on the Mexican Stock Exchange concerning the previous day to determine the percentage of rising or falling of the most representative shares of the companies listed therein.

Table 2
The Price and Quotation Index of the Mexican Stock Exchange
(Base: October 1978, 0.78=100)

Period	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
January	45,278	40,879	40,951	43,631	47,001	50,456	43,988	44,862	42,986	51,331	54,564	57,373
February	44,121	38,783	44,190	43,715	46,857	47,438	42,824	41,324	44,593	53,401	52,758	55,414
March	44,077	40,462	43,725	45,881	48,542	46,125	43,281	34,554	47,246	56,537	53,904	57,369
April	42,263	40,712	44,582	45,785	49,261	48,354	44,597	36,470	48,010	51,418	55,121	56,728
May	41,588	41,363	44,704	45,459	48,788	44,663	42,749	36,122	50,886	51,753	52,736	55,179
June	40,623	42,737	45,054	45,966	49,857	47,663	43,161	37,716	50,290	47,524	53,526	52,440
July	40,838	43,818	44,753	46,661	51,012	49,698	40,863	37,020	50,868	48,144	54,819	53,094
August	39,492	45,628	43,722	47,541	51,210	49,548	42,623	36,841	53,305	44,919	53,021	51,986
September	40,185	44,986	42,633	47,246	50,346	49,504	43,011	37,459	51,386	44,627	50,875	52,477
October	41,039	45,028	44,543	48,009	48,626	43,943	43,337	36,988	51,310	49,922	49,062	50,661
November	42,499	44,190	43,419	45,286	47,092	41,733	42,820	41,779	49,699	51,685	54,060	49,813
December	42,727	43,146	42,998	45,643	49,354	41,640	43,541	44,067	53,272	48,464	57,386	

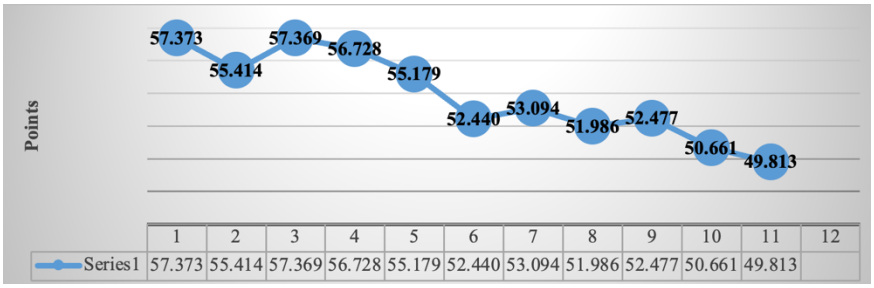
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=7&accion=consultarCuadro&idCuadro=CF57&locale=es

Graph 3
The Price and Quotation Index of the Mexican Stock Exchange, 2013 - 2023
(Score at the end of each year)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=7&accion=consultarCuadro&idCuadro=CF57&locale=es

Graph 4
The Price and Quotation Index of the Mexican Stock Exchange, January-November 2024
(Score at the end of each month)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=7&accion=consultarCuadro&idCuadro=CF57&locale=es

3. EXCHANGE RATE

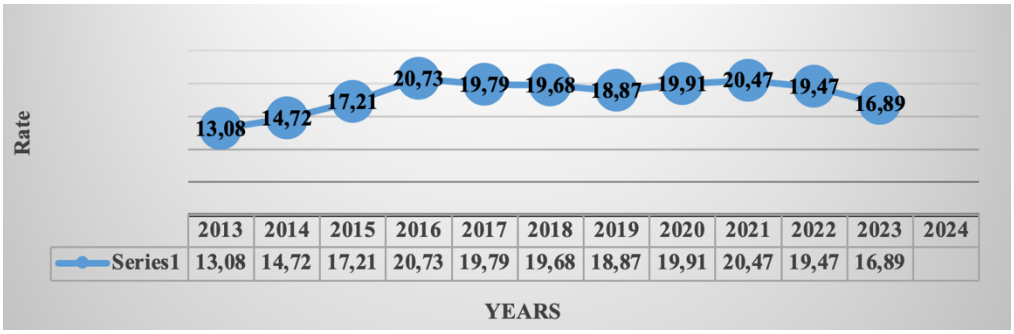
It is the value of the Mexican peso relative to the dollar calculated using the daily average of the five most important banks in the country. It reflects the spot price (cash) negotiated between banks. It is highly related to Inflation, the interest rate, and the Mexican Stock Exchange.

