# MERCADOS y Negocios

51

ISSN-i: 1665 - 7039/ISSN-e: 2594 - 0163

REVISTA DE INVESTIGACIÓN Y ANÁLISIS ■ año 25 ■ número 51 enero-abril 2024

UNIVERSIDAD DE GUADALAJARA
Rector: Dr. Ricardo Villanueva Lomelí
Vicerrector Ejecutivo: Dr. Héctor Raúl Solís Gadea
Secretario General: Mtro. Guillermo Arturo Gómez Mata

CENTRO UNIVERSITARIO DE CIENCIAS ECONÓMICO ADMINISTRATIVAS

Rector: Mtro. Luis Gustavo Padilla Montes
Secretario Académico: Dr. José María Nava Preciado
Secretaria Administrativa: Lic. Denisse Murillo González
Director de la División de Gestión Empresarial: Dr. José Luis Santana Medina
Jefe del Departamento de Mercadotecnia y Negocios Internacionales: Dr. José Sánchez Gutiérrez

EQUIPO EDITORIAL
Editorial Director: José Sánchez Gutiérrez, Universidad de Guadalajara, México
Executive Editor: Tania Elena González Alvarado, Universidad de Guadalajara, México
Senior Editor: Pablo Cabanelas Lorenzo, Universidad de Vigo, España
Juan Gaytán Cortés, Universidad de Guadalajara, México
Jesús F. Lampón Caride, Universidad de Vigo, España

Editorial Support: Gabriela Morales Alvarado, Universidad Nacional Autónoma de México, México

CONSEJO DE REDACCIÓN

José Octavio Alonso Gamboa (Universidad Nacional Autónoma de México, México); Tania Elena González Alvarado (Universidad de Guadalajara, México); Renata Kubus (Universidad Complutense de Madrid, España).

COMITÉ CIENIÍFICO

Tony Antakly (University of Montreal, Canadá); Demetrios Argyriades (John Jay College of Criminal Justice New York, Estados Unidos); Pablo Cabanelas Lorenzo (Universidad de Vigo, España); José Cabanelas Omil (Universidad de Vigo, España); Juan José Durán Herrera (Universidad Autónoma de Madrid, España); Rosa Amalia Gómez Ortiz (Instituto Politécnico Nacional, México); Prosper Lamothe Femández (Universidad Autónoma de Madrid, España); Jesús Lampón Caride (Universidad de Vigo, España); Jahir Lombana Coy (Universidad del Norte, Colombia); Gonzalo Maldonado Guzmán (Universidad Autónoma de Aguascalientes, México); Alexander Rühl (Commerzbank AG, Alemania); Giovanni Schiuma (University of Basilicata, Italia); Femando Ubeda Mellina (Universidad Autónoma de Madrid, España); Charis M. Vlados, Democritus (University of Thrace, Grecia).

*MERCADOS Y NEGOCIOS,* año 25, número 51 (enero-abril, 2024), es una revista de investigación, divulgación y análisis de publicación cuatrimestral editada por la Universidad de Guadalajara, a través de Departamento de Mercadotecnia y Negocios Internacionales del Centro Universitario de Ciencias Económico Administrativas (CUCEA), con domicilio en Periférico Norte 799, Módulo G-306, núcleo Los Belenes, Zapopan, Jalisco, México, C.P. 45100. Tel.: 3770-3343, Tel./fax: 3770-3300 ext. 25607. web: http://mercadosynegocios.cucea.udg.mx/index.php/MYN/index email: revistamercadosynegocios@cucea.udg.mx Editor responsable: José Sánchez Gutiérrez. Reservas de Derechos al Uso Exclusivo del Título: 04-2005-011212585100-102, ISSN 1665-7039 versión impresa, ISSN 2594-0163 versión electrónica, otorgados por el Instituto Nacional del Derecho de Autor, Certificado de Licitud de Título 12710, Certificado de Licitud de Contenido 10282, ambos otorgados por la Comisión Calificadora de Publicaciones y Revistas Ilustradas de la Secretaría de Gobernación. Este número se terminó de imprimir el 1 de enero de 2024 con un tiraje de 50 ejemplares. Las opiniones expresadas por los autores no necesariamente reflejan la postura del editor de la publicación. Mercados y Negocios aparece en el índice del catálogo Latindex 2.0; en la Matriz de Información para el análisis de revistas (MIAR), en DOAJ (Directory of Open Access Journals), en Dialnet, en tres bases de datos de EBSCO (Business Source Corporate Plus; Business Source Ultimate y Fuente Académica Plus), REDIB (Red Iberoamericana de Innovación y Conocimiento Científico}, en el Sistema de Información Científica REDALYC, Scielo-México y Biblat -UNAM.

*Mercados y Negocios* por Departamento Mercadotecnia y Negocios Internacionales.
Universidad de Guadalajara se distribuye bajo una Licencia Creative Commons Atribución-NoComercial 4.0 Internacional.
Basada en una obra en http://revistascientificas.udg.mx/index.php/MYN/

Mercados y Negocios
1665-7039 printed
2594-0163 online
**Year 25, N. 51, January-April (2024)**

# Editor's Letter

https://doi.org/ 10.32870/myn.vi51.7725

*Mercados y Negocios* is supported by the University of Guadalajara (a Public Institution) by academics and experts who support open science. For this reason, the author of the articles is not charged. Readers are also not charged for access to the content. These actions support the collective construction of a participatory and universal scientific ecosystem. We want research on marketing, international Business, and competitiveness to benefit society and be available to everyone (Redalyc-Amelica, 2023). This issue contains five research articles subjected to the peer-review process.

*Maintaining Your Marketing Competitiveness Through Marketing Innovations* is the first article, written by Nancy J. Church. It shows that a revolution is occurring in marketing today due to the application of artificial intelligence (AI) to various marketing tasks and functions. In addition, marketing innovations are taking place on Web 3.0, in the Metaverse, in virtual and augmented reality, in omnichannel marketing, in social media, in video marketing, in live streaming, in connected and addressable TV, in voice and visual search, in influencer marketing, in how advertising budgets are allocated, in social shopping, and additional credentials for marketing professionals in a dynamic profession. Marketing professionals and professors must prioritize pursuing continuous education in their field due to the dynamic nature and complex changes in marketing technology and media options.

The second article was written by Yelly Yamparli Pardo Rozo, Gabriela Carvajal Valderrama, and Alexandra Perdomo Carvajal. Its title is *Corporate Social Responsibility as a Determinant of Competitiveness in Supermarkets.* The objective was to analyze the contribution of Corporate Social Responsibility (CSR) to the competitiveness of supermarkets in Florencia, Caquetá in southern Colombia. In a sample of six supermarkets, a self-assessment survey of CSR and competitiveness variables was carried out for 2021 to 2022, consisting of six dimensions: values and ethical principles, responsible marketing, economy and finance, social commitment, quality of working life, and environment. The tool makes it possible to measure the commitment of the organization's CSR activities to competitiveness. The environment is the dimension with the lowest score and contribution to competitiveness in the dimensions evaluated in the supermarkets (2.0 on a scale of 0.0 - 3.0). According to the correlation analysis, there is a relationship between CSR and competitive position. Awareness-raising and training actions aimed at stakeholders are proposed.

*Green Consumer's Paradox* is the next article. Its author is Almeirim Isabel Acosta Bahena. The objective of the research is to analyze the contradiction between green consumers'

behavior and green technology foods offered to them. An analysis of papers from different authors showed that green consumers are willing to make conscious food consumption. However, factors like price, knowledge about the green cause, consumer income, reference groups, shopping convenience, and food availability influence their final consumption. Collective intelligence is a solution for green consumers to make better decisions: it also involves challenges, ethical considerations, and avoiding political influences on shared information. In conclusion, governments and food producers must do a lot to ensure green consumers have enough tools to make informed and sustainable alimentary decisions.

Fernando Rodríguez, Martin Vivanco Vargas, and Moisés Gómez Salazar wrote *Economic and Social Vulnerability Because of Covid-19: poverty and Food Security,* which is the fourth article. The article's objective is to analyze food poverty and the effects in terms of vulnerability because of the COVID-19 pandemic in Mexico City from the capability approach. In the analysis stage, centrality, variability, and correlation parameters were used to identify the effects of the health crisis on food poverty.

The fifth and last article is *A Proposal of a Pension Plan Design Based on Collective Pension Funds*. Its authors are Denise Gómez Hernández and Humberto Banda-Ortiz. This work proposes a design of an alternative pension plan based on collectivity with the characteristics of hybrid plans. Based on actuarial methods and financial modeling of some of the variables involved, numerical modeling of collective plans is performed to achieve this objective. Then, various scenarios were carried out to simulate a pension fund based on an institution database. At the end of each period, the replacement rate value for each plan member is calculated with a target of 30% of the last salary. As the plan works collectively, surpluses and deficits are distributed uniformly among the plan members. The results are that it is possible to achieve a replacement rate of 70% in the form of a life annuity due with 30 years of service, a contribution rate of 15% of the salary, and an investment portfolio of 60% of assets invested in equities and 40% in bonds.



We thank our authors for their papers. We thank the readers for recommending and citing *Mercados y Negocios*, and our editorial team for not giving up in times of hard work. We want to demand more of ourselves every day and relentlessly aim to achieve more.

Tania Elena González Alvarado
Coeditor

**REFERENCE**

Redalyc-Amelica. (2023). Manifesto on Science as Global Public Good: Noncommercial Open Access. In *Global Summit on Diamond Open Access*, Toluca, México. https://globaldiamantoa.org/manifiesto/

Mercados y Negocios
1665-7039 printed
2594-0163 on line
Year 25, n. 51, January-April (2024)

# Maintaining Your Marketing Competitiveness Through Marketing Innovations

*Manteniendo la competitividad en marketing a través de innovaciones de marketing*

https://doi.org/10.32870/myn.vi51.7713

Nancy J. Church
State University of New York at Plattsburgh (Estados Unidos)
churchnj@plattsburgh.edu
http://orcid.org/0009-0009-1162-5579

Received: October 30, 2023
Accepted: December 28, 2023

**ABSTRACT**

A revolution is occurring in marketing today due to the application of artificial intelligence (AI) to various marketing tasks and functions. In addition, marketing innovations are taking place on Web 3.0, in the Metaverse, in virtual and augmented reality, in omnichannel marketing, in social media, in video marketing, in live streaming, in connected and addressable TV, in voice and visual search, in influencer marketing, in how advertising budgets are allocated, in social shopping, and additional credentials for marketing professionals in a dynamic profession. Marketing professionals and marketing professors must prioritize pursuing continuous education in their field due to the dynamic nature and complex changes in marketing technology and media options.

Keywords: Artificial Intelligence, Metaverse, VR, influencer marketing, live streaming, social shopping, voice search, visual search, video shorts.

JEL code: M31, M30

Mercados y Negocios por Departamento de Mercadotecnia y Negocios Internacionales. Universidad de Guadalajara se distribuye bajo una Licencia Creative Commons Atribución-NoComercial 4.0 Internacional. Basada en una obra en http://mercadosynegocios.cucea.udg.mx/index.php/MYN.

**RESUMEN**

Hoy en día se está produciendo una revolución en el marketing debido a la aplicación de la inteligencia artificial (IA) a diversas tareas y funciones de marketing. Además, se están produciendo innovaciones de marketing en la Web 3.0, en el Metaverso, en la realidad virtual y aumentada, en el marketing omnicanal, en las redes sociales, en el vídeo marketing, en la transmisión en vivo, en la televisión conectada y direccionable, en la búsqueda visual y por voz, en marketing de influencers, en cómo se asignan los presupuestos publicitarios, en compras sociales y credenciales adicionales para los profesionales del marketing en una profesión dinámica. Los profesionales y profesores de marketing deben priorizar la educación continua en su campo debido a la naturaleza dinámica y los cambios complejos en la tecnología de marketing y las opciones de medios.

Palabras clave: Inteligencia artificial, Metaverso, realidad virtual, marketing de influencers, transmisión en vivo, compras sociales, búsqueda por voz, búsqueda visual, videos cortos

Código JEL: M31, M30

## INTRODUCTION

Those who teach marketing and those who work in marketing would agree that marketing is a dynamic discipline and practice. However, once every several years, a new product or service disrupts and significantly changes the modus operandi in marketing. Examples of past disruptive technologies in marketing include the printing press, radio, television, the computer, the Internet, mobile phones, and Big Data.

The most recent disruption, which is impacting many marketing processes as well as many other disciplines and fields, is artificial intelligence (AI). Articles written about how AI affects marketing practices at both the tactical and strategic levels are omnipresent. They can be found in thousands of print, online, and electronic media articles. Furthermore, AI and CHATGPT currently dominate professional marketing conferences and webinars. This paper will present the most recent marketing innovations that will provide marketers with the tools necessary to be competitive in the marketplace.

## PURPOSE



This research aims to highlight the most cutting-edge marketing innovations to benefit two primary audiences: marketing academics and marketing practitioners. Marketing academics must be knowledgeable about the most recent marketing innovations to cover them in their courses and seminars and prepare their students for the ever-changing competitive landscape. To stay ahead of the competition, marketing professionals will want to be well-informed regarding the newest marketing tools, processes, and practices.

## METHODOLOGY

In order to compile an up-to-date list of the most compelling, meaningful, paradigm-shifting marketing innovations, traditional academic journals will not provide the most current information available due to the long review and publication processes used by journals. Hence, the research methodology utilized in this paper involved the use of Google searches and "Google alerts" that provided primarily online information sources that were identified using keywords. All of the Google sources are dated 2023.

## MARKETING INNOVATIONS

#1 – The Artificial Intelligence Revolution: It is Everywhere & It is Affecting Everything!

While AI has been around since the 1950s, it has multiplied in power, realism, accuracy, versatility, and usage through the development of more sophisticated neural networks, natural language processing (NLP), algorithms, large language models (LLMs), machine learning, and deep learning using advanced, high-end computers requiring large amounts of energy to process massive data sets (with hundreds of billions of parameters). Three types of AI have been identified as creating value for marketers: (1) Generative AI (AI-generated content, tone, length), (2) Predictive AI (AI machine learning predicts consumer behavior and customer propensity, enabling product recommendations), and (3) Prescriptive AI "Insights lead to next-best actions for customers, highlight missed opportunities in campaign strategies and suggest messaging experiments to improve marketing effectiveness" (Hotz, 2023). For a better understanding of the artificial intelligence timeline and a comparison of AI, ML, and Deep Learning, look at Ron Karjian's article, The History of Artificial Intelligence: Complete AI Timeline, and Petersson's and Hashemi-Pour's article comparing AI, machine learning, and deep learning.



Attitudes toward the benefits of AI vary from country to country. For example, more survey respondents from Indonesia, Thailand, and Mexico agreed that "products and services using AI have more benefits than drawbacks" compared to respondents from Canada, France, and the US, who reported the lowest agreement (Nanji, 2023).

According to TRACXN (2023), more than 18,500 Artificial Intelligence startups are in the U.S. today. Marketing professionals will find hundreds of AI subscription services to help them perform various marketing functions. Some of these services are pretty narrow in scope, but as AI matures, one will find more companies offering an AI-powered suite of marketing functions and, eventually, a comprehensive AI-powered platform.

With so many microservices available, marketers can access "composable architecture," whereby they build a customized tech stack aligned to their needs (Palmer, 2023). For companies that find AI daunting, marketing agencies specializing in AI marketing applications are ready to help them integrate AI into their marketing functions. Whatever route a company takes to use AI technology will require collaboration across tech, data, and marketing teams to be most effective (Nesbitt, 2023).

The top 5 uses for generative AI by marketers worldwide are basic content creation, writing copy, inspiring creative thinking, analyzing market data, and generating asset images

(Consumer Goods Technology, 2023). Following is a list of the many valuable applications of Generative AI in marketing:

Lead identification: Pophal (2023) reported that a McKinsey study revealed that this was considered by the largest percentage of business leaders to be a significant/very significant use of AI.

Analyze Customer Journey Across Touchpoints: Search for patterns, create comprehensive customer journey maps, personalize content or create segments based on these patterns (Gearrice, 2023)

Create Dynamic Content for email, websites, social media, blogs, podcasts, video scripts, presentations, brochures, logos, product descriptions, and advertising: For AI to create the best content for a target audience, it must be "prompted" in the right direction by giving it as much data as possible about their pain points, preferences, and behaviors (Pittaluga, 2023). While AI may save time and make marketers more efficient, they will still need to review for accuracy and humanize AI-created content. Fares (2023) suggests that AI can be used to "edit written work, make suggestions, summarize ideas, and improve overall copy readability." Translation of copy into other languages and language localization is also available.



Create Unique and Hyper-Personalization of Content: AI makes it possible to personalize content for each customer that would be nearly impossible and uneconomical for marketing staff to create and send individualized versions of a marketing message to a company's customer database.

Enhance Search Engine Optimization: This can be accomplished by analyzing trends, examining ideal keywords and tags, and optimizing websites to improve search engine rankings (Fares, 2023; Gearrice, 2023).

Respond Accurately to Voice Search: This requires AI and natural language processing to understand spoken queries and give personalized responses.

Offer Immersive Shopping Experiences in AI- and AR-enabled retail stores with AI-enabled fitting rooms (Khalid, Feb. 5, 2023).

Provide Accurate Product Suggestions, Often based on a consumer's previous website or social media activity (Khalid, Feb. 5, 2023).
Strategic Matching, Support &Assessment of Affiliate Marketers and Influencer Marketers: "AI algorithms can assess an influencer's reach, engagement, and authenticity, ensuring effective collaborations and brand alignment" (Gearrice, 2023).

Optimize Advertising Campaigns: AI algorithms analyze user data in real-time, optimizing ad placements and targeting to reach the right audience at the right time, resulting in higher conversion rates and ROI (Gearrice, 2023).