Table 3
Exchange rate (National currency per US dollar, parity at the end of each period)

Period	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
January	12.71	13.37	14.69	18.45	21.02	18.62	19.04	18.91	20.22	20.74	18.79	17.16
February	12.87	13.30	14.92	18.17	19.83	18.65	19.26	19.78	20.94	20.65	18.40	17.06
March	12.36	13.08	15.15	17.40	18.81	18.33	19.38	23.48	20.44	19.99	18.11	16.53
April	12.16	13.14	15.22	19.40	19.11	18.86	19.01	23.93	20.18	20.57	18.07	17.09
May	12.63	12.87	15.36	18.45	18.51	19.75	19.64	22.18	19.92	19.69	17.56	17.01
June	13.19	13.03	15.57	18.91	17.90	20.06	19.21	23.09	19.91	20.13	17.07	18.24
July	12.73	13.06	16.21	18.86	17.69	18.55	19.99	22.20	19.85	20.34	16.73	18.59
August	13.25	13.08	16.89	18.58	17.88	19.07	20.07	21.89	20.06	20.09	16.84	19.60
September	13.01	13.45	17.01	19.50	18.13	18.90	19.68	22.14	20.56	20.09	17.62	19.64
October	12.89	13.42	16.45	18.84	19.15	19.80	19.16	21.25	20.53	19.82	18.08	20.04
November	13.09	13.72	16.55	20.55	18.58	20.41	19.61	20.14	21.45	19.40	17.14	20.32
December	13.08	14.72	17.21	20.73	19.79	19.68	18.87	19.91	20.47	19.47	16.89	

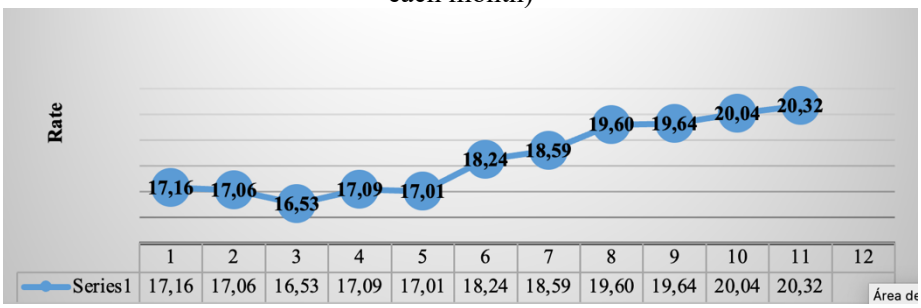
NOTE: Exchange rate FIX by The Banco de México, used for settling obligations denominated in foreign currency. Quote at the end
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CF102&locale=es

Graph 5
Exchange rate (National currency per US dollar, 2013-2024,
(FIX parity at the end of each year)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CF102&locale=es

Graph 6
Exchange rate (National currency per US dollar, January-November 2024, FIX parity at the end of each month)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CF102&locale=es