Provide Automated Customer Support with Chatbots & More Satisfied Sales Teams: Pittaluga (2023) suggests that plugging an AI machine into a company's CRM or website for a few months will result in enough data that it should be able to take care of customer service 24/7, with oversight by humans. It may also reduce the customer's "wait time" to reach and obtain customer service. By automating the more routine, mundane aspects of customer service, AI has considerably increased the customer service agent's job satisfaction and reduced the customer service agent's attrition (Martin, 2023). On the other hand, some AI systems can alert a customer who is becoming increasingly agitated or frustrated and help guide an agent to a positive resolution (Britt, 2023).

Tool for Product Development & Package Design: Coca-Cola has used AI to co-create a new flavor (Y3000) and to design the artwork on the can. The process "started with researchers collecting flavor preferences from consumers, looking for trends to understand what the "future tastes like." Next, this data was fed into a proprietary artificial intelligence system to help create the flavor profile." (Bonk, 2023).



Retail Store Traffic Analysis, Plan effective store and shelf layouts, location-based engagement, pricing, and promotion optimization.

Marketing Mix Modeling: Developing Brand Strategy:  Daydrm.AI developed an AI model trained on learning from award-winning marketing campaigns. When the marketer enters a marketing brief, "AI will generate ideas for creating a viral YouTube video, a user-generated campaign for Instagram, a live event, in-store activation, and/or various digital campaigns" (Swant, 2023).

Manage Product Placement by digitally inserting sponsored products into digital videos (movies, shows, social media content made by millions of influencers on various platforms) using AI by startup Rembrand (Swant, 2023). Product placement will also become available in virtual environments in the metaverse.

Prevention of Loss and Theft & Logistics and supply chain optimization: analyzing product sales by location to ensure products are delivered where they are needed most, as well as determining optimal and cost-effective shipping routes (Comarch, 2023)

Cybersecurity
Limitations/Dangers of AI

There are numerous limitations of AI, such as:
"Hallucinations" – occur when AI (confidently) generates misinformation, which can create problems with marketing materials, marketing strategies, customer relations, and trust.
Frustrating Chatbots – that cannot understand or resolve the customer's problem, requiring the customer to repeat the problem with a human customer service representative.
Potential Lawsuits for Copyright and Privacy Laws – if copyrighted work was used to train AI models without permission, if AI-generated work infringes on copyrights, or if AI violates the privacy of individuals
"Weaponization by Cybercriminals (Traver, 2023).

#2 – The Metaverse, 5G, Web 3.0, and Decentralized Social Media & the Fediverse

*The Metaverse*
McKinsey and Company (2022) define "Metaverse" as the "emerging 3-D-enabled digital space that uses virtual reality, augmented reality, and other advanced internet and semiconductor technology to allow people to have lifelike personal and business experiences online….It represents a convergence of digital technology to combine and extend the reach and use of cryptocurrency, artificial intelligence (AI), augmented reality (AR) and virtual reality (VR), spatial computing, and more."



Although gaming may be an entry point for many people into the Metaverse, the InterWorld Metaverse is a fast-paced economy requiring users to have digital wallets. It operates on a blockchain. Participants can create their avatars, buy plots, build buildings, furnish their homes, immerse themselves in shopping experiences at virtual 3D shopping malls that are "unconstrained by physical boundaries and could even be situated underwater or on another plant, attend virtual meetings and events, work in shared workspaces, participate in immersive & personalized educational experiences, receive health and wellness services, and others. (InterWorld: A Web3 AI Metaverse, 2023; Hsu, 2023)

*5G*
The fifth generation of wireless technology, 5G, promises speeds up to 100 times faster than 4G with ultra-low latency, meaning Netflix movies would be viewable in near-real time in ultra-high-resolution. 5G also facilitates immersive 3-D and metaverse content and real-time data processing, encouraging the use of more connected devices of all types. The 5G network has yet to be widely available; but can be found in many of the largest cities in the U.S. (Arora, 2023).

*Web 3.0*
Most people are familiar with the social media platforms controlled by a single entity and/or operated on a centralized server with multi-millions of users (Facebook, Instagram, X).

However, Web 3.0 is a decentralized internet run on independent servers and/or a blockchain where users are consumers, creators, and owners who can engage with each other across networks. Blockchains are the operating system that many Web3 apps (DApps) are built upon. DAOs (Decentralized Autonomous Organizations) operate like a club with members with a financial stake in the organization (Gahan, April 11, 2022).

*The Fediverse*

The term "fediverse" (a combination of "federation" and "universe") "enables different social networks to communicate with each other because there are multiple servers." Examples of decentralized social media are Minds, Mastodon, and Steemit. The attraction of decentralized social media platforms is user privacy/anonymity, little censorship, control/ownership of profile and content, user rewards and incentives, newer forms of monetization (NFTs, cryptocurrency), and audibility (Kenan, September 7, 2023).

#3 – Omni-Channel Strategy + Customer Data Platforms (CDPs) = Personalization

Google defines omnichannel marketing as a "customer-centric approach that integrates all channels, delivering a unified and consistent brand experience" through both online and offline touchpoints (including physical stores, point-of-sale systems, apps, websites, social media, direct mail, email, mobile, and phone calls, and "it ensures customers can seamlessly interact with the brand across different platforms, enhancing their overall brand experience." What is critical for marketers using an omnichannel strategy is that they map out their customer journeys and understand their CX (customer experiences). According to Decker (2023), the average number of touchpoints that consumers needed to purchase fifteen years ago was two, and today, consumers need six touchpoints on average.



The COVID-19 pandemic significantly increased customers' purchasing channel options. Decker (2023) listed the following options that have expanded over the past three years:
Delivery: USPS, Fed-Ex, UPS, store delivery, Insta-Cart, Door Dash, Uber Eats, and others.
Point of purchase: online, in-store, central check-out, department check-out, indoor or outdoor checkout, phone checkout

Pickup Options: in-store, warehouse, curbside, pickup lockers
Self-checkout options: in-store kiosks, self-checkout lanes, mobile phone checkout, and cashierless "just walk out" checkout in autonomous stores

Customer data platforms (CDPs) are being used by marketers today as a centralized, unification platform for all of their customer interactions from multiple platforms, which allows marketers to "effectively track, understand, and build in-depth attribution throughout the customer's journey…Advanced CDPs can deliver deep insights that can be leveraged for

personalization at scale." (Sherman, August 3, 2023). The end goal is to provide each customer with meaningful and personalized engagements throughout the customer journey.

#4 – Bye-Bye Third-Party Cookies; Hello PETs

In late 2024, the use of third-party cookies on Google that can track user activity across many different websites will be a thing of the past. Edge, Firefox, and Safari have already blocked third-party cookies in their browsers. As a result, when marketers can no longer buy third-party tracking information from other companies that obtain customer engagement information from tracking cookies, they will need to develop privacy-focused alternatives and better ways of cultivating first-party data directly from their customers. They should also seek second-party data from their business partners and vendors (KPMG, 2023).

A company can always collect first-party data from its customers or prospects via interactions on its channels (owned media), i.e., platforms such as its website, blog, or social media account). Zero-party data is data shared by a consumer. Zhang (2023) posits that cookieless advertising will create a better customer experience because a company will focus more on its customers and their overall customer journey, establish a deeper connection, and better protect the customers' privacy. In response to legislation that aims to protect consumers' privacy, many websites ask visitors to opt in and "accept" their cookies. It allows the online company to track their behavior on the website.



Behavioral targeting is affected by losing third-party cookies based on a person's past internet browsing behavior, typically requiring third-party cookies. Contextual targeting has been used for many years and is expected to become increasingly important and profitable when combined with first-party cookies. Contextual targeting is simply a form of online advertising where advertisers "place ads on webpages based on the content of those pages… and it involves segmenting ads based on parameters like a keyword or website topic" (Vrountas, 2023).

With the increasing concern over privacy and data breaches, now there are PETs (Privacy Enhancing Technologies) that substitute for the loss of third-party cookies but "empower brands to pinpoint their audience, tailor their message, and assess their campaigns' outcomes, all the while ensuring personal privacy is protected."

Buchanan (2023) discussed several PETs, including Google's Privacy Sandbox, which blends individuals' data into a large group where individual data is indistinguishable. Homomorphic encryption allows marketers to work with encrypted data without seeing any data in its raw form to protect individuals' privacy. Johnson (2022) describes "data clean rooms" as "online platforms where companies like Google, Amazon, and Disney can safely share data with

advertisers without violating user privacy by sharing aggregated data rather than individual customer data. Advertisers are then allowed to enter their first-party data to see how it matches the aggregated data. Any inconsistencies between the two may mean that the advertiser is serving ads to the wrong audiences."

#5 - Changing Social Media Usage & Engagement & Influencers

Over time, some users of social media brands have gravitated away from the most prominent social media and found other social media that best fit their lifestyles and preferences. Some now-defunct social media sites, such as MySpace, Friendster, and Second Life, are proof that newer social media sites that load faster, are more relevant, and offer more features to users will overtake older social media brands. An excellent example is younger people's move toward Instagram and TikTok, which has led to more investment in advertising and influencer marketing in social media.

First, we will examine the differences in social media use by age group (Target Internet, 2023). Members of the Gen Z category, born between 1997 and 2012, use Instagram the most, followed by YouTube, Snapchat, and TikTok, and they prefer to get their news from social media. More members of the Millennial category, born between 1981 and 1996, use Facebook, followed by Instagram, Snapchat, and Twitter.



More members of Gen X, born between 1965 and 1980, use Facebook, followed by Instagram, Pinterest, LinkedIn, and X (Twitter), and they shop a lot on social media. Baby Boomers and earlier generations, born between 1946 and 1964, are by far the most significant users of Facebook and YouTube, with WhatsApp far behind. Younger consumers also use social media platforms, such as TikTok and Instagram, as search engines, which, in turn, has led to more shopping on social media (Square, 2023).

Second, "social e-commerce" and "social media shopping" have become big business on social media as Meta launched shops on Facebook and Instagram in 2020, and TikTok offered its first TikTok shops in 2021. What is significant about these shops is that they offer in-app checkout rather than sending customers to the seller's website. (Smith, 2023). Companies are spending an increasing percentage of their advertising budgets on social media. A LinkedIn study found that 78% of social media sellers outsell their peers who do not use social media (Pophal, 2023). Since the "media is the store," stores are becoming media (Christie, 2023). Retail stores must now be used as a "powerful and engaging media channel that can draw consumers into the brand ecosystem…doubling as brand clubhouses, brand cathedrals, event stages, and concert studios" to attract a new generation.

Third, "cloud-based social shopping" attempts to provide online shoppers with the ability to shop with other people online just as they do when they shop together in shopping malls.

Typically, if online shoppers wanted advice from their friends or needed an opinion about something, they would need to "step out of the e-commerce site" to send links or texts to others and wait for responses.

Cloud-based social shopping "enables interaction and contribution from others directly within the buying process" (Mueller, 2023). All companies selling online can incorporate multiple shoppers into a single customer journey by contracting with a software-as-a-service (SaaS) company to manage the technical part. A valuable benefit of having multiple people participate in the shopping trip is that the online company increases its reach, may gain additional customers, and gains additional online data and insights.

Fourth, social media sites have offered ads for quite some time, and video ads are increasingly being used to engage consumers, sell goods and services, and seek donations. Khalid (Sept. 29, 2023) suggests that "video content consumption is on the rise, and it is becoming the preferred way for consumers to engage with brands" on social media platforms, such as TikTok, YouTube, and Instagram. She observes other video trends: live streaming to engage with followers and demonstrate expertise, interactive videos, and augmented reality experiences.

Fifth, marketers will increasingly engage with social media users through social media messaging apps or direct messaging with personalized and relevant messages. Direct messaging on social media can create meaningful connections and gather valuable insights directly from customers (Kernochan, 2023).



The results of these personal communications include extremely high clickthrough rates to a landing page and significantly more purchases (Koziolek, 2023). Huston (2023) reported that a Salesforce study revealed that consumers are more likely to purchase from a brand they have interacted with on social media.

#6 – User-Generated Content (UGC) – Influencers & The Creator Economy (types, de-influencers,

"User-generated content (also known as UGC or consumer-generated content) is original, brand-specific content created by customers and published on social media or other channels. UGC comes in many forms, including images, videos, reviews, testimonials, or even podcasts" (Beveridge, 2022). Beveridge names the 4 types of UGCs: (1) customers, (2) brand loyalists, (3) employees, and (4) UGC Creators.

The first three are perceived as the most authentic and similar to word-of-mouth promotion. The fourth type of UGC – UGC Creators – is paid by companies to provide content about its

products/services. Hyder (2023) distinguishes between influencers and creators: "Influencers have a fairly strong hold on more traditional lifestyle industries, like fashion, beauty, food, and travel. Alternatively, creators are more likely to leverage emerging technologies and platforms, occupying the digital realms of live streams, gaming, and entertainment content."

The difference is somewhat nuanced. A brand will look for influencers or creators who have credibility and trust with their followers. However, paid influencers tend to work with brands that dictate the creative aspects of their social media posts. In contrast, paid creators establish a strong brand identity that allows them to seamlessly incorporate trends and branded campaigns into their content, rather than forcing disingenuous deals onto their audiences." Hence, creators may be seen as more authentic, more trustworthy, and less scripted.

Sovay (2023) reported that social media is the dominant channel in digital marketing and that companies that develop an influencer marketing strategy and program for social media perform far better on several KPIs (Key Performance Indicators), such as impressions, engagement, and conversion rates. As digital advertising becomes more expensive and less effective, the use of influencers/creators becomes more critical, significantly since the creator economy is projected to double in the next five years.

14 In the U.S., the Federal Trade Commission has issued rules that must be followed by paid influencers who post pictures, text, video, or live streaming. They are required to either use the terms "Advertisement," "Ad," or "Sponsored" or use wording such as "Thanks to X Company for the free product" or "X Company Partner" or X Company Ambassador" in their message. They may also use a hashtag, such as #ad or #sponsored.

Influencers/Creators have become very important in digital and social media marketing, and they fall into several categories:

Influencers range from Nano-influencers (fewer than 1,000 followers) to Micro-influencers up to 100,000 followers) to Macro-influencers (up to 1 million followers) to Mega-influencers (more than a million followers. Influencers with larger audiences tend to be celebrities who provide more general, while micro-influencers have much more minor, niche audiences that tend to be loyal and highly engaged. Ehlers (2022) predicts that micro-influencer partnerships will see the most significant growth in the future as their "hyper-relevant" followers are more engaged and the cost is lower to work with them,

Granfluencers (Di Carlo, 2023) have been recognized as seniors who have built up a significant following on social media platforms such as Instagram, Facebook, TikTok, and YouTube. Their appeal is that they have valuable experiences, wisdom, and passion to share and are perceived as authentic and reliable. Influencers especially appeal to baby boomers,

as 70% of baby boomers trust the recommendations of influencers over traditional advertising.

Virtual Influencers are "computer-generated characters with their personalities and fan bases" (Jacob, 2023). They can do everything that real-life influencers do: endorse products, share experiences, and engage with their virtual communities, but there are ethical problems with this type of influencer; they may not appear to be as authentic or relatable as real people. Virtual influencer Lil Miquela has over 3 million followers and charged $8500 per post.

Digital Doubles are computer-generated avatars of celebrities who influence others and promote brands or events. Kendall Jenner's digital double promoted a Burberry collection, and Justin Bieber's digital double promoted a music release and performed songs in a live, virtual concert (Chitrakorn, 2021).

De-influencers have gained some traction on social media with videos and posts telling viewers why they should not buy certain products or types of products, perhaps because they are not worth the money, they do not work, are not sustainable, and others. Even a #deinfluencing on TikTok has racked up millions of views (Pandey, 2023). Although de-influencers attempt to stop you from buying a product, some may influence you to buy an alternate product.



Pophal (2023) reports that experts now recommend using a mix of influencer types in addition to popular branded individual influencers, such as internal experts, micro-influencers, niche experts, and customers in the influencer marketing mix."

Ciampa (2023) recommends that marketers use a mix of owned, earned, and paid media when developing their social media marketing strategy. Owned media is under the marketer's control (website or social media page). Earned media is when a user creates a post, writes a blog or review, uses a video, and others. To speak about the marketer's product without any compensation. Paid media is material the marketer has promoted by paying an influencer or social media or providing free products.

#7 – Greater Importance of Videos & Live Streaming & Shoppable Video Ads

Video Advertising

Who still needs to catch up by watching reel after reel on Facebook or video after video on YouTube? Pophal (2023) reports that marketing experts posit that:

"The world is becoming more visual when it comes to consuming content…With the rise of a generation that would much rather watch or look at something vs. sit and read, there is

going to be a growing trend of more visual content, including pictures, videos --long and short form—memes, diagrams, and infographics" – Paige Arnof-Fenn.

"The biggest trend we are continuing to see sweeping and gaining momentum is a focus on video marketing above all else," said Stephanie Scheller. She stated that YouTube and Meta " emphasize video with their reels and shorts programs." YouTube video shorts can be 15-60 seconds, while Meta video shorts can be up to 2 minutes long. However, the 'sweet spot' for video ads is 15 seconds.

The growth rate in video ad spending is expected to be higher than in social media ad spending over the next few years (Pophal, 2023). Doxee (2023) highlighted three elements within this growth trend that will influence digital marketing:

Personalized videos – "translate data from numerous sources into stories in which the user himself is the protagonist."

Interactive videos – using video automation platforms, interactive videos are more engaging and build customer relationships.



Video automation – "The automation of routine processes for video creation… will allow the user to participate in the creation process firsthand by providing him/her with automatic ways of creating the various sequences." More product users, employees, and influencers will be able to share their knowledge about a product.

Live Streaming Shopping is on the rise – Live shopping is where "a host, usually an influencer or a celebrity, promotes a product through a live video. It is similar to home shopping TV shows where a person demonstrates how to use a product, but all engagement between the host and the audience is entirely live. (Influencer Marketing Hub, 2023). Live streaming can occur on e-commerce apps, social media platforms, and websites or apps, such as Poshmark, Shopify, FacebookLive, and AmazonLive. Another feature of live-streamed shows is using raffles, giveaways, promotional prices, and limited-time offers to build hype and urgency among their audience.

Ad-supported live streaming is growing quickly as the number of streaming services and the amount of streaming inventory continue to rise. As the supply of streaming programming rises, the cost per thousand has recently declined up to ten percent.

*Shoppable Video Ads Allow for Frictionless Commerce*

Kolvitz (2020) writes about how consumers expect a frictionless experience when they are in a buying mode. Friction is defined as anything that prevents a customer from completing the customer's journey or anything that slows them down or causes dissatisfaction. Tamara

Ingram, Global Chairperson at Wunderman Thompson, stated, "By the year 2030, what is exciting is (that) most things will be frictionless. Everything will be purchasable."

Here is an example of how technology can provide a frictionless customer experience. Wolff (2023) describes how viewers of a cable or broadcast network show might stop to admire the TV character's shoes and then be able to buy them through their TV. Wolf explains, "Innovation has reached a zenith where technology can identify products within scenes of shows, paving the way for unobtrusive commerce integration." In this example, QR codes make consumer interaction seamless, and Audi and Sephora have already used this technology. Wolf predicts, "The integration of AR, VR, and AI heralds the next phase of transformation for immersive video advertising, one that transcends conventional boundaries," and that "frictionless commerce promises forever to change consumers' relationships with screens of all types."

#8 – Greater Use of Augmented Reality (AR) and Virtual Reality (VR)

AR and VR have existed for several years, "but they are becoming increasingly more important as Web3 comes into focus and accessible via in-app created social media filters" (McCoy, 2023). Current uses of VR: One of the reasons that more people do not use VR is that they need the headset, which costs hundreds of dollars. McDonald's offered a limited edition of Happy Meal boxes that could be turned into Happy Goggles (similar to Google's Cardboard viewer) to view a fun and educational game, making virtual reality more accessible.



Another example is how Patrón used VR in a video that, through a bee's perspective, shows how tequila is made from the Jalisco agave fields at the distillery. The video can be viewed with a Google Cardboard viewer and a cell phone. VR has been used by auto companies for a virtual test drive, by museums for a virtual tour, by fashion shows to have a front-row seat, by cosmetic companies to test different colors of makeup, and by realtors to give a tour of a property. Merrell created a VR video to support its new hiking boot that also added a tactile dimension of a mountain hike.

*AR technology integrates digital information with the user's physical environment in real-time.*

Mobile AR advertising is expected to increase as marketers seek ways to stand out in the saturated digital marketplace by providing entertaining, immersive, and interactive content. Web-based AR (WebAR) requires no app; it increases engagement and sales and allows marketers to establish deeper relationships with customers using messages that can be twice as impactful (Jonmar, 2023). AR products have increased in popularity, yet Jonmar (2023)

reported that "only 1% of retailers have incorporated AR into their operations…yet most consumers prefer retailers who offer AR experiences."

In addition to offering AR products on websites and in retail stores, AR experiences can be sent by email or text or can be triggered with QR codes on signs, mailers, and business cards." AR is also projected to be used in out-of-home advertising, such as electronic billboards, that could provide information about a nearby product based on a customer's age, gender, interests, and location (Amati, 2022). AR glasses are available from several companies now, although the price is still high, ranging from $150 to $500+.

*Avatars*

Social media and gaming websites have seen tremendous growth in the use of avatars in the past five years. Some users simply want an avatar that resembles them. Others want to create an avatar that projects a desired image for them. In online gaming (e.g., Oculus Rift and Pokémon Go), players can "play" using their avatars, move and explore, fight, compete, or build in a virtual reality environment. Social media such as TikTok, Snapchat, Instagram, Meta, Apple, and social gaming media (e.g., Roblox) all encourage users to create avatars. The avatars are reactive; that is, they will speak when you speak and move when you move. Meta users can use their avatars on Messenger phone calls, and Meta employees attend meetings in VR. Fashion leaders, such as Valentino, Prada, and Balenciaga, enthusiastically support the use of avatars and offer to sell digital versions of clothing designs. Digital fashion has become a lucrative industry in social media gaming platforms like Roblox and Fortnite. McDowell (2023) reported that "one in five of Roblox's 220 million monthly active users update their avatars daily via its marketplace, which enables independent creators to monetize their designs."



#9 – TV Marketing Trends - Streaming vs. Cable vs. Satellite vs. Linear TV

The allocation of advertising budgets is changing to reflect changing consumer media usage habits. As more households are watching more streaming TV and less broadcast TV (linear TV) and less cable TV, advertising dollars are being reallocated to streaming OTT TV (Over-the-Top TV, which includes content on TV shows or live streams watched over the Internet on smart TVs, computers, mobile phones, and gaming consoles.) from social media, digital advertising, and cable and linear TV. Marketing/advertising professionals have found that OTT is the most valuable channel for achieving Key Performance Indicators (KPIs) (PREMION, 2023; Lukovitz, 2023).

Dish Network and DirectTV are multichannel video programming distributors (MVPDs) offering consumers hundreds of channels and programming that can be accessed through a satellite dish or the Internet. Consumers can also subscribe to any streaming services, such as Disney+, BritBox, and Netflix.

However, DirectTV conducted a survey and found that 22% of adults in the U.S. had canceled a streaming video subscription for three months in 2023 (Sullivan, 2023). There are many reasons, including cost, not needing content, not watching a streaming service enough to justify the cost and the flexibility of adding/dropping streaming services. However, DirectTV's chief ad sales officer predicts that "as consumers reach their limit on the number of subscriptions they are willing to pay for…we will see more consolidation and bundling of content" (Sullivan, 2023). Cable TV is predicted to lose customers as they are typically locked into service for 6-12 months, and cable operators do not invest in their exclusive content (Treffiletti, 2023).

Addressable TV advertising allows advertisers to show different ads to households while watching the same program on OTT. Currently, it is only possible on streaming TV called Over-the-Top TV (OTT), which includes content on TV shows or live streams watched over the Internet, but it is coming to satellite TV soon. Addressable TV is unavailable on linear TV, which refers to old-fashioned broadcast TV that only shows programs on a fixed schedule).

#10 - Greater Saturation & Use of Mobile Phones - Mcommerce – Mobile First Strategy



Mobile phones continue to grow in terms of the time people spend using them and the percentage of people using them to interact with the Internet and make online purchases. Statista (Buchholz, 2023) reported that mobile e-commerce sales comprise 60 percent of all e-commerce sales worldwide. Marketers must use a mobile-first strategy and ensure that their content is easily and quickly downloadable by phone, that it is formatted to fit phone screens, that they take advantage of SMS (texting) and in-app messaging, and that they use target messaging and geo-targeting, QR codes, and push notifications (Chandler, 2023).

#11 - Greater Use of Voice Search

Can you speak faster than you can write? Most people can, which explains the explosive growth of voice search via smart speakers on our phones, computers, and voice assistants, such as Google, Alexa, and Siri. Triangle Direct Media (2023) predicts that voice search will become the primary search mode by 2030. It suggests that online marketers must ensure that their websites, chatbots, and content are optimized and consistent with the spoken queries (Amati, 2022). Voice search tends to be more conversational and natural sounding. Typed queries are short (1-3 words), while spoken queries are longer. Search Engine Optimization (SEO) is also likely to be affected if voice search uses different keywords than text search. Fast food restaurants have also used voice assistants (chatbots) to take voice orders for pick up at the restaurant.

#12 – Greater Use of Visual Search with Computer Vision

Visual search is expected to grow, mainly if consumers search for products using images rather than words (Eslamboli, 2023). Computer vision, the "computer's ability to make sense of digital images, videos, and other visual inputs," enables marketers to identify products and make recommendations, allows self-driving cars to successfully engage with their surroundings, and allows facial recognition programs to work in real-time (McCoy, August 14, 2023). Marketers may wish to find pictures that can be used in the company's advertising or perhaps they found a photo that they would like to use in a marketing campaign but first need to find the original source of that photo. The major browsers (Google Lens and Bing) have an image search feature and a reverse image search feature that can be used for this purpose. Eslamboli recommends that marketers use high-quality images of their products from different angles on their websites and use metadata to connect those images to their brand.

#13 - Introduction of Faux Out-of-Home (OOH) Advertising

An interesting new experiment called faux or fake OOH advertising makes use of AR and computer-generated images to create what looks like 3-D billboard signs or extraordinary-looking physical sights, such as vehicles in the shape of designer handbags, a train with eyelashes that have mascara applied while it is moving, or the gigantic image of Barbie that was used to promote the movie (McCoy, 2023, August 11). The actual videos are only used online. Therefore, the cost of this advertising is lower, while the scale and the reach tend to be much higher.



#14 - Greater Use of Gamification by Marketers: Interactivity & Fun

In addition to interactive online video games, marketers use gamification to motivate customers to engage with their online content (Doxee, 2023). Users are given a task to complete, which causes them to spend more time on an app and have greater engagement with a brand, for which they are rewarded with points, badges, discounts, coupons, free products, and gift cards. Starbucks uses gamification where users play a videogame that requires skill. Users' scores win them points and badges, determining if they have won Starbucks points, products, or sweepstakes entries. Specific types of Starbucks purchases win users more plays and chances to win.

#15 - Owned Media is Gaining Interest

Owned media is media that is entirely under a company's control through which they build direct relationships with their audience, and more companies are seeing its benefits. Walling

(2023) states that owned media include websites, email, in-person events, physical mail, branded apps, articles, podcasts, videos, webinars, digital events, e-books, whitepapers, online courses, training programs, community forums/online groups, memes, and merchandise. The beauty of these items is that when people access them, the company can capture their email address and frequently name, address, company, and title when they wish to attend a webinar, download an article or e-book, or participate in an online group.

#16 - Adopting Universal Brandscapes – Serving Consumers of all Abilities

Katie Baron of Stylus Innovation has coined the term "University Brandscapes" to encourage marketers and retailers to "service and empower consumers of all abilities (physical, mental, sensory) within the same spaces, both physical and digital." The importance of this stems from the fact that 16% of people globally live with a disability, and as awareness and diagnoses of neurodiversity rise as the population ages, businesses should make their digital sites and retail stores more accessible. (Christie, 2023). To improve UX (user experience), marketers can retrofit physical spaces, enable customers to use screen readers, overlays, and others, and represent a cross-section of the population in their advertising.

#17 – Embracing Sustainability, Diversity, and Social Responsibility



Businesses strategically committed to protecting the environment, sustainability, diversity, and being good corporate citizens will find that consumers are willing to pay more for their goods and services, particularly if these actions and values align with their customers' values. It is essential that the company clearly communicates its commitment and actions related to sustainability and social responsibility to its target market (Tulsiani, 2023). "Environmental, social, and governance (ESG) and corporate social responsibility (CSR) will need to be part of your marketing DNA (PEGA, 2022).

#18 – Advanced Education & Greater Credentialing in Marketing

Marketing practice has become more complex, requiring greater expertise in marketing technology (MarTech), research metrics and analytics, sustainability, cultural sensitivity, and others. Marketing professors know that the content of most marketing courses must be updated to include the most current knowledge and practices in the field. Marketing professionals must keep up with a field that is changing faster than it has ever changed. The dynamic nature of marketing, similar to other professions such as medicine or law, suggests that marketing professionals must pursue continuing education by taking courses or attending conferences or by obtaining additional credentials (i.e., earning advanced degrees, taking a

specialized certificate program, or obtaining a marketing designation similar to the C.P.A. for accountants (Boyle, September 6, 2023).

## LIMITATIONS

This investigation includes predictions from a wide variety of marketing professionals, consultants, and companies that were not selected using any scientific sampling technique. Since many articles referenced in this investigation do not contain empirical studies, one should assume that they are based on the experience and opinions of the authors. Furthermore, some articles may have been written with the goal of promoting a company's or consultant's services.

## CONCLUSIONS

Marketing innovations spurred on by AI, Web 3.0, AR, VR, 5G networks, the metaverse, blockchain, and cryptocurrency will certainly change the type of work done by marketers, and it may cause some marketing positions to be eliminated as new, more complex positions are developed. New positions, such as omnichannel data scientist, model owner, prompt engineer, AI ethicist, AI trainer, validation and tester, and marketing operations/automation, will be needed (Torres, 2023).



AI technology, software, and platforms are already available to identify leads, create content, enhance SEO, provide customer service and product recommendations, optimize ad campaigns, do marketing mix modeling, develop products and packaging, analyze store traffic, optimize the supply chain, set optimal prices, and others.

The implementation of an omnichannel strategy using customer data platforms (CDPs) and AI provides a rich view of customer experiences and consumer journeys across online and offline touchpoints, which allows marketers to create highly personalized messages to target audiences.

The importance and effectiveness of various media, channels, and devices are changing. Social media, live streaming, connected TV, videos, and mobile phones are gaining in usage, while broadcast TV, cable TV, and print media are losing their share of advertising dollars. User-generated content and influencers on social media and blogs have a significant impact on consumer behavior.

The increase in voice search, visual search, social shopping, gamification, AR and VR, avatars, and digital doubles make the consumer's life easier and/or more entertaining.

Marketers must still be proactive in advancing diversity, serving consumers of all abilities, embracing sustainability and social responsibility, and protecting consumers' privacy.

Given the seismic changes in the marketing world, marketers will need advanced and/or continuing education in marketing technology, certificate programs, advanced degrees, or specialized marketing designations. In the end, the goal of all of these marketing innovations is to provide more personalized and high-quality customer experiences.

**REFERENCES**

Amati, F. (2022, August 15). *The future of digital marketing*. Amati Associates. Link: https://www.amati-associates.com/the-future-of-digital-marketing/

Arora, K. (2023, July 28). *A new era: The impact of 5G on digital marketing*. Forbes. Link: https://www.forbes.com/sites/forbesagencycouncil/2023/07/28/a-new-era-the-impact-of-5g-on-digital-marketing/?sh=2062a156264e

Beveridge, C. (2022, January 13). *What is user-generate content? And why is it important?* Hootsuite. Link: https://blog.hootsuite.com/user-generated-content-ugc/#Types_of_user-generated_content



Bonk, L. (2023, September 13*). Coca Cola's AI-generated soda tastes like marketing.* Engadget. Link: https://www.engadget.com/coca-colas-ai-generated-soda-tastes-like-marketing-184556330.html

Boyle, P. (2023, September 6). *Top 5 marketing trends shaping the digital future*. Martech series. Link: https://martechseries.com/mts-insights/guest-authors/top-5-marketing-trents-shaping-the-digital-future/

Britt, P. (2023, September 6). *Empathy & AI in customer experience: How their tango can wow.* CMS Newswire. Link: https://www.cmswire.com/customer-experience/empathy-ai-in-customer-experience-how-their-tango-can-wow/

Buchanan, D. (2023, August 13). *Looking beyond the cookie: The rise of PETs in modern digital advertising.* Medium. Link: https://medium.com/@danebuchanan/looking-beyond-the-cookie-the-rise-of-pets-in-modern-digital-advertising-bbf1d5f666aa

Buchholz, K. (2023, August 10). *Global Mobile E-Commerce Worth $2.2 Trillion in 202.* Statista. Link: https://www.statista.com/chart/13139/estimated-worldwide-mobile-e-commerce-sales/

Chandler, A. (2023, February 21). *5 Marketing tips for brand success.* Entrepreneur. Link: https://www.entrepreneur.com/growing-a-business/top-5-marketing-tips-for-a-successful-brand/444539

Chitrakorn, K. (2021, December 7). *What influencer marketing looks like in the metaverse?* Vogue Business. Link: https://www.voguebusiness.com/technology/what-influencer-marketing-looks-like-in-the-metaverse

Christie, B. (2023, July 4). The future of retail: Part 1. Strategy. Link: https://strategyonline.ca/2023/07/04/the-future-of-retail-part-1/

Ciampa, Z. (2023, June 28). *Adweek pulls back curtain on the future of digital brand marketing.* S&PGlobal. Link: https://www.spglobal.com/marketintelligence/en/news-insights/research/adweek-pulls-back-curtain-on-the-future-of-digital-brand-marketing

Comarch. (2023.). *The future of AI in the retail industry: What to expect*. Marketing week Link: from https://www.marketingweek.com/the-future-of-ai-in-the-retail-industry-what-to-expect/



Consumer Goods Technology. (2023, August 31). *Beyond the hype: How AI is reshaping retail & CPG marketing*. Consumer Goods Link: https://consumergoods.com/beyond-hype-how-ai-reshaping-retail-cpg-marketing.