4. EQUILIBRIUM INTERBANK INTEREST RATE (TIIE)

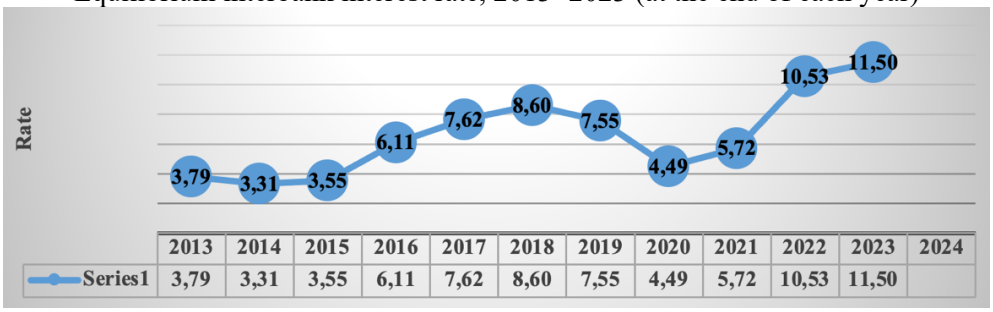
On March 23, 1995, the Bank of Mexico, to establish an interbank interest rate that better reflects market conditions, released the Interbank Equilibrium Interest Rate through the Official Gazette of the Federation.

Table 4
Equilibrium interbank interest rate (28-day quote)

Period	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
January	4.84	3.78	3.29	3.56	6.15	7.66	8.59	7.50	4.47	5.72	10.82	11.50
February	4.80	3.79	3.29	4.05	6.61	7.83	8.54	7.29	4.36	6.02	11.27	11.50
March	4.35	3.81	3.30	4.07	6.68	7.85	8.51	6.74	4.28	6.33	11.43	11.44
April	4.33	3.80	3.30	4.07	6.89	7.85	8.50	6.25	4.28	6.73	11.54	11.25
May	4.30	3.79	3.30	4.10	7.15	7.86	8.51	5.74	4.29	7.01	11.51	11.24
June	4.31	3.31	3.30	4.11	7.36	8.10	8.49	5.28	4.32	7.42	11.49	11.24
July	4.32	3.31	3.31	4.59	7.38	8.11	8.47	5.19	4.52	8.04	11.51	11.25
August	4.30	3.30	3.33	4.60	7.38	8.10	8.26	4.76	4.65	8.50	11.51	11.08
September	4.03	3.29	3.33	4.67	7.38	8.12	8.04	4.55	4.75	8.89	11.50	11.08
October	3.78	3.28	3.30	5.11	7.38	8.15	7.97	4.51	4.98	9.56	11.50	10.95
November	3.80	3.31	3.32	5.57	7.39	8.34	7.78	4.48	5.13	10.00	11.50	10.74
December	3.79	3.31	3.55	6.11	7.62	8.60	7.55	4.49	5.72	10.53	11.50	

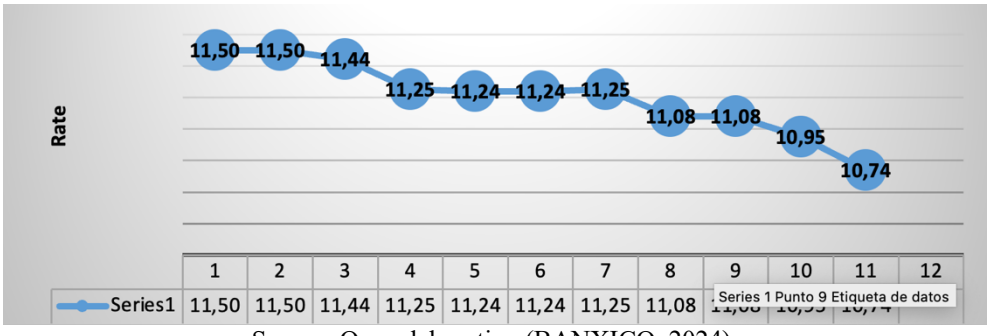
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es

Graph 7
Equilibrium interbank interest rate, 2013- 2023 (at the end of each year)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es

Graph 8
Equilibrium interbank interest rate, January-November 2024 (28-day quote)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es