Decker, A. (2023, March 7). *9 retail omnichannel trends to watch in 2023*. Shopify. Link: https://www.shopify.com/sg/retail/omnichannel-trends#

Di Carlo, M. (2023, July 19). *Why granfluencers are the future of social media marketing.* The Weekly Crunch. Link: https://www.crunchytales.com/why-granfluencers-are-the-future-of-social-media-marketing/

Doxee. (2023). *Digital marketing trends for 2023*. Doxee. Link: https://www.doxee.com/blog/digital-marketing/digital-marketing-trends-for-2023-2/#

Ehlers, K. (2022). *Influencer marketing: 2023 Predictions*. Forbes Link: https://www.forbes.com/sites/forbesagencycouncil/2022/12/12/influencer-marketing-2023-predictions/?sh=649f5cb14b54

Eslamboli, M. (2023, February 15). *5 predictions for digital marketing in 2023.* Forbes. Link: https://www.forbes.com/sites/forbesagencycouncil/2023/02/15/5-predictions-for-digital-marketing-in-2023/?sh=376effcc719d

Fares, O. H. (2023, January 22). *ChatGPT could be a game-changer for marketers, but it won't replace humans any time soon*. The Conversation. Link: https://theconversation.com/chatgpt-could-be-a-game-changer-for-marketers-but-it-wont-replace-humans-any-time-soon-198053

Gearrice. (2023, July 25). *The future of AI in digital marketing: trends and predictions.* Gearrice. Link: https://www.gearrice.com/update/ai-in-digital-marketing/

Hotz, S. (2023, September 7*). Cordial begins unveiling its AI roadmap to transform the future of marketing.* Cision PR Newswire. Link: https://www.prnewswire.com/news-releases/cordial-begins-unveiling-its-ai-roadmap-to-transform-the-future-of-marketing-301920013.html

Hsu, J. (2023, August 25). *The future of E-Commerce in the Interworld Metaverse: Immersive and personalized shopping experiences await.* CMSWire. Link: https://www.cmswire.com/the-wire/the-future-of-e-commerce-in-the-interworld-metaverse-immersive-and-personalized-shopping-experiences-await/



Huston, S. (2023, July 18). *'Butterfly Effect' customer journeys: how algorithms change everything.* The Drum. Link: https://www.thedrum.com/opinion/2023/07/18/butterfly-effect-customer-journeys-how-algorithms-change-everything#

Hyder, S. (2023, October 3). *Influencer marketing is out. Creator marketing is in. Build trust with creators to amplify your brand*. INC. magazine. Link: https://www.inc.com/shama-hyder/influencer-marketing-is-out-creator-marketing-is-in.html

Influencer Marketing Hub. (2023). Livestream Shopping. Influencer Marketing Hub. Link: https://influencermarketinghub.com/glossary/livestream-shopping/

InterWorld. (2023). *A Web3 AI Metaverse.* InterWorld. Link: https://interworld.io/pdfs/InterWorldLitepaper.pdf

Jacob, A. (2023, July 19). *The future is here: Leveraging marketing services in the metaverse*. TechBullion. Link: https://techbullion.com/the-future-is-here-leveraging-marketing-services-in-the-metaverse/

Johnson, T. (2022, April 13). *The ultimate list of data clean room providers.* Tinuiti. Link: https://tinuiti.com/blog/data-privacy/list-of-data-clean-room-providers/

Jonmar. (2023). *Why WebAR is the new ecommerce*. MediaPost. Link: https://www.mediapost.com/publications/article/388802/why-webar-is-the-new-ecommerce.html?

Karjian, R. (2023, August 16). *The history of artificial intelligence: complete AI timeline*, TechTarget.com, Link: https://www.techtarget.com/searchenterpriseai/tip/The-history-of-artificial-intelligence-Complete-AI-timeline.

Kenan, J. (2023, September 7). *What does the future of decentralized social media mean for marketers?* SproutSocial.com. Link: https://sproutsocial.com/insights/decentralized-social-media/



Kernochan, W. (2023, September 4). *The future of customer engagement: 10 trends to watch.* Enterprise Apps Today. Link: https://www.enterpriseappstoday.com/top-10/the-future-of-customer-engagement-10-trends-to-watch.html#google_vignette

Khalid, Z. (2023, February 5). *8 ways AI will change the future of marketing in 2023*. Globe Echo. Link: https://globeecho.com/business/8-ways-ai-will-change-the-future-of-marketing-in-2023/

Khalid, Z. (2023, September 29). *The future of marketing: Emerging trends and technologies*. Globe Echo. Link: https://GLOBEECHO.COM/BUSINESS/THE-FUTURE-OF-MARKETING-EMERGING-TRENDS-AND-TECHNOLOGIES/

Kolvitz, E. (2020, January 9). *Marketing & martech trends in 2030: Past, present, and future*. Link: https://www.bynder.com/en/blog/marketing-martech-2030-past-present-future/

Koziolek, M. (2023, July 26). *5 predictions to help retailers prepare for the future of retention marketing.* Total Retail. Link: https://www.mytotalretail.com/article/5-predictions-to-help-retailers-prepare-for-the-future-of-retention-marketing/

KPMG LLP. (2023, August 7). *Is your MarTech stack ready to say goodbye to third-party cookies? 5 steps to prepare for a cookie-less world*. KPMG. Link:

https://kpmg.com/us/en/articles/2023/your-martech-stack-ready-say-goodbye-third-party-cookies.html?

Lukovitz, K. (2023). *CTV Advertisers +4% in 1H, ROKU maintains 40% of impressions.* MediaPost. Link: https://www.mediapost.com/publications/article/388968/ctv-advertisers-4-in-1h-roku-maintains-40-of-i.html

McCoy, K. (2023, February 16). *Tech-driven marketing strategies pick up as AR/VR and AI become more accessible.* DIGIDAY. Link: https://digiday.com/marketing/tech-driven-marketing-strategies-pick-up-as-ar-vr-and-ai-become-more-accessible/

McCoy, K. (2023, August 11). *What Maybelline's 'faux OOH' ads say about the future of advertising in augmented reality*. DIGIDAY. Link: https://digiday.com/marketing/what-maybellines-faux-ooh-ads-say-about-the-future-of-advertising-in-augmented-reality/

McCoy, K. & Swant, M. (2023, August 14). *Digiday's definitive, if not exhaustive, 2023 artificial intelligence glossary.* DIGIDAY. Link: https://digiday.com/marketing/digidays-definitive-if-not-exhaustive-2023-artificial-intelligence-glossary/



McDowell, M. (2023, July 2014). *Valentino to dress Meta avatars in digital fashion*. Vogue Business. Link: https://www.voguebusiness.com/technology/valentino-to-dress-meta-avatars-in-digital-fashion

McKinsey & Company. (2022, August 17). *What is the Metaverse?* McKinsey & Company. Link: https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-the-metaverse

Martin, P. (2023, September 25). *Super-Power your teams with generative AI in customer service.* CMSwire.com. Link: https://www.cmswire.com/customer-experience/super-power-your-teams-with-generative-ai-in-customer-service/

Mileva, G. (2022, December 26). *Top 15 VR marketing examples for 2023*. Influencer Marketing Hub. Link: https://influencermarketinghub.com/vr-marketing-examples/#toc-0

Mueller, J. (2023, October 2). *The future of shopping is social: How cloud-based social commerce is re-defining the buyer journey.* Total Retail. Link:

https://www.mytotalretail.com/article/the-future-of-shopping-is-social-how-cloud-based-social-commerce-is-redefining-the-buyer-journey/

Nanji, A. (2023). *How Attitudes Toward AI Vary Among Countries and Demographics.* MarketingProfs. Link https://www.marketingprofs.com/charts/2023/49920/how-attitudes-toward-ai-vary-among-countries-and-demographics

Nesbitt, A. (2023, September 10). *AI-Powered marketing: A roadmap for executive leaders to drive innovation*. Medium. Link: https://medium.datadriveninvestor.com/ai-powered-marketing-a-roadmap-for-executive-leaders-to-drive-innovation-74b48267b3ac

Palmer, J. (2023, August 26). *Exploring key martech trends beyond generative AI.* Cryptopolitan. Link: https://www.cryptopolitan.com/key-martech-trends-beyond-generative-ai/

Pandey, E. (2023, February 12). *The rise of the anti-influencers.* Axios. Link: https://www.axios.com/2023/02/12/tiktok-instagram-deinfluencing-trend



PEGA. (2022). *The Future of Marketing Report. 7 trends changing the status quo.* PEGA. Link: https://www.pega.com/future-of-marketing

Petersson, D. & Cameron H-Pour. (2023, June 21). *AI vs. machine learning vs. deep learning: key differences*, TechTarget.com. https://www.techtarget.com/searchenterpriseai/tip/AI-vs-machine-learning-vs-deep-learning-Key-differences?Offer=abMeterCharCount_var3.

Pittaluga, M. (2023). *Will artificial intelligence Change the World of Digital Marketing Forever?* Forbes. Link: https://www.forbes.com/sites/forbesbusinesscouncil/2023/02/08/will-artificial-intelligence-change-the-world-of-digital-marketing-forever/?sh=656f808b30ef

Pophal, L. (2023, June 30). *The Top Marketing Trends for 2023: AI Captures the Mindshare, but Marketers Have More on Their Plates*. DestinationCRM.com. Link: https://www.destinationcrm.com/Articles/Editorial/Magazine-Features/The-Top-Marketing-Trends-for-2023-AI-Captures-the-Most-Mindshare-but-Marketers-Have-More-on-Their-Plates-159431.aspx

PREMION. (2023, June). *CTV/OTT Advertiser Study*, PREMION. Link: Premion.com/thank-you-for-your-interest-in-our-2023-ctv-ott-advertiser-study/

Sherman, J. (2023, August 3). *CDP integration & personalization: A new standard of marketing*. Spiceworks. Link: https://www.spiceworks.com/marketing/customer-data/guest-article/cdp-integration-and-personalization/

Smith, E. (2023, September 29). *What TikTok's Ecommerce Leap Means for Marketers.* Media Post. Link: https://www.mediapost.com/publications/article/389728/what-tiktoks-ecommerce-leap-means-for-marketers.html?edition=131848#

Sovay, T. (2023, July 20). *Brands outperform competitors in most KPIs with creator marketing.* The Drum. Link: https://www.thedrum.com/profile/creatoriq/news/how-and-why-to-maximize-your-creator-marketing-investment

Square. (2023, April 4). *The Future of Commerce: 2023 Edition*. Square. Link: https://squareup.com/us/en/the-bottom-line/selling-anywhere/future-of-commerce

Sullivan, L. (2023). *DirectTV: Digital media, addressable TV still a priority for advertisers.* MediaPost. Link: https://www.mediapost.com/publications/article/388241/directtv-digital-media-addressable-tv-still-a-pr.html

Swant, M. (2023, February 9). *Wave of AI-based marketing startups arrives as Microsoft, Google rush AI-based products to market*. Digiday. Link: https://digiday.com/marketing/marketing-startups-try-to-profit-as-tech-giants-battle-over-generative-ai/

Target Internet. (2023). *How different age groups are using social media 2023.* Target Internet. Link: https://targetinternet.com/resources/how-different-age-groups-are-using-social-media-2023/

Torres, J. (2023). *5 AI jobs poised to change marketing landscape.* CMSWIRE. Link: https://www.cmswire.com/digital-marketing/5-ai-jobs-poised-to-change-marketing-landscape/

TRACXN. (2023, June 16). *Artificial intelligence startups in United States.* TRACXN. Link: https://tracxn.com/d/explore/artificial-intelligence-startups-in-united-states/__8hhT66RA16YeZhW3QByF6cGkAjrM6ertfKJuKbQIiJg/companies

Traver, C. (2023). *E-commerce 2023: Trends and Future Outlook.* Pearson. Link: https://www.pearson.com/en-us/higher-education/insights-and-events/webinars-events/2023/09/e-commerce-2023-trends-and-future-outlook.html

Treffiletti, C. (2023, September 20). *How cable may have just sunk its own ships.* Media Insider. Link: https://www.mediapost.com/publications/article/389397/how-cable-may-have-just-sunk-its-own-ships.html

Triangle Direct Media. (2023). *Digital marketing in 2030: Mind-blowing trends you can't afford to Miss.* Triangle Direct Media website. Link: https://www.triangledirectmedia.com/blog/digital-marketing-in-2030-mind-blowing-trends.html#

Tulsiani, Y. (2023, August 24). *Proactive marketing approaches for small businesses in the future*. AdGully. Link: https://www.adgully.com/proactive-marketing-approaches-for-small-businesses-in-the-future-135697.html

Vrountas, T. (2023). *Contextual advertising 101: how it works, benefits & why it's necessary for relevant ads*. Instapage. Link: https://instapage.com/blog/contextual-advertising/#

Walling, J. (2023, September 6). *This former CMO believes "Owned Media" is the future of marketing.* Business News. Link: https://biz.crast.net/this-former-cmo-believes-owned-media-is-the-future-of-marketing/



Wolf, J. (2023, October 2). *The future of shoppable video ads is here: Embracing active attention.* Total Retail. Link: https://www.mytotalretail.com/article/the-future-of-shoppable-video-ads-is-here-embracing-active-attention/

Zhang, K. (2023, September 4). *Why the death of cookies will make online advertising better*. Entrepreneur. Link: https://www.entrepreneur.com/growing-a-business/why-the-death-of-cookies-will-make-online-advertising-better/457344

Mercados y Negocios
1665-7039 printed
2594-0163 on line
Year 25, n. 51, January-April (2024)

# Corporate Social Responsibility as a Determinant of Competitiveness in Supermarkets

*Responsabilidad Social Empresarial como determinante de la competitividad en supermercados*

https://doi.org/10.32870/myn.vi51.7717

Yelly Yamparli Pardo Rozo
Universidad de la Amazonia, Florencia, Caquetá (Colombia)
y.pardo@udla.edu.co
https://orcid.org/0000-0001-8060-0281
Gabriela Carvajal Valderrama
Universidad de la Amazonia, Florencia, Caquetá (Colombia)
ga.carvajal@udla.edu.co
https://orcid.org/0000-0001-9543-655X
Alexandra Perdomo Carvajal
Universidad de la Amazonia, Florencia, Caquetá (Colombia)
ale.perdomo@udla.edu.co
https://orcid.org/0000-0003-0730-7964

Received: August 15, 2023
Accepted: December 28, 2023

**ABSTRACT**

The research aimed to analyze the contribution of Corporate Social Responsibility (CSR) to the competitiveness of supermarkets in Florencia, Caquetá in southern Colombia. In a sample of six supermarkets, a self-assessment survey of CSR and competitiveness variables was carried out for 2021 to 2022, consisting of six dimensions: values and ethical principles, responsible marketing, economy and finance, social commitment, quality of working life, and environment. The tool makes it possible to measure the commitment of the organization's CSR activities to competitiveness. The environment is the dimension with the lowest score and contribution to competitiveness in the dimensions evaluated in the supermarkets (2.0 on a scale of 0.0 - 3.0). According to the correlation analysis, there is a relationship between CSR and competitive position. Awareness-raising and training actions aimed at stakeholders are proposed.

Keywords: sustainable development, environmental management, stakeholders, environmental policy.

JEL code: M14

Mercados y Negocios por Departament
o de Mercadotecnia y Negocios Internacionales. Universidad de Guadalajara se distribuye bajo una Licencia Creative Commons Atribución-NoComercial 4.0 Internacional. Basada en una obra en http://mercadosynegocios.cucea.udg.mx/index.php/MYN.

**RESUMEN**

La investigación buscó analizar la contribución de la Responsabilidad Social Empresarial (RSE) en la competitividad de los supermercados en Florencia, Caquetá al sur de Colombia. En una muestra de seis supermercados se realizó una encuesta de autoevaluación de la RSE y variables de la competitividad en el periodo de 2021 a 2022, que constó de seis dimensiones: valores y principios éticos, mercadeo responsable, economía y finanzas, compromiso social, calidad de vida laboral y medio ambiente. La herramienta permite medir el compromiso de las actividades de la RSE de la organización hacia la competitividad. El medio ambiente es la dimensión con más baja puntuación y aportes hacia la competitividad en las dimensiones evaluadas en los supermercados (2,0 en escala de 0,0 – 3,0). Según el análisis de correlación existe una relación entre la RSE y la posición competitiva. Se proponen acciones de sensibilización y capacitación dirigida a los grupos de interés.

**Palabras Clave:** Desarrollo sostenible, gestión ambiental, grupos de interés, política ambiental

Código JEL: M14.

## INTRODUCTION

Marketing processes are links in the supply chain of goods and services for households, where "the moment of truth" is incurred between the organization, the product, and the customer; it is essential time to induce the consumer on the rational use and disposal of by-products derived from the purchase process.

In this sense, from the perspective of Corporate Social Responsibility (CSR), trading centers must try to induce and guide both internal and external customers on the use of products and the reduction of the impact on the environment due to the premise of the conservation of the ecosystemic balance and the quality of the environment, as an argument for human welfare and competitiveness of companies.

Because Florencia, Caquetá, in Colombia, about 17% of GDP is attributed to the commerce sector (Mincomercio, Industria y Turismo, 2023) and considering that supermarkets are the places of preference for the acquisition of essential household goods, such as food, beverages, toiletries, stationery, varieties, liquors, clothing, toys, kitchen items, and appliances, among others, these places of commerce should adopt environmental management policies with their stakeholders - partners, suppliers, customers, workers, the community in general - as well as with the community in general, clothing, toys, kitchenware, and household appliances, among others, these places of commerce should adopt environmental management policies with their stakeholders - partners, suppliers, customers, workers and the community in general, as proposed by the CSR approach, to seek a differential element among their competitors (Terán et al., 2017).



Supermarkets are places that, within the urban idiosyncrasy in Colombia have a significant cultural influence on the forms and habits of consumption of the different products of the family basket, as well as the daily decisions on the disposal of by-products such as packaging and waste from the family support activity (Ortíz-Coronado & Páramos-Morales, 2021), so that the orientations or practices that are induced from there can generate an impact on consumers, as one of the benefits of CSR (Jaimes-Valdez et al., 2021). CSR generates a competitive advantage that can translate into increased sales, customer loyalty, and a positive image from the consumer's perspective.

CSR is a valuable tool for the construction of business management models that facilitates the creation of value and fosters inter-institutional and social relationships that are profitable in economic, social, and environmental terms, improving business conditions in terms of competitiveness (Hernández et al., 2020).

Following the approach of Cañizares and Arévalo (2020) on the proper fulfillment of CSR in companies, the following research question was posed: How to evaluate the corporate social responsibility programs applied in supermarkets in Florencia-Caquetá and their contribution to the competitiveness of companies? Therefore, the objective of this research project was to evaluate corporate social responsibility (CSR) in the city of Florencia - Caquetá and its impact on competitiveness from the management systems, environmental policy, methods, or tools used in the most representative supermarkets of commerce in the region, their contribution and there propose solutions to improve the impact on competitiveness.

The results will make it possible to propose actions that impact stakeholders such as workers, customers, and suppliers since CSR benefits are evident in organizations' internal and external conditions (Camacho-Parra & Soaza-Forero, 2016).

The topic is framed within the themes of business, environment, and competitiveness, relevant to the global policy agenda considered in the projected development goals for 2030 (United Nations, 2015) related to sustainable production and consumption. The resulting information will make it possible to design guidelines for decision-makers in managing the sector's companies to comply with Colombian policies to strengthen competitiveness and sustainable development.