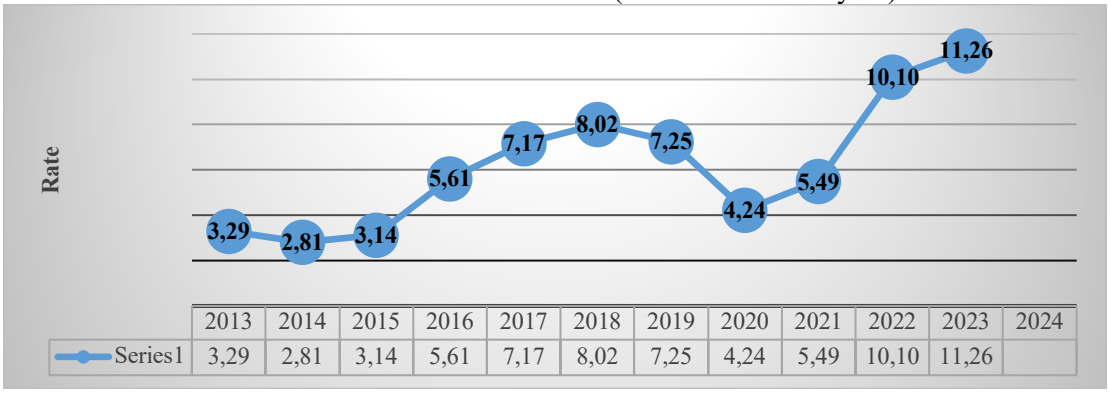
5. CETES RATE OF RETURN

Table 5
CETES rate of return (28-day)

Period	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
January	4.15	3.14	2.67	3.08	5.83	7.25	7.95	7.04	4.22	5.50	10.80	11.28
February	4.19	3.16	2.81	3.36	6.06	7.40	7.93	6.91	4.02	5.94	11.04	11.00
March	3.98	3.17	3.04	3.80	6.32	7.47	8.02	6.59	4.08	6.52	11.34	10.90
April	3.82	3.23	2.97	3.74	6.50	7.46	7.78	5.84	4.06	6.68	11.27	11.04
May	3.72	3.28	2.98	3.81	6.56	7.51	8.07	5.38	4.07	6.90	11.25	11.03
June	3.78	3.02	2.96	3.81	6.82	7.64	8.18	4.85	4.03	7.56	11.02	10.88
July	3.85	2.83	2.99	4.21	6.99	7.73	8.15	4.63	4.35	8.05	11.09	10.87
August	3.84	2.77	3.04	4.24	6.94	7.73	7.87	4.50	4.49	8.35	11.07	10.65
September	3.64	2.83	3.10	4.28	6.99	7.69	7.61	4.25	4.69	9.25	11.05	10.35
October	3.39	2.90	3.02	4.69	7.03	7.69	7.62	4.22	4.93	9.00	11.26	10.20
November	3.39	2.85	3.02	5.15	7.02	7.83	7.46	4.28	5.05	9.70	11.78	9.95
December	3.29	2.81	3.14	5.61	7.17	8.02	7.25	4.24	5.49	10.10	11.26	