## COMPETITIVENESS AS A BUSINESS APPROACH

Competitiveness is an approach that dates back to the 1960s and is defined as the ability of companies to position and maintain themselves in the market with a performance that exceeds the average performance of the sector's industries (Porter, 1998).

Competitiveness integrates markets between countries and economic sectors based on the openness processes between highly productive companies and organizations (Porter, 2008). According to the author, competitiveness in organizations requires the design of strategies that are classified into three categories: cost leadership, differentiation, and focus strategy.

Competitiveness requires efficient companies, sectors, or countries to use their technologies, productivity, and administrative and financial efficiency. Competitiveness, therefore, implies efficient and globalized production systems. Productivity refers to optimization or the optimum ratio between input and output, and although it does not necessarily require insertion in global markets, it is essential for competitiveness.

It is also related to technological, operational, or physical efficiency. On the other hand, allocative or economic efficiency is a concept of linear programming that aims to optimize the variables of production, sales, costs, and profitability. Both operational and

administrative efficiency are critical factors in the search for competitive companies and sectors.

A country's competitiveness is related to the development capacity of its industrial sectors, which in turn depends on the level of human capital and technological investment available. Another essential concept linked to competitiveness and its development is innovation. Innovation, which goes beyond mere invention, creativity, mass application, and the capacity to commercialize, transforms the collective mentality of the agents of change in the social system. Innovation for companies allows them to have the capacity to improve the well-being of stakeholders through substantial changes in the quality of life.

The competitive company innovates and forces competitors and the sector to surpass themselves and thus improve financial and technological performance and strengthen human talent (Porter, 2021). Porter clarifies that while comparative advantages are usually external variables to organizations, competitive advantages are created, which is why the former is static.

The latter has a dynamic nature that only depends on human capital. In the last two decades, the competitive diamond approach proposed by Porter included the environmental and sustainable component in response to the industry's impact on the environment and given the ethical sense that this entails.



The competitiveness reports and studies carried out in the country have as fundamental aspects: the efficiency of the state, justice, infrastructure, digital economy, education, health, labor market, pensions, as well as foreign trade, tax system, business financing, science, technology, and innovation, green growth and productivity (CPC, 2022).

The four areas of competitiveness studied in the economic sectors present the following levels: microeconomic (the creation of competitive advantages of the company, which evaluates its management capacity, strategies, and innovation); macroeconomic, which refers to the environment, the factor market, physical and institutional infrastructure and specific policies in science, technology, environment, and innovation, at the regional level.

The macroeconomic level corresponds to fiscal, monetary, trade, exchange, and budgetary policies. The metaeconomic level is oriented toward developing the strategic vision and compliance with development plans for international trade (Peña-Torres et al., 2021).

## CORPORATE SOCIAL RESPONSABILITY CSR

CSR is considered a strategy that seeks to achieve high standards at the corporate level while contributing to the improvement of internal and external processes of the organization to reduce the impact of decisions on society and the environment (Gutiérrez-Calderón et al., 2018). It is a concept that has become important in organizations in recent years (Cardona, 2016).

Other authors define CSR as a commitment made by an organization to contribute to sustainable development and, in turn, to the well-being of employees, families, the local community, and society in general (Severino-González et al., 2022). However, Toca-Torres (2017) mentions that part of the morale vis-à-vis the concept of CSR is precisely not seeking purposes other than selfless service. After the mandatory isolation due to the pandemic caused by the appearance of SarszCov-2, CSR is a management model that has become much more relevant (Valencia & Esquivel, 2022).

The origin of CSR dates back to the 19th century, when large corporations sought to strengthen their ties with democracy and the people's standard of living, promoting the idea that the economic progress of business would bring about a general improvement for the people.



Among the well-known examples of CSR are Henry Ford's initiative in 1936 to create the Ford Foundation and contribute ideas for his employees to improve their performance and environment and Starbucks' decision to ban straws in all its stores (2018).

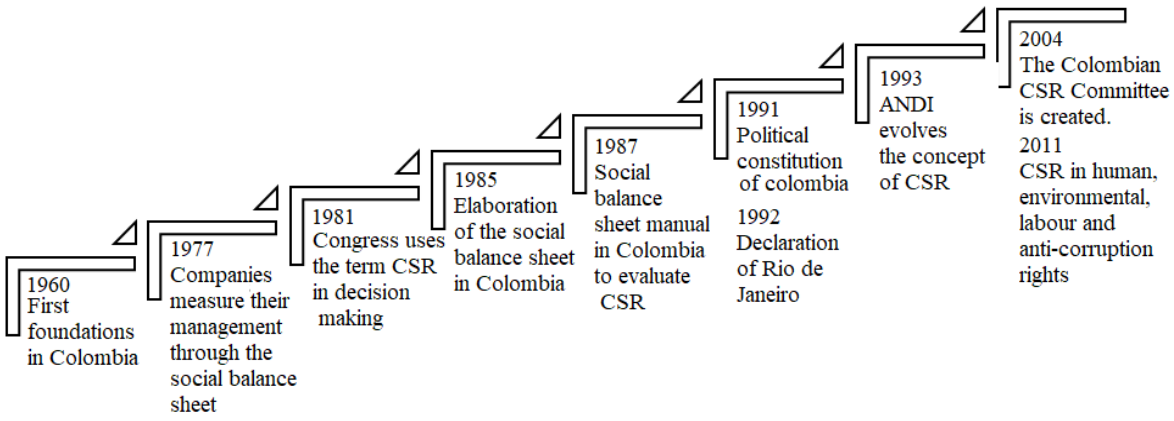
In China, it is a primary movement to adopt social and/or environmental practices that make them more competitive. "Between 1999 and 2005, only 22 CSR reports were published. That number between 2006 and 2009 grew to 1,600 sustainability reports in China" (Lazovska, 2017).

The context of CSR in the Colombian context CSR is not explicitly contemplated in the Constitution of the Republic of Colombia or Law 99 of 1993 (Colombian environmental law). However, some sections mention it secondarily: "Article 333: Economic activity and private initiative are free, within the limits of the common good.

For its exercise, no one may demand prior permits or requirements, without authorization by law"; "The company, as the basis of development, has a social function that implies obligations; "The State shall strengthen solidarity organizations and stimulate business development." These fragments of the Constitution could be described as a proper legal

framework in which CSR could find solid bases for implementing actual corporate responsibility policies. Figure 1 summarizes the evolution of CSR in the country.

Figure 1. Evolution of Corporate Social Responsibility CSR in Colombia




Source: Own elaboration with information from Gutiérrez-Calderón et al. (2018) and Valencia (2018).

In Colombia, the companies that adopt these corporate social responsibility policies have yet to determine their impact on valuation and likewise have yet to identify CSR as a source that generates benefits for stakeholders (Petro-Ramos et al., 2020).



There is a debate on whether CSR should be considered in light of generating benefits or only in the ethical work of not affecting and if it generates such welfare (Ospina-Rivera & Sotelo-Bula, 2013). Law 668 of 2016 regulates the use of plastic bags in supermarkets to reduce the impact caused by these on water sources that threaten aquatic animal species and water quality (Pardo Rozo et al., 2016).

Due to the relevance of CSR for the management and management in companies, and because supermarkets are the most critical distribution points and constitute one of the first moments of truth between the consumer and the companies that supply goods and products of primary necessity. For example, the study by Parra-Báez et al. (2019) discusses the importance of incorporating into CSR the inclusion policy regarding the right to link people with disabilities.

Variables associated with competitiveness and CSR in companies can be considered as follows: i. Internal factors: Human talent capabilities (perception of stakeholders (employees, direct customers, suppliers) on CSR, financial capabilities (direct relationship between CSR program costs and profitability, customer loyalty), technological capabilities (productivity from the reduction of waste, time, effort); operational capacity (increased productivity). ii. External factors. Market capabilities (positioning, market capture, customer growth), human talent capabilities (external, perception of suppliers, competitors, potential customers, communities), economic and political capabilities (compliance with the global sustainable

development agenda, government plans, and regulations), context capabilities (environmental impacts, relationship with competitors). In summary, one mechanism for assessing sustainability in a context, a sector, or a community is to observe improvements in the quality of life, efficiency, productivity, competitiveness, respect for the balance, and conservation of ecosystem services of the communities.

## RELATIONSHIP BETWEEN COMPETITIVENESS AND CSR

There are two approaches to CSR, according to its fundamental objectives. The first, and historically the initial one, was the philanthropic stage, where CSR is an intrinsic value in each of the company's operations, where the cost was assumed without seeking any retribution or recognition, which was discussed until 1950. The second contemplates CSR as an advantage in generating value where resources are allocated to develop this concept, compatible with the theory of competitive advantage (Ramirez, 2018). Recent research on the positive effects of CSR on competitiveness is cited below (Table 1).

Table 1. CSR and competitiveness studies in the Latin American region and Colombia

| Authors | Principal conclusion |
|---|---|
| Lara-Manjarrez and Sánchez-Gutiérrez (2020) | Increased competitiveness and profitability of companies in Mexico. |
| Castro-Alfaro (2017), Morgestein-Sánchez (2019) | Economic, social, and environmental benefits for Colombian companies. |
| Caro & Salazar (2019), Ramírez (2018) | Environmental activities contribute to the competitiveness of MSMEs in Peru. |
| Andrade Restrepo and Andrade Restrepo (2022) | Construction of reciprocal benefits between the company and the community. |
| León and others (2019) | Contributions of CSR in universities, companies, and communities in Latin American countries. |
| Severino-González and others (2022a, 2022b), Severino-González and others (2020), Acuña Moraga and Severino González (2019). | Increased efficiency in Chilean companies in the health sector, supermarkets, and the wine trade. Need to improve CSR in the community of mining companies in Chile. |

Source: Own elaboration

From these studies, it can be summarized that CSR is considered a new method within business management that positively affects companies, evidenced in their financial statements, sustainability, and position in the medium and long term, generating a more strategic vision of the environment and the business organization itself.

These studies document the contributions to financial performance and internal and external social and environmental indicators, which are variables associated with competitiveness. Other authors, such as Scarpellini et al. (2020), document the relationship between competitiveness, social responsibility, accounting, and environmental management in the dynamics of the circular economy.

## METHODOLOGY

The research was conducted in the urban area of Florencia, Caquetá, and the unit of analysis was supermarkets. Although different, the supermarkets surveyed had similar characteristics, such as their organizational structure, and the popular and crowded ones were surveyed. The research has a mixed approach because of its analysis methods and because qualitative and quantitative methods were used. It is also descriptive and propositional because it characterizes a phenomenon and formulates actions for improvement or changes.

The study population consisted of chain supermarkets registered in the Chamber of Commerce of Florencia for Caquetá (2023). According to the records, 695 businesses were found within merchandise, neighborhood stores, and specialized stores. There are 19 chain supermarkets (100%), of which six (6) have greater recognition by Florencian households: Éxito (2 branches), D1 (3), Justo & Bueno (4), Surtiplaza (2), Supermio (4), Frutas y Verduras El Primo (4). The sample represents 30%. Therefore, the type of sampling used in the research was non-probabilistic or convenience sampling following Severino-González, et al. (2022), since the chain supermarkets of most excellent recall for the client were selected instead of random selection.



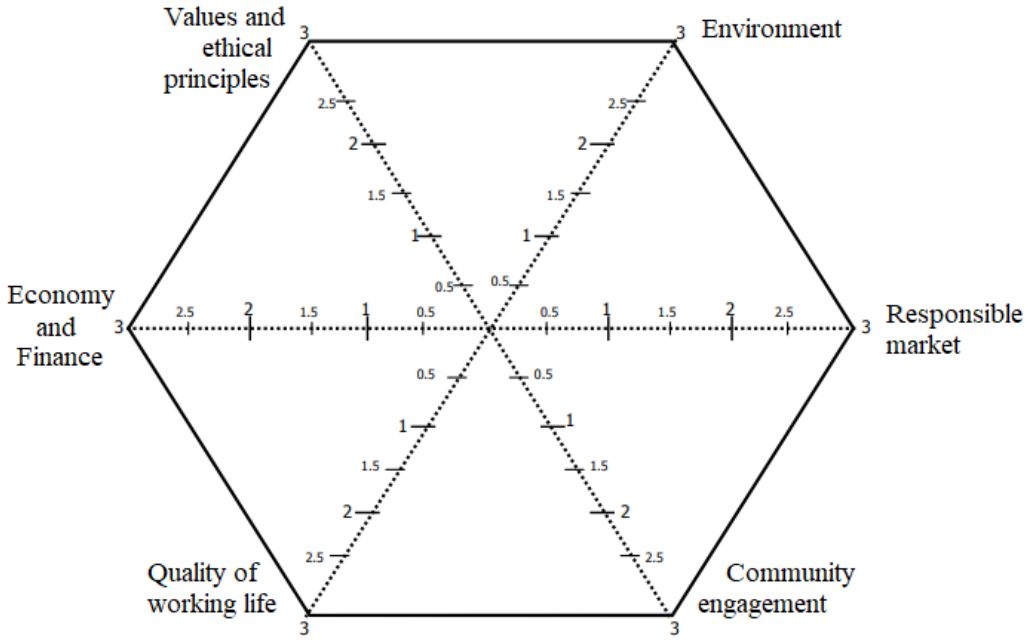
The research had primary information sources for which the survey and interview technique was applied from the use of the CSR Evaluation Manual developed by Yepes (2016), which is based on a conventional process of strategic planning and continuous improvement, such as diagnosis, design of actions, implementation, evaluation, and monitoring (Nova et al., 2020).

The instrument is aimed at managers or supervisors. It uses the ERSOS structure (Yepes, 2016) (Evaluation of Corporate Social Responsibility) where six dimensions are established: i) Values and Ethical Principles, ii) Economy and Finance, iii) Quality of Working Life, iv) Commitment to the Community, v) Responsible Marketing and vi) Environment. Secondary information sources such as reports, literature reviews, and previous studies, according to Puente-López & Lis-Gutiérrez (2018), were also used. A diagnosis of corporate social responsibility was made based on factors such as work environment, responsible marketing, environmental protection, community support, values, and ethical principles to determine the company's performance in the different areas.

Likert scales with numerical ratings facilitated the measurement and interpretation of data. For example, YES (Always): 3; Sometimes: 2; No (Never): 1; with options of Not applicable or No answer. The averages obtained in each area should be transferred to the axes of the Hexagon (marked with a dot) to visualize the result individually. The figure resulting from

joining the points already marked is intended to illustrate the overall situation of the company in terms of CSR: the closer the figure obtained is to the Hexagon, the greater the development of the company's CSR" (Universidad del Externado - CSR tools) (Figure 2).

Figure 2. CSR Assessment Manual Graphic




Source: Own elaboration

The hexagon shape determines how the organization is doing regarding CSR, so the closer the shape draws to the Hexagon, the more CSR is being developed.

*METHODS AND TECHNIQUES OF ANALYSIS*

In the diagnostic phase of the supermarkets, surveys were used for the human talent linked to the company and interviews for managers and administrators. The information analysis phase in the supermarkets used descriptive statistics, evaluation according to Yepes' manual (2016), and sequential explanatory analysis.

The phase of identifying actions to improve CSR practices used a SWOT analysis (weaknesses, opportunities, strengths, and threats) according to David & David (2017) in the strategic direction processes. A correlation matrix was performed as proposed in Caro & Salazar (2018) to determine the degree of linear association between the variables of competitiveness (market positioning) and the CSR evaluation score of supermarkets.

## RESULTS. EVALUATION OF CSR IN SUPERMARKETS IN FLORENCIA, CAQUETÁ

These were the results for the six dimensions of CSR (Table 2).

Table 2. Average results for each dimension for supermarkets in Florencia Caquetá

| Supermarket | Ethics and value | Finance | Quality of work | Community | Responsible market | Environment |
|---|---|---|---|---|---|---|
| Justo y Bueno | 2,6 | 2,4 | 2,5 | 1,9 | 2,7 | 2,0 |
| El primo | 3,0 | 2,7 | 2,7 | 2,5 | 2,9 | 2,4 |
| Supermío | 3,0 | 2,7 | 2,7 | 3,0 | 3,0 | 2,8 |
| Éxito | 3,0 | 2,7 | 2,8 | 3,0 | 3,0 | 2,7 |
| Surtiplaza | 2,8 | 2,6 | 2,8 | 2,0 | 2,9 | 1,8 |
| El D1 | 2,9 | 2,2 | 2,7 | 1,5 | 2,3 | 1,9 |
| Total | 2,9 | 2,6 | 2,7 | 2,3 | 2,8 | 2,2 |

Source: Own elaboration

*Values and ethical principles*

Assessed aspects associated with the inclusion of CSR policy in the company's mission, vision, and philosophy; the degree of awareness of these policies and CSR among the company's human resources; the criteria for ethics and values in internal and external relations in the company for both workers and management; the existence of rules to prevent corrupt practices and mechanisms for complaints; procedures for possible corruption, sanctions; and the management of benefits and donations.



Eighty-seven percent of supermarkets have effective management of these aspects, and the remaining 13% have management that is considered acceptable. The average for the dimensions for the six companies was 2.9. This rank places the dimension in high compliance with the standards proposed by the CSR assessment manual. In other words, the most representative supermarkets in Florencia, Caquetá, adhere to ethical principles and value the philosophy managed within the working environment.

*Economics and Finance*

This dimension asked about the existence of orderly accounting and operational records; budgeting; financial projections; compliance with corporate, tax, and legal obligations; implementation of auditing processes (internal and external); assurance of cash flows, and sufficiency of own resources.

Questions were also asked about continuous improvement processes (in planning, execution, monitoring, and control); whether there are legal processes and mechanisms for handling donations in cash and in-kind; and information to employees on the financial status of the company. In this regard, 79% of companies meet all these requirements. 100% of the supermarkets surveyed keep accounting records of their operations and comply with their tax obligations as required by law. The average for the companies was 2.5 which places this dimension in a high range.

*Quality of working life*

A harmonization is sought between the interests of human talent and the company's objectives regarding human rights and quality of life. Here, we inquired about the existence and application of programs for the prevention of accidents, occupational diseases, and disasters by the law; improvement of working conditions beyond the regulations; the existence of sanctions and rules prohibiting discrimination, harassment at work, and psychological harassment; clarity about the form of payment within the legality for employees, their hiring in general.

It was also verified whether the companies promote human, labor, and environmental rights and training and encourage the participation of internal human talent or collaborators. It was found that 90% of the companies offer training before employment and are involved in a communication roundtable where employees are taught about their rights and aspects of interest to be managed within each supermarket. The average score across the six supermarkets was 2.7.



*Commitment to the community*

In this section, we can find additional actions that the companies carry out under specific parameters and conditions, totally aimed at the beneficiaries, to make themselves known and collaborate with their stakeholders, thus achieving an impact on responsible projects with the community.

We inquired about aspects related to the knowledge of the impacts generated by business activities on the community's life in social, economic, or environmental matters and the action plans to reduce these impacts and their due follow-up. Only 58% of companies implement these activities. There are 18% of supermarkets do this; sometimes, 14% have managed very little of these aspects mentioned towards community engagement, and 10% have yet to manage these aspects. The overall average for the community engagement dimension of the supermarkets surveyed in Florencia-Caqueta was 2.3, which is low.

*Environment*

In this dimension, supermarkets were asked about their commitment to sustainable development and actions that reflect respect for the environment by producing and marketing

their products and services. The survey asked if the company was aware of the environmental impacts of its activities, knowledge of environmental regulations on the use of public spaces, the existence of ecological policies for selecting suppliers and products, the actions that companies implement to protect the environment, waste management, paper, energy, water, environmental education, and environmental complaints.

Only 48% of the supermarkets apply the items to be evaluated, 21% do so occasionally, 21% have never applied them, and 9% have never applied them. This dimension was the lowest-scoring dimension for the majority of supermarkets. Table 3 presents the summary results that will feed into the CSR Hexagon.

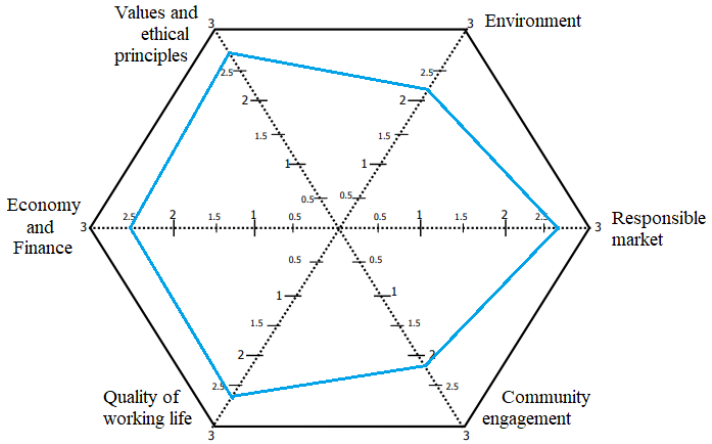
Table 3. Assessment of the CSR dimensions of supermarkets in Florencia

| Dimension | Promedio | Mas alto | Mas bajo |
|---|---|---|---|
| Values and ethical principles | 2,9 | Éxito, El Primo, Supermío | Justo & Bueno |
| Responsible market | 2,8 | Éxito, Supermio | EL D1 |
| Quality of working life | 2,7 | Éxito, Surtiplaza | Justo & Bueno |
| Economy and finance | 2,5 | Éxito, El Primo, Supermío | El D1 |
| Community engagement | 2,3 | Éxito, Supermío | El D1 |
| Environment | 2,2 | Supermío | Surtiplaza |

Source: Own elaboration

Figure 3. CSR evaluation hexagon in supermarkets in Florencia, Caquetá






Source: Own elaboration.

Figure 3 presents the average scores on the Hexagon to assess CSR according to Yepes' (2016) methodology. It shows that the supermarkets in Florencia, Caquetá, have CSR policies embedded in their values and ethical principles (2.9), with a high incidence in the responsible market dimension (2.5). The dimension with the lowest score was the environment, followed by Community Engagement. Therefore, the improvement actions to be proposed will concentrate on these two dimensions.

*Responsible market*

All actions involve the integrity of the services offered, product quality, advertising, transparency, and respect for the consumer concerning environmental policies. Here, we asked about quality policies in contracts, agreements, advertising, research on markets, clients, and products, complete information on products, and training for human talent. The results obtained in the Responsible Market dimension indicate that 86% comply with the standards, 7% eventually comply, and 7% are aspects that have yet to be considered.

As relevant data, it is admitted that all supermarkets apply fair purchasing policies and honesty in advertising to consumers. They justified that all customers are provided with the same information on product specifications, price, marketing, and care of the product, but market research and studies are rare.

All supermarkets state that they train internal and external human talent within the company to take preventative and corrective action quickly and efficiently. Therefore, these supermarkets feel they have a good image with their workers, customers, and suppliers. The overall average for the responsible marketing dimension was 2.8.



*Correlation analysis between the CSR evaluation score and the supermarket's competitive position*

When the correlation matrix was run on the data in Table 4, r obtained a value of -0.86.

Table 4. Evaluation of Corporate Social Responsible CSR dimensions of supermarkets in Florencia, Caquetá

| Supermarket | CSR | Ranking | Supermarket | CSR | Ranking |
|---|---|---|---|---|---|
| 1 | 2,86 | 1 | 4 | 2,80 | 2 |
| 2 | 2,70 | 4 | 5 | 2,20 | 5 |
| 3 | 2,48 | 3 | 6 | 2,30 | 6 |

Source: Own elaboration

The hypothesis test obtained a value of the t-estimator = -2.92, which, when compared to the value in the standardized table (t = 2.35 with 3 degrees of freedom and a significance level of 5%), indicates that the value is statistically valid for the relationship between the two variables.

It indicates a proportional relationship (-0.86) between the CSR evaluation score and the company's ranking or position in terms of the level of competitiveness, taken as the positioning in the local market and its financial performance. In the survey, only 38% of employees surveyed in the supermarkets believe that CSR can increase the company's

competitiveness, compared to 55% who believe that cultural and economic factors determine regional competitiveness. The remaining percentage considered that the relationship between CSR and competitiveness is low. Therefore, it was proposed to identify improvement actions toward CSR in the companies under study based on the SWOT analysis.

*Swot analysis*

The analysis is approached according to environmental aspects: relationship in water, soil, air, energy, flora, fauna, and ecosystem dynamics.

*Strengths*

Discharges to water (meat section has water management and grease traps in 84% of supermarkets) F1. ii. Energy emitted and used: energy-saving light bulbs and equipment (in 84% of supermarkets) F2; iii. Management of solid resources (bagless day management in 86%) F3; iv. Human talent. Favorable working environment F4.

*Weaknesses*

Air emissions (100% of the companies are unaware of their carbon footprint) D1; ii. Local environment (No programs towards environmental conservation in 84% of supermarkets) D2; iii. Community Engagement (Customer treatment on site, only associated with purchasing processes) D3; iv. Human Resources (no training in environmental education for stakeholders in 100% of supermarkets) D4; iii. Waste and by-products (50% of supermarkets have no signage for solid waste management routes) D5.



*Opportunities.*

Community engagement (regional, national, and international policy focuses on sustainable development, Amazonianism, responsible production, and consumption) O1; ii. Commitment to the Community (There is a high level of persuasion among customers in the information offered by the chain stores and supermarkets) O2. Likewise, a promise of price, fashion, variety, design, quality, and sophistication must be delivered to the consumer in a short time.

*Threats*

Community Engagement (Congestion of public space due to customer parking) A1; ii. Human Talent (Rising prices of goods in the family basket that may reduce demand) A2; iii. Energy emitted and used (Increase in energy costs from 2022) A3. With the above information, the following SWOT matrix is presented (Table 5).

Table 5. SWOT matrix for the identification of environmentally and community-friendly activities by supermarkets

| WO | Opportunities |
|---|---|
| Weaknesses | Air emissions: Measure the carbon footprint of supermarkets and generate a reduction and dissemination plan for customers and suppliers. DIO1. |
| | Commitment to the community / Waste and by-products / Energy emitted and used / Local environment. Environmental information campaign aimed at supermarket customers on responsible consumption, recycling, reuse, water, and energy saving. D3O2. |
| | Human talent: Training on environmental policy, CSR and environmental education of the supermarket and its stakeholders. D4O1O2. |
| **ST** | **Threats** |
| **Strengths** | Commitment to the Community / Signage for parking in areas surrounding the supermarket, avoiding noise and visual pollution and safety schemes for customers and their vehicles. A1F4. |

Source: Own elaboration

The activities identified can be condensed into an Environmental Education program for supermarkets that wish to undertake it. After formulating the values and business principles oriented towards corporate social responsibility and sustainable development criteria, an environmental education project with these aims should have five stages: 1. Awareness raising of stakeholders about the environmental impacts of the organization and ways to mitigate them; 2) Diagnosis of the current impacts of the organization for the measurement of impact indicators of the company on the environmental aspects addressed (Emissions to air, water, solid waste management, energy emitted and used, noise and visual pollution, use of paper, recycling, and forms of reuse, use of public space, safety conditions for staff); 3) environmental management plan in the supermarket to reduce the impacts and monitoring.



## CONCLUSION

Florencia is classified as an intermediate city (around 160,000 inhabitants. In the last decade, it has experienced significant changes in its economic growth (especially in the construction sector), urban growth, and the arrival of new companies in the region (Cuellar, 2020), among other changes.

It impacts the increase in demand for consumer goods and, therefore, the need for warehouses and supermarkets to supply necessities, where populations with a high degree of diversity and economic vulnerability are observed, but who in turn are looking for an economy, recognized brands, and quality. Although the financial situation and competitive position between a multinational such as Almacenes Éxito and other regional competitors in a small

market such as Florencia Caquetá are not comparable, there are features of a monopolistic competition market (Pardo-Rozo et al., 2016).

The evaluation of CSR in supermarkets in Florencia found that the dimensions of ethical values and principles and responsible marketing are well conceived in the CSR policy. These results were like the study by Zegarra Reyes and Cortegana Salazar (2021), who found that the ethical and social dimensions positively impact consumers and enhance corporate image. However, paradoxically, the weakest scores for supermarkets in Florencia were recorded for the environmental and community engagement dimensions, which could explain their relationship with competitive market position as suggested by Andrade Restrepo & Andrade Restrepo (2022), who state that the relationship between CSR and competitiveness is direct. Therefore, the SWOT analysis focused on activities aimed at strengthening these necessary aspects, according to the study by Caro and Salazar (2019).

The supermarket assessment found that all six companies have implemented CSR approaches in recent years, which have led to positive benefits for the organization's bottom line. However, the companies implement these strategies but do not quantify them, nor do they carry out studies of the impact of the investment and efforts or the returns in terms of profits and other benefits, i.e., CSR acts as a positive externality as Belso-Martínez et al. (2020) refers. Regarding the role of CSR, as stated by Vergara-Romero et al. (2020), it is possible to identify whether the practices in organizations are authentic or just for show.



However, there is a clear need to strengthen the design, implementation, and subsequent evaluation of direct actions towards CSR by stakeholders external to supermarkets (actual and potential customers, community, government, and competitors) to achieve recognition of the impacts of these supermarkets on the environment and the problems that arise from these commercial activities, as suggested in the studies by León et al. (2019).

Supermarkets have great potential for building a social fabric with greater environmental awareness, as they can help to promote responsible consumption by guiding customers' consumption habits and frequency, advertising management that guides the sustainable use of products and goods, the reuse and efficiency of the cycle of use of products, by-products, and waste, as well as the implementation of technological and communication processes and systems that at the same time strengthen the credibility and good name of these commercial centers, which form part of the daily life of both households and industrial sectors (González-Peralta, 2021).

## REFERENCES

Acuña Moraga, O., & Severino González, P. (2019). Corporate social responsibility and competitive advantage. The study of small mining companies in Chile. *Encuentros,* 17(02). https://doi.org/10.15665/encuent.v17i02.979

Andrade Restrepo, L., Andrade Restrepo, M. (2022). Responsabilidad Social Empresarial y cómo deben implementarla las empresas para que sean más competitivas. *Actualidad Económica*, 32(108), 19–26.

Belso–Martínez, J., López-Sánchez, M., Sánchez, M., & Nerja, A. (2020). *Responsabilidad social corporativa en las empresas: Un enfoque general.* Universitas Miguel Hernández.

Camacho-Parra, N., & Soaza-Forero, D. (2016). Los beneficios que genera ser una empresa socialmente responsable en Colombia. *Revista de la Universidad de La Salle,* (70), 203-227.



Cañizares, Y., & Arévalo, C. (2020). El rol de la responsabilidad social empresarial para las microempresas: ¿qué tanto se cumplen la buena práctica. *Revista de investigación, administración e ingeniería,* 107-115. https://doi.org/10.15649/2346030X.700

Cardona A. (2016). *La responsabilidad social empresarial. Concepto, evolución y tendencias*. Universidad Libre.

Caro, N., & Salazar, I. (2018). La responsabilidad social y la competitividad de las MYPES de Tingo María. *Balance's,* 6(18), 4-12.

Castro, A. (2017). La Responsabilidad Social Empresarial y la Competitividad en las Organizaciones Empresariales. *Revista Innova ITFIP*, 1(1), 78-89.

CPC. (2022). *Informe nacional de competitividad 2021-2022.* Consejo Privado de Competitividad.

Cuellar, R. (2020). *Inventario y caracterización de asuntos y determinantes ambientales del municipio de Florencia Caquetá. [Proyecto aplicado].* UNAD.

David, F., & David, F. (2017). *Conceptos de Administración estratégica.* Pearson.

González-Peralta, H. (2021). *Las Empresas en Colombia y la objetiva Responsabilidad Social Empresarial como requisito de Sostenibilidad.* Universidad Nacional Abierta y a Distancia UNAD.

Gutiérrez-Calderón, M., Prieto-Pulido, R., Carmona-Alvarado, F. (2018). *Responsabilidad social como una intervención psicoterapéutica interna en sistemas no clínicos*. Universidad Simón Bolívar.

Hernández, H., Pitre, R., & Orozco, B. (2020). Responsabilidad social empresarial como factor de cambio de la gestión empresarial. *Dictamen Libre*, (27), 35–43. https://doi.org/10.18041/2619-4244/dl.27.6269

Jaimes-Valdez, M., Jacobo Hernández, C., & Ochoa, S. (2021). Los beneficios de la responsabilidad social empresarial: una revisión literaria. *Tiempo y Economía*, 8(2), 201–217. https://doi.org/10.21789/24222704.1720

Lara-Manjarrez, I., & Sánchez, J. (2020). Corporate Social Responsibility for the Competitiveness of the Organizations in Mexico. *Mercados y Negocios*, (43), 97–118. https://doi.org/10.32870/myn.v0i43.7546

Lazosvka, D. (2017). *La responsabilidad social en China.* Benchmark. Link:: https://www.expoknews.com/la-responsabilidad-social-en-china-benchmark/

León, J., Makita, T., Gaber, V., Flores, E., García, L., Góngora, G., & Puente, G. (2019). *Responsabilidad Social y competitividad*. Red de Iberoamericana de Investigación.

Ministerio de Comercio, Industria y Turismo (2023). *Perfiles periódicos departamentales*. Ministerio de Comercio, Industria y Turismo.

Morgestein-Sánchez, W. (2019) La Responsabilidad Social de la empresa y el derecho de la competencia en Colombia: una visión desde la economía social de mercado y la Multi-Stakeholder Theory. *Revista Republicana*, 2019(27), 69-87.

Nova, L., Moreno, S., & Moreno, L. (2020). Modelos de gestión estratégica: estudio exploratorio en PyMEs manufactureras de la Provincia de Sugamuxi (Colombia). *Revista Espacios*, 41(41), 238-252.

Naciones Unidas (2015). *Objetivo de Desarrollo del Milenio, Informe 2015*. United Nations.

Ortíz-Coronado, C., & Páramo, D. (2021). Hábitos de compra de alimentos de las familias residentes en la zona de Villa Campestre de Barranquilla, Colombia. *FACE: Revista*

*de la Facultad de Ciencias Económicas y Empresariales*, 21(1), 31–48. https://doi.org/10.24054/face.v21i1.1025

Ospina, E., & Sotelo, M. (2016). *Responsabilidad social empresarial: beneficios económicos, sociales y ambientales para los Stakeholders.* Trabajos de Grado Contaduría UdeA.

Pardo-Rozo, Y., Sabí-Ramírez, E., & Sanjinés-Tudela, G. (2016). Beneficios económicos por demanda de bolsas plásticas y eco bolsas en supermercados de Florencia. *Revista Facultad de Ciencias Contables Económicas y Administrativas -FACCEA*, 6(2), 206–212.

Parra-Báez, A., Vargas-Espitia, L., & Woolcott-Oyague, O. (2019). La responsabilidad social del empleador (RSE) en Colombia frente a la discapacidad. *Opinión Jurídica,* 18(37), 135-155. https://doi.org/10.22395/ojum.v18n37a5

Peña, P., Lara, V. A. & Baracaldo, H. J. (). Capítulo 4. Importancia y aplicabilidad de los factores en la competitividad sistémica de la ganadería doble propósito del municipio de Florencia-Caquetá. [info:eu-repo/semantics/article, Libros Universidad Nacional Abierta y a Distancia]. Repositorio Institucional UNAD. https://repository.unad.edu.co/handle/10596/45907

Petro Ramos, J. A., Díaz Vásquez, T. K., Vega Hernández, M. A., Periñán Martínez, J. S., y Maza Ávila, F. J. (2020). Efectos de la implementación de actividades de responsabilidad social empresarial en un supermercado de Cartagena de Indias, Colombia. *Revista de Jóvenes Investigadores AD Valorem*, 3(1), 1–19. https://doi.org/10.32997/RJIA-vol.1-num.1-2020-3004

Porter, M. (1998). *The Competitive Advantage: Creating and Sustaining Superior Performance*. New York Free Press.