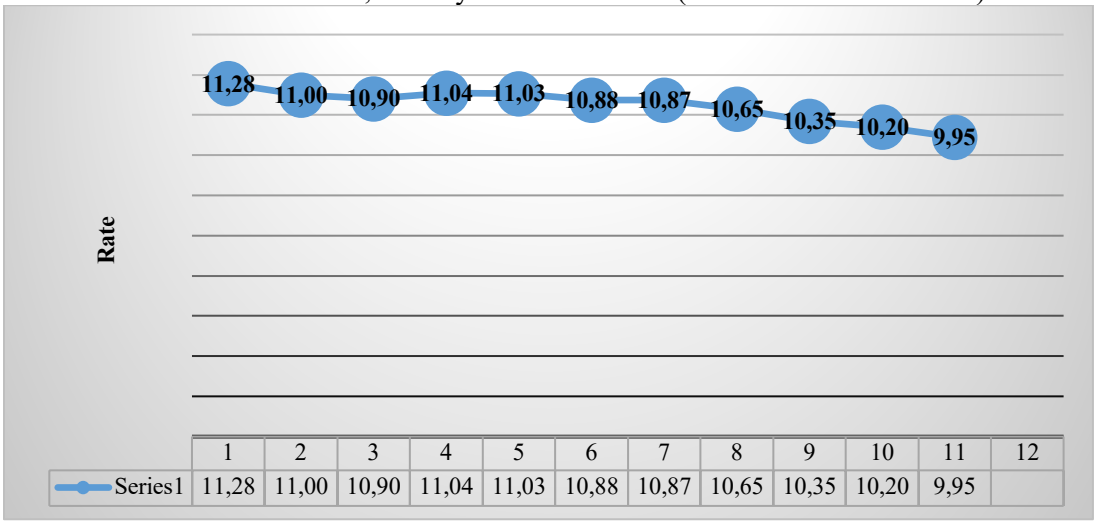
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es

Graph 9
CETES rate of return 2013- 2023 (at the end of each year)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es

Graph 10
CETES rate of return, January-November 2024 (at the end of each month)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es

6. INVESTMENT UNITS (UDIS)

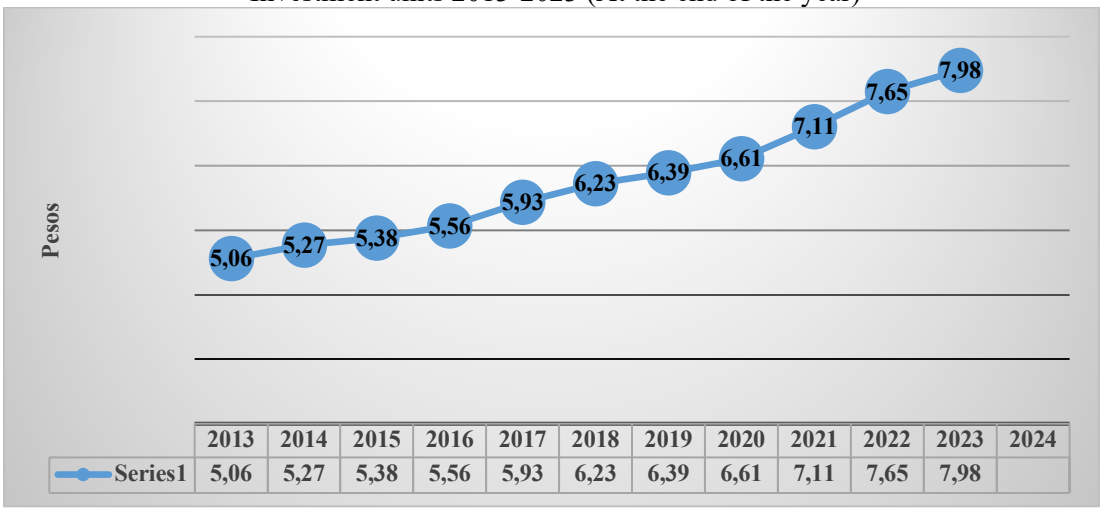
The UDI is a unit of account of constant real value to denominate credit titles. It does not apply to checks, commercial contracts, or other acts of commerce.

Table 6
Investment units (value concerning pesos)