Porter, M. (2008). *On competition: Updated and Expanded Edition*. Harvard Business Press

Porter, M. (2021). *The changing role of business in society*, Working paper.

Puentes-López, A., & Lis-Gutiérrez, M. (2018). Medición de la responsabilidad social empresarial: una revisión de la literatura (2010-2017). *Suma de Negocios*, 9(20). http://dx.doi.org/10.14349/sumneg/2018.V9.N20.A9

Ramírez, J. (2018). La Responsabilidad Social Empresarial desde una perspectiva de desarrollo sostenible y su influencia en la competitividad empresarial de San Martin. *Revista Científica*, 7(1), 141-156.

Scarpellini, S., Marín-Vinuesa, L. M., Aranda-Usón, A., & Portillo-Tarragona, P. (2020). Dynamic capabilities and environmental accounting for the circular economy in businesses. *Sustainability Accounting, Management and Policy Journal*, 11(7), 1129-1158. https://doi.org/10.1108/SAMPJ-04-2019-0150

Severino-González, P., Acuña-Moraga, O., Yevenez-Jara, J., Chandía-Arco, M. M., Villalobos-Antúnez, J. V., Arenas-Torres, F., Lillo, F., & Salcedo-Muñoz, V. (2022a). Responsabilidad social corporativa y consumidores de vino: percepción en tiempos de pandemia en Chile. *Interciencia 47*(10):447-455.

Severino-González, P., Villalobos Antúnez, J., González-Soto, N., & Ramírez Molina, R. (2020). Perspectiva de la responsabilidad social empresarial de la salud pública chilena. *Revista Venezolana de Gerencia*, 25(92), 1397-1421.

Severino-González, P., Acuña-Moraga, O., González-Gutiérrez, P., Araya-González, I. (2022b). Responsabilidad social corporativa y supermercados. Explorando la percepción de los consumidores en Chile. *Interciencia*, 47(12):24-30.



Terán, R., Montenegro O., Bastidas G., Realpe, I., Villarreal, J. & Fernández, A. (2017). Análisis crítico de la responsabilidad social en entidades de salud. *Rev Cubana Invest Bioméd;* 36(1):1-10.

Toca-Torres, C. (2017). Aportes a la responsabilidad social. *Revista Mexicana de Ciencias Políticas y Sociales*, 62(230), 393-407. https://doi.org/10.1016/S0185-1918(17)30033-8

Valencia, L. (2018). *La responsabilidad social empresarial y su influencia en la administración ambiental.* Universidad Santo Tomás, Colombia.

Valencia, W., & Esquivel, M. (2022). La responsabilidad social empresarial y el desarrollo sostenible en Latinoamérica en tiempos de pandemia. Ciencia Latina *Revista Científica Multidisciplinar,* 6(1), 415-435. https://doi.org/10.37811/cl_rcm.v6i1.1507

Vergara-Romero, A., Olalla Hernández, A., Yturralde, J. M. & Sorhegui Ortega, R. (2020). Responsabilidad social corporativa (RSC) y su impacto en el rendimiento económico de las principales Empresas en Ecuador. *Revista Espacios*, 41(10), 13-20.

Yepes, G. (2016). *Ersos. Manual para la Evaluación de la Responsabilidad Social en la Organización Social.* Universidad Externado de Colombia.

Zegarra, R., & Cortegana, J. (2021). Corporate social responsibility and the perception of the company: a review of the scientific literature. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(14), 2818–2834.

Mercados y Negocios
1665-7039 printed
2594-0163 on line
**Year 25, n. 51, January-April (2024)**

# Green Consumer's Paradox

*La paradoja del consumidor verde*

https://doi.org/10.32870/myn.vi51.7714

Almeirim Isabel Acosta Bahena
Universidad de Guadalajara (México)
almeirim.acosta@academicos.udg.mx
http://orcid.org/0000-0002-4233-5226

Received: November 15, 2023
Accepted: December 28, 2023

**ABSTRACT**

The paper aims to analyze the contradiction between green consumers' behavior and green technology foods offered to them. An analysis of papers from different authors showed that green consumers are willing to make conscious food consumption. However, factors like price, knowledge about the green cause, consumer income, reference groups, shopping convenience, and food availability influence their final consumption. Collective intelligence is a solution for green consumers to make better decisions: it also involves challenges, ethical considerations, and avoiding political influences on shared information. In conclusion, governments and food producers must do a lot to ensure green consumers have enough tools to make informed and sustainable alimentary decisions.

Keywords: Green consumer; green technology; collective intelligence; informed decision; food consumption

JEL code: M2

Mercados y Negocios por Departament
o de Mercadotecnia y Negocios Internacionales. Universidad de Guadalajara se distribuye bajo una Licencia Creative Commons Atribución-NoComercial 4.0 Internacional. Basada en una obra en http://mercadosynegocios.cucea.udg.mx/index.php/MYN.

**RESUMEN**

El objetivo del trabajo es analizar la contradicción entre el comportamiento de los consumidores verdes y los alimentos con tecnología verde ofrecidos en el mercado. A través del análisis de artículos de diversos autores, se encontró que los consumidores verdes tienen disposición de hacer consumos alimentarios conscientes. Aunque factores como el precio, conocimiento de la causa verde, ingresos económicos, grupos de referencia, la conveniencia de compra y la disponibilidad de los alimentos influencian la decisión final de consumo. La inteligencia colectiva parece una solución para que los consumidores verdes tomen mejores decisiones, también implica retos, consideraciones éticas y evitar influencias políticas en la información compartida. En conclusión, hace falta mucho por hacer de parte de gobierno y productores de alimentos para asegurar que los consumidores verdes tengan suficientes herramientas para tomar decisiones alimentarias informadas y sustentables.

Palabras clave: Consumidor verde; tecnología verde; inteligencia colectiva; decisión informada; consumo alimentario.

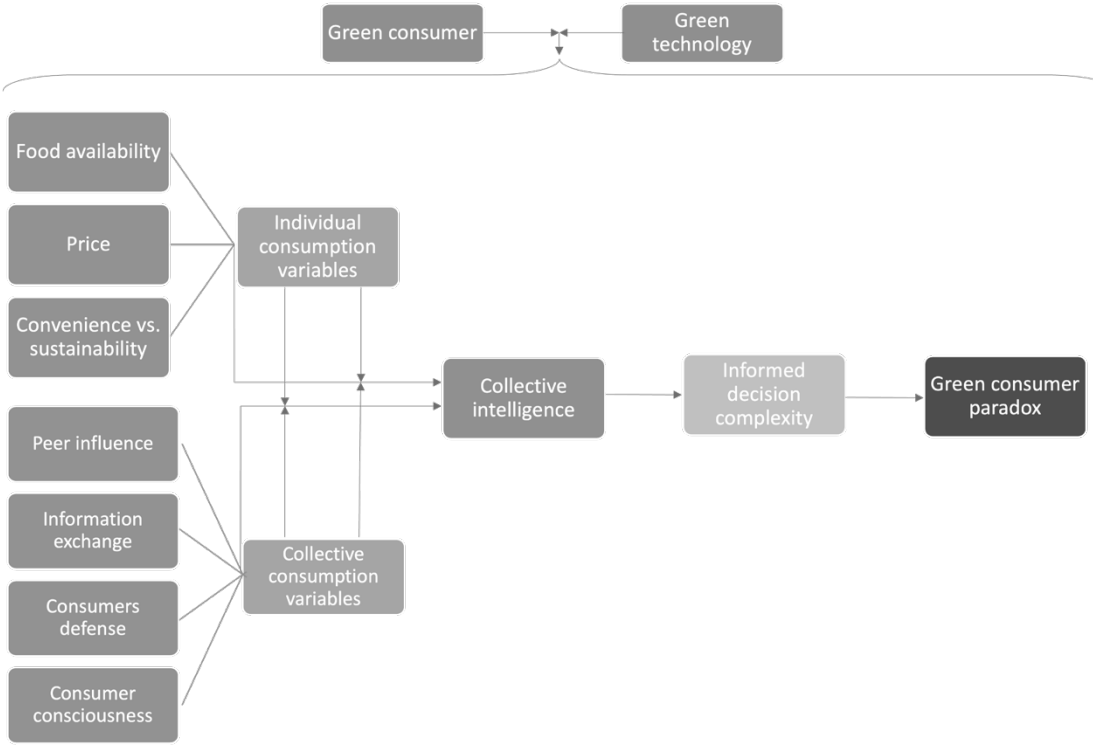
Código JEL: M2

## INTRODUCTION

The so-called green consumers or conscious consumers are subconsciously not green. They are called green or conscious consumers because they are committed to environmental sustainability and, because of it, are willing to make conscious shopping decisions, including food. Green consumers have even become a symbolic group of society because of their very laudable objective: to reduce their diet's environmental impact, support sustainable agricultural practices, and promote ethical food production.

This group takes relevance from the necessity to modify alimentary paradigms to a more sustainable diet given the climate change crisis, loss of biodiversity, and health crisis. That is why, with the growth of green consumers, there is a growing demand for a more extensive availability of products that satisfy their necessities. It is why there has been an increase in products and services labeled as ecological or sustainable.

Figure 1. Variables and variants influence green consumers' food intake.




Source: Modified from McHugh et al. (2016).

However, this apparent harmony and coherence between green consumer intention and actual buying behavior hide a complex contradiction, identifying some crucial areas: food availability, accessibility, information, and collective intelligence. This last one plays a vital role in food intake because it encourages communities and individuals to explore, understand, and implement alimentary elections that are environmentally friendly. The Figure 1 explains how, through this essay, variables and variants influence green consumers' food intake.

Ideas and concepts exposed here aim to explore how, even with the best intentions, green consumers face obstacles and dilemmas that make it hard to have a food intake that protects the environment, and sometimes even without this consumer knowledge.

## THE GREEN CONSUMER

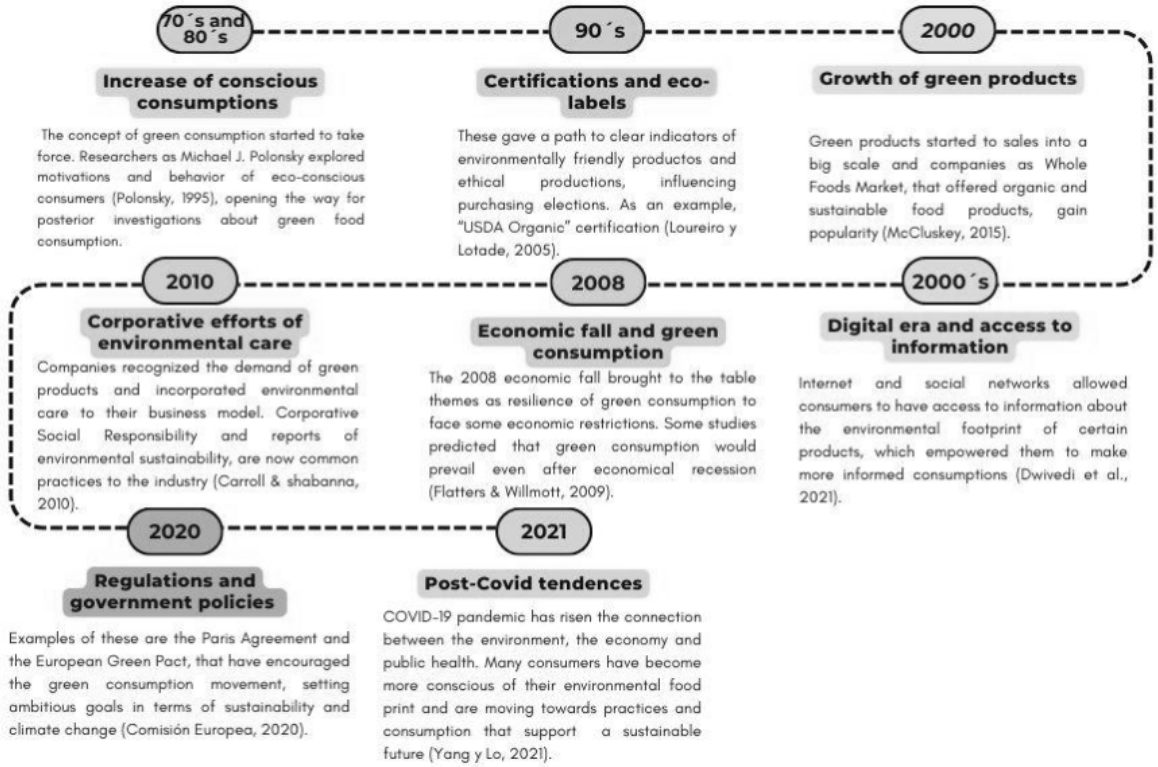
In the 60s and 70s, Eastern Europe started to worry about the consequences of consumption patterns and production in the environment due to health effects, industrial contamination, economic impact, and population increase. These concerns have become green consumerism, perceived as an environmental reform element, both in the Occident and the European Union, where the consumer gets involved as responsible and co-responsible (along with producers) to address environmental issues and adopt a more friendly environment lifestyle. It has resulted in the rise of a consumer that willingly, instead of normatively, is environmentally friendly and has been called a "green consumer" (Connolly & Prothero, 2008). Figure 2 has a timeline with some of the most representative events that have marked the evolution of green consumerism.



Currently, to be a green consumer, it is necessary to have a specific profile; it is not enough to have good intentions for environmentally sustainable consumption; that is, the green consumer is not only a consumer who has intentions to purchase products that protect the environment currently but also in the future. According to Narula and Desire (2016), they are usually young adults with a medium to high income, and they expect green products to work effectively and with the same quality as non-green products.

So, in addition to the profile of this group, green consumers also have standards for acquiring this type of product. They seek to consume products not only classified as green, but that meet the basic needs inherent to the characteristics of the original product, in addition to having pro–environmental characteristics. For these reasons, it can be assumed that not everyone can be considered a green consumer.

Figure 2. Evolution of green consumerism




Source: Own elaboration.



However, the description of the green consumer profile, such as the characteristics required of food products by this group, is not directly related to the behavior that green consumers show. In a Euromonitor study, 53% of 15,933 respondents from 8 markets: Brazil, China, Germany, The United Kingdom, France, Germany, India, and The United States, considered the fact that a product was "green" to be an essential characteristic to consider when purchasing. However, the demand for green products does not show this trend; this phenomenon is known as the "Green gap" (Johnstone & Tan, 2015). It means that the positive attitudes of green consumers regarding the environment are not translated into real purchases, showing a contradiction between attitudes and actual behavior. Here, it starts to distinguish that these consumers are less green than they think.

This way, to study green consumers, there needs to be more than just the description of a profile; it is necessary to analyze motivational factors, knowledge of the environment, attitudes, and economic factors, among others, to find and analyze appropriate consumers psychology (Johnstone & Tan, 2015; Smelser & Baltes, 2001), in this case, green consumers behavior.

Food consumption with productions that attempt to protect the environment is related to changing eating patterns and modern eating styles that encourage ultra-processed food consumption (Reisch et al., 2013). At the same time, it is essential to mention that as the consumer's consciousness grows, their diet will be based on fruits and vegetables, avoiding meat consumption or products that have had to be transported by air or through long distances by road, in other words, more sustainable food consumption. Reisch et al. (2013) also discuss a series of interventional politics to improve food consumption informational instruments for the population, market initiatives, and regulation proposals to incentivize more environmentally friendly food consumption.

The urgency to move towards eating practices that avoid environmental damage must be addressed. The prevalence of current alimentary systems contributes significantly to greenhouse gas emissions, land degradation, and loss of biodiversity, while it fails to provide nutritious food for the population. Different researchers have noted that food intake elections have a considerable environmental impact. Modifying eating patterns is fundamental to reaching food productions that protect biodiversity and avoid land degradation (McCluskey, 2015). It must be remembered that the nutritional part of processed food products and choices made in production practices also play an essential role.



## GREEN TECHNOLOGY IN FOOD PRODUCTION

Technology has been part of alimentation with different perspectives since long ago. Technology has been mainly used to improve food, making it more abundant, fresh, long-lasting, safe, and added to what has been detected to be nutritionally lacking in the general population or a specific one. In recent decades, there have been controversies because of the use of technology in new forms to process food. However, it has been proved that these new technologies are also more environmentally conscious. These new technologies ensure lower energy use than traditional methods, benefiting food safety and the industrial economy (Akhila et al., 2022). Thus, technology has long been an ally in food production processes and the search to improve human nutrition.

Many studies show the benefits of the use of technology. Kreidenweis et al. (2016) conducted a study in Germany and Brazil to observe if producing food locally instead of importing it might result in lower greenhouse gas emissions (GHGs). Ultimately, the authors found that, even though local production was closer to consumption sites, it became bigger GHGs. This result was due to the number of times food had to be transported to satisfy the demand, while the imported food was transported in one trip only. In this case, it is proper to analyze the relevance of measurement instruments used to measure contamination between the two cases, besides the punctuality that only GHGs were measured during food transportation. It is

necessary to evaluate the consequences of each production under the same standards to determine the level of pollution and their affection for the environment.

It will be the only way to define which production is more environmentally friendly, not only in terms of GHGs but also with affection to the land, the economy, and the local population. This type of study stands out for the lack of information that green consumers must make consumption decisions and, therefore, the importance of producers informing their production methods to consumers and the GHG impact of products for sale for population consumption.

In another study, Boye and Arcand (2013) found that food processing has less environmental impact than agriculture according to GHGs. However, it might be due to legal obligations that companies have. In any case, Xu et al. (2015) propose that consumers choose products with a low carbon print and have also influenced companies in the direction of emergent technology and science to make them greener. It is not easy to achieve, mainly because we are not informed consumers about these advances or green technology applications in food production; neither the producers nor any other organization is dedicated to analyzing consumption patterns and food production.

Aithal and Aithal (2016) see green technology as a cure to reduce environmental damage by creating diverse products and technologies for human beings. Nonetheless, for this essay, it is Pratama's (2022) definition that will be considered. This author observes that keywords in defining green technology are low environmental impact, safe methods for human beings, and sustainability for natural resources.