Period	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
January	4.89	5.10	5.29	5.41	5.62	5.97	6.25	6.44	6.64	7.12	7.69	8.06
February	4.92	5.13	5.29	5.43	5.69	6.00	6.25	6.46	6.70	7.18	7.74	8.11
March	4.94	5.15	5.30	5.44	5.71	6.02	6.26	6.49	6.75	7.24	7.77	8.11
April	4.97	5.15	5.32	5.45	5.75	6.03	6.28	6.43	6.79	7.31	7.78	8.13
May	4.96	5.13	5.29	5.42	5.75	6.01	6.27	6.42	6.81	7.33	7.78	8.15
June	4.95	5.13	5.28	5.42	5.75	6.01	6.26	6.44	6.83	7.36	7.77	8.13
July	4.95	5.14	5.28	5.42	5.76	6.04	6.27	6.49	6.87	7.43	7.79	8.20
August	4.95	5.16	5.29	5.44	5.79	6.07	6.29	6.52	6.90	7.47	7.83	8.25
Sep.	4.97	5.18	5.31	5.45	5.82	6.11	6.29	6.55	6.92	7.53	7.87	8.25
Oct.	4.99	5.20	5.33	5.49	5.84	6.13	6.31	6.57	6.97	7.57	7.90	8.26
Nov.	5.02	5.23	5.36	5.53	5.89	6.17	6.35	6.60	7.04	7.62	7.94	8.32
Dec.	5.06	5.27	5.38	5.56	5.93	6.23	6.39	6.61	7.11	7.65	7.98	

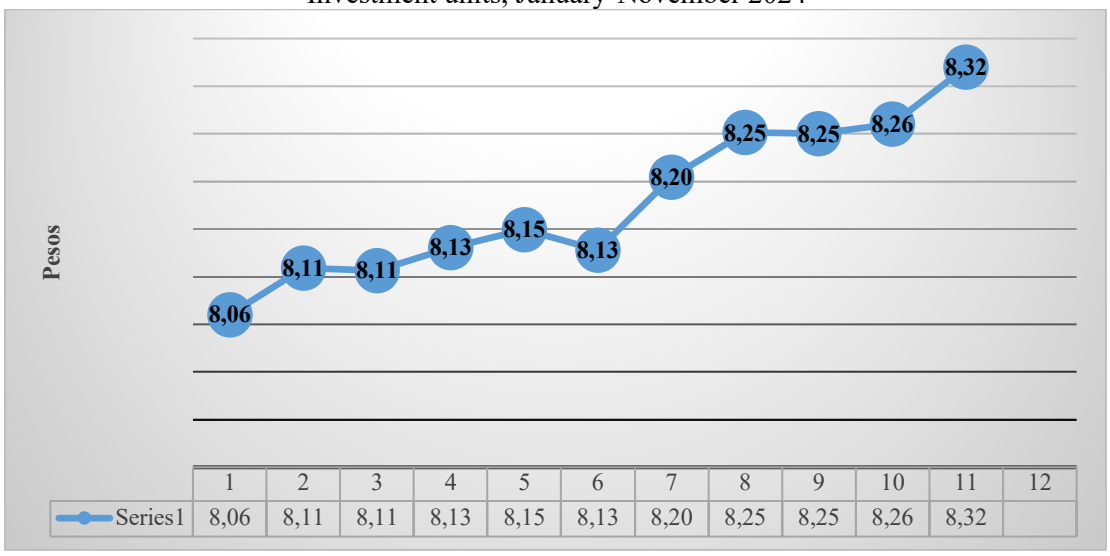
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CP150&locale=es

Graph 11
Investment units 2013-2023 (At the end of the year)



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CP150&locale=es

Graph 12
Investment units, January-November 2024



Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CP150&locale=es

CONCLUSIONS

Business assessment is indispensable for managing any organization's growth, sustainability, and competitiveness. By taking a structured and strategic approach, companies can ensure that their decisions are informed by sound analysis, maximizing their potential for long-term

success. Economic, financial, and strategic theories support determining a company's value and allow multidimensional analyses to be carried out. Choosing the right approach depends on factors such as the valuation objective, the type of company, and the economic context. Integrating multiple approaches can provide a more robust and reliable titration.

Financial valuation responds to the company's demand for higher managerial quality by developing creativity, innovation, and executive talent. The dynamics of company financial evaluations result from the changing financial context, which is why the general models must be adapted to the specific circumstances that arise in organizations' future environments.

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