However, applying the green concept to food technology applies to environmentally safe practices and healthy and nutritious productions. The last part is one of the main reasons to choose this definition of green technology characteristics because it does not only consider processes and environmental benefits but also the benefit that might, and should have, to final consumers.

Several advances in green technology have attempted to take away "the weight" of current agricultural production systems, which are not entirely welcomed by consumers who tend to show skepticism towards these advances. It was proved by Giacalone and Jaeger (2023), who conducted a study in Singapore, the United States, India, and Australia and classified the acceptance of technology into three groups:

1) Technologies with high consumer acceptance related to urban productions of vegetables and packages in modified atmospheres;
2) Technologies with medium consumer acceptance that have to do with cultivated fishes, plant-based alternatives to animal proteins, and genetic edition;

3) Technologies with low consumer acceptance related to insects as ingredients in food and meat cells and cultivated fishes.

One of the most exciting data from this article is that only 5% of the sample (N=2494 surveys) showed high acceptance of these technological innovations in food. The general population's acceptance of technology in their food remains a big challenge. The challenge becomes more prominent with green consumers' acceptance of technology in food production as an acceptable element of green alimentary products.

With the low disposition by green consumers to accept technology in food processing, Boye & Arcand (2013) published an abstract of the book "Current Trends in Green Technologies in Food Production and Processing." This book focuses on the Life Cycle Assessment (LCA) methodology to detect GHGs of food production, where they found that food processing has less environmental impact than agriculture.

It contradicts some beliefs of green consumers who, as previously commented, do not have a good acceptance of technology in food production. Notably, the results presented in the book might be because food producers are obligated to take pro-environmental measures by law or directly from their responsible practices. A positive image presented to consumers and retailers may influence the pro-environmental decisions of specific food processors, which is why it cannot be concluded that the results come from an altruist preoccupation with the environment.



Green technology can be a good tool that helps to have more conscious consumption and healthier food produced under better friendly environmental standards. Even if green consumers do not fully accept it, this might be useful to convince them that food has a lower environmental impact during production. If environmental affectation were low, it would not conflict with the ideology of green consumers, as long as it is adequately informed so they can have green and conscious consumption practices.

Knowing what is being done in terms of technology applied to processed food and how this might help green consumers have greener food intakes, it is worthy to deeply analyze those variables that have individual influence over green consumption, such as food availability, price, and acquisition convenience.

## FOOD AVAILABILITY

Despite green consumer efforts to choose green food with a lower environmental impact, such as organic, local, and seasonal products, in the end, they face a low availability of these kinds of products.

The purchase and consumption of green products are directly related to their availability. In a bibliographic revision by Joshi and Rahman (2015), they found that purchasing behavior becomes more positive if green products are available. It is because, as individuals, consumers prefer what is within their reach, which is convenient, avoiding products that require a more significant effort to find. Limited availability and inconvenience in green product acquisition may act as a barrier between the attitude of consumers or purchasing intention and the final consumption of green products.

That is why green consumers' commitment plays a significant role: The extra time dedicated to finding green alimentary products can be perceived as an extra cost to their regular individual or familiar budget that they are only sometimes willing to cover. It is one of the reasons why they might prefer not to purchase green products, even when their initial purchasing intention was in that direction (Nguyen et al., 2019). The availability of green alimentary products would help in the low-cost perception and make it more attractive to green consumers. It could facilitate the final purchase decision when individuals are alone in front of store stands.

Food availability in stores can also be used as a reminder of food with green production purchase intentions. In the qualitative study of Nguyen et al. (2019), it is mentioned that the low availability of green products is among the main reasons to buy a non-green alternative. Once again, it proves the importance of consumers feeling close to the product they are looking for, both as a reminder of their purchase intentions and as facilitating this action.



Ultimately, the difficulty in finding and purchasing these products may prove that the green consumer feels obligated to make certain concessions and limit their green consumption. It must be added that green consumers do not see city life as green consumption-friendly (Johnstone & Tan, 2015).

This perception of difficulty might be a factor that discourages green consumption and forces green consumers to turn to and consume other products that are not necessarily green. To be perceived as easy to acquire, producers of processed food with green technology should show more interest and preoccupation to make their products available and easy to reach for the referent market.

The availability will not only help in purchase decision-making but could also increase sales, which would lower their production costs. If green product production costs slow down, prices could be more accessible to a more significant part of the population and not only to green consumers.

## PRICE DILEMMA

As previously mentioned, another individual conflict that green consumers face is the price of green food because it tends to be higher than that of their traditional counterparts. Although part of the green consumer profile is indeed an economic income above the average, this conflict can create an economic barrier between green consumers willing to make respectful decisions towards the environment but needing more resources to sustain these practices.

It is also true that green consumers look for convenience when acquiring a product because they are not willing to pay a higher price only for foods with green characteristics. The willingness that green consumers have, as individuals, to pay extra for green food is mediated not only by the cost but also by the knowledge they have about the green cause, consumers income, groups of reference (they will be analyzed later), purchasing convenience and eve availability (Narula & Desore, 2016), as it was previously discussed.

These products must have some extra benefit beyond their production, even if it could be as part of the use or disposal of the product, which is not a theme of this essay. However, it is essential to mention it because, in the end, it is a variant that could define purchasing decisions besides price.



Consumers can perceive green food as more expensive, making them feel they need more options for consumption. According to Johnstone & Tan (2015), if green foods are perceived as too expensive, consumers may ignore them, even without acknowledging them. This situation can make consumers perceive themselves as "not entirely green" and, somehow, out of the group they are trying to belong to. In the end, green consumers need to adapt their consumption to their budget, which is logical considering that, even if food intake is a necessity, there are several ways to cover it, and they can choose a less expensive one.

Thus, the green consumer is constantly trapped between their environmental commitment and the choice of their budget, failing again into concessions that go against the values this consumer professes as part green consumers it identifies with. Nonetheless, as previously mentioned, there could be other ways to reduce costs and make these products more reachable to the consumer's pocket and their physical closeness.

As it has been studied, the cost of green food can be a barrier to purchasing green products in terms of individual decisions, but it also exists as a collective part of these decisions. Purchases for the home have cultural influences, which is why consumers will look for green products that substitute those that have similar characteristics to the ones they are already used to in terms of flavor and quality (Ariani et al., 2021). Therefore, besides being an

economic matter, it also directly affects the green consumer paradox, which does not only bet on cost but also personal taste.

## CONVENIENCE VS ENVIRONMENTAL CARE

Modern life has challenges in terms of convenience because the speed at which we live leads us continuously to look for easy and fast options that are not the most environmentally friendly. It is how the green consumer is trapped between the comfort of easy solutions and its conviction to make decisions that help the planet.

The perception of convenience disagrees with environmental care and has been expressed by consumers, proclaiming themselves too indulgent to leave aside comforts to be a green consumer. It is even more because there is a perception of collective requirements beyond food consumption to be considered a green consumer, like participating in activities requiring donating part of their free time (Johnstone & Tan, 2015). Ultimately, they choose to be something other than green consumers and stay completely away from this definition by considering it too complicated for their lifestyle.

These contradictions are also identified by Lartey (2021), who mentions that certain practices related to environmentally friendly consumption have to do with personal comfort, trust, available choices, and price paradox. It confirms and brings up, once again, the point to which conveniences influence alimentary choices over collective proposals or belonging to a specific group, as can be green consumers.



In 2015, Johnstone and Tan explored how consumers' perceptions of green products, consumers themselves, and their consumption practices contribute to understanding the discrepancy between green attitudes and behavior. The study identified three key subjects: 1-"Is too hard to be green," 2-"Green stigma," and 3-"The green reserve." Some consumers refuse or resist participating in green consumption practices due to the unfavorable perception of green consumption. In this way, green perceptions can influence consumers' purchasing intention of green products, besides the difficulties mentioned above, to find green information and products.

It is also worth mentioning that part of the acquisition of convenience and green products is related to individual values, among them the hedonist (Joshi & Rahman, 2015), even overpassing altruist values such as green food consumption. The environmental values that some groups or collectives profess positively influence green consumers as long as they do not affect their values of consumption satisfaction.

So far, the variables mentioned above have been under the individual influence of food intake consumption. However, other variables affect consumers' decisions and are taken based on collective influences of green consumption, as are the ones that are analyzed next.

## COLLECTIVE VARIABLES OF GREEN CONSUMPTION

A collective is an entity where members are interdependent based on shared beliefs. It differentiates from a group because of the level of expertise about a specific subject, the level of interaction among members, and one-on-one connections (McHugh et al., 2016).

Moreover, the distribution of knowledge of individuals, groups, and nets plays a vital role in environmental care behavior about food consumption. Table 1 shows that food consumption is a social construct where variables influence the final green consumer choices.

Table 1. Variables influence the final green consumer choices

| | |
|---|---|
| Peer influence | Social networks and online communities inside collective intelligence platforms might influence peers in consumption decision-making. When individuals observe others making sustainable food elections and sharing their positive experiences, they are more likely to follow the example (Thøgersen, 2010). |
| Information exchange | Collective intelligence encourages information exchange among green consumers and provides a space to discuss sustainable practices, recipes, and successful stories. Collective intelligence can motivate and guide individuals towards a more sustainable food intake (Fanzo et al., 2018). |
| Consumers defense | The defense of green consumers' beliefs can be taken advantage of by collective intelligence. When theories are organized and informed, green consumers can fight and defend better food labeling, stricter regulations, the promotion of more green food options, and the consciousness of the relevance of sustainable food consumption (Alam et al., 2023). |
| Consumers consciousness | Collective intelligence platforms can give consumers access to trustworthy information about the environmental impact, ethical considerations, and the authenticity of green products (Willet et al., 2019). It allows green consumers to make informed choices. |

Source: Own elaboration.

Collectivities can mitigate the paradox between green food and green consumers through different platforms and social connectivity (online and one-on-one). Nonetheless, food intake behavior is much more complex, and there are individual and collective variables that affect consumption decisions and, therefore, consumers' food intake behavior.

## COLLECTIVE INTELLIGENCE AND GREEN CONSUMPTION

Food intake behavior is multifactorial; many elements can influence purchase and food consumption, even more so if we speak about green technology-produced food. Chen & Antonelli (2020) identified and categorized determinant factors in food choices: Internal factors of alimentation (sensorial and perceptive factors), external factors of alimentation (information, social context, and physical context), personal state factors (biological characteristics and physiological needs, psychological components, habits and previous experiences with certain food), cognitive factors (knowledge and abilities, attitudes, preferences, anticipated consequences and personal identity) and also sociocultural factors (culture, economics and politics).

Consumer behavior involves physical and mental activities in which consumers get involved when looking, evaluating, purchasing, and throwing away a product or service. Consumers exchange their resources (money, time, and effort) in the market per valuable articles. As a result of these large amplitudes of factors, it is proposed that a multidisciplinary team study how all these variables, among them technology, culture, beliefs, and values, interact with each other. Likewise, individual, and collective variables also affect consumption decisions.



Collective intelligence can be defined as a phenomenon that occurs when a collective, acting as such, has a more significant level of intelligence than its members would show if they acted out in little groups or individually. Collective intelligence refers to problem resolution (Polonsky, 2011), such as food choices from green consumers.

When a collective is formed, the individuals get together to reach a new level of analysis, which will be helpful in the decision-making of everyone separately. When it comes to green food intake, it has been proved that there are certain variables that collectivity analyzes and incentives to achieve green food consumption of individuals. Next, there is a table where the most critical variables are shown (Table 2).

Table 2. Critical variables

| | |
|---|---|
| Consumers empowering | Access to information that different collectives give about food print, nutritional value, and food ethical considerations helps individuals to make more informed decisions and align with their values (Rahman &Nguyen-Viet, 2023). It contributes to a more sustainable alimentary system, creating a more significant demand for green products. |
| Global collaboration | It is necessary to reach sustainable food intake, and collective intelligence platforms can facilitate the connection between local producers and consumers, reinforcing local and regional alimentary systems (Fanzo et al., 2018). Additionally, they encourage sharing consumers' knowledge globally, allowing the dissemination of sustainable productions and the propagation of sustainable efforts through borders. |
| Defense of public policies | Collective intelligence encourages the development of technological solutions such as precision agriculture, blockchain in food supply, and alternative protein sources (Zhang & Zhang, 2018). Taking advantage of experts' knowledge, entrepreneurs, and researchers can accelerate the adoption of these innovations. |
| Technology and innovation | Modifying behavioral food intake is hard a task. Collective intelligence can facilitate this process by sharing successful stories, better practices of consumption, and advice for individuals who aim to transition toward greener consumption (White et al., 2019). Peer support and community commitment can make these changes more accessible and assimilated for consumers. |
| Behavioral changes | Collective intelligence can play an essential role in the defense to change public policies that support green consumption. Collectives can organize, find, share information, and collaborate with the government to promote policies that favor green values (Alam et al., 2023). It can lead to more legislative support, such as subsidies for green food production and improving food labeling. |

Source: own elaboration.



In this section, it is also essential to analyze consumers' social responsibility because their demands impact food producers' choices. If consumers choose food produced ethically, with a low environmental impact and a high nutritional addition, producers will put it on the market. It is how consumers' final decisions can affect the possibilities of social and economic ways to be more careful with the environment (Jakubczak & Gotowska, 2020). This way, purchasing decisions have a big responsibility for green consumers, who, even with social support and information from a collective, only sometimes make the best decisions.

Although collective intelligence is a solution for green consumers to make better decisions, it also implies specific challenges and ethical considerations. Part of these challenges involve data protection to ensure that all voices are heard, to prevent the spreading of wrongful information (Rahman & Nguyen-Viet, 2023), and to avoid, as far as it can, political influences in collective shared information. The goal is to balance open collaboration and information sharing in a responsible way to maintain the integrity and effectiveness of collective intelligence efforts.

Now, considering the environmental and health focus, which are the interest of this essay, Alam et al. (2020) conducted a study in Malaysia to identify factors affecting healthy and pro-environmental food consumption among the Malaysian population. As an extra,

perceived value was added to understand better consumer factors and their effect on low environmental impact food consumption.

The results showed that collective variables such as social norms, perceived effectivity of consumption, and attitude, and individual variables like perceived value, availability perception, and purchasing intention significantly impact low environmental impact food consumption. It confirms what has been said about the consumption factor and motivation that overcome environmentally friendly food production to purchase and consume these products.

The influence of collective intelligence on low environmental impact food consumption is considered that individual characteristics (social demographic attributes, individual attitudes towards the environment, among others) influence the decision of this type of consumption. However, there is evidence of "social learning," which implies that sustainable consumption can be learned, although it would have a heterogeneous impact on specific social groups (Salazar et al., 2013), according to individual social demographic characteristics of members of this group.

Another modification due to social influence can be found in alimentary preferences, mainly if it receives positive feedback from peers; in other words, we eat as other persons because we are looking for a positive emotional experience about our feeding and also internal and external validation of or food choices (Higgs & Thomas, 2016; Shen et al., 2022), which is why green food consumption must see beyond superficial, sustainable characteristics of food.



On the other hand, as previously mentioned, we cannot let aside the values that green consumers profess beyond their environmental consciousness because part of their slogan is to not affect future generations with current alimentary patterns. Paço et al. (2019) looked for a way to examine green consumer behavior based on prosocial attitudes, value put in green and green communication.

They developed a survey for it. In the end, results show how prosocial attitudes, in general, directly influence collective values of green consumption and that these values positively influence green purchasing behavior and reception to green publicity. They proved that collective intelligence is a significant component of green consumption, an element that cannot be left aside and could also be explored through this publicity or green communication by green food production companies.

Therefore, green purchasing behavior or sustainable consumptions are related to the acceptance of a group they belong to or want to belong to but are also related to favoring the environment and society. For that reason, consumers look for green attributions when

purchasing food products. However, it is also an extra referent to social values, purchasing convenience, use, and disposal of the product, all of it influenced by collective intelligence.

## INFORMED DECISION COMPLEXITY

Accessibility to information is a reference to the human right to consult data; it comprehends free access to information promptly and can investigate, defund, search, and receive any information (Gobierno de México, 2022). This way, with free access to information, more precise and conscious decisions can be made, in this case, about food purchasing by green consumers.

Information is an angular stone for green food consumption. However, green consumers continuously face ambiguous or contradictory information. For example, food labels can show conducive data that cannot be read (Johnstone & Tan, 2015), leading consumers to think they are consuming or supporting something that could not be happening or is challenging to understand. Although it has been proved that some demographic characteristics could be relevant in the analysis and use of information, Jakubczak and Gotowska (2020) show that these are less relevant at the purchasing decision moment.



As shown by Narula and Desore (2016), several studies have considered that green consumers need clarification on the little knowledge they have about green products and the little information provided by those producing them. This way, those consumers with more knowledge about environmental care and food production will be the ones who spend more on these types of products because they have a bigger capacity for decision-making. The information about these green products could be through labels and even web pages or producer social networks, at list according to what was found by these authors.

Nevertheless, knowledge does not necessarily increase the purchasing and consumption of green products. It should be noted that alimentation is only sometimes rational and objective because it depends on a series of psychological, cultural, economic, and social factors. Therefore, knowledge will make consumers act a certain way leaving aside emotional and intuitive factors that significantly influence green food purchasing (Johnstone & Tan, 2015). The conjunction of factors suggests a more complex relationship between knowledge and green consumer behavior.

A lot of times, food producers use something called greenwashing, which consists of making consumers believe that a company is participating in green production processes and affirms it on its label or in marketing communications, when this is not the reality (Boncinelli et al., 2023; Johnstone & Tan, 2015). Greenwashing generates a feeling of distrust and insecurity

in consumers, who, in the end, cannot be sure if they are being part of non-sustainable consumption and supporting a company with non-green practices.

One of the most significant issues is that companies use greenwashing to show their products as environmentally respectful without a stent for those affirmations. This situation has caused consumers to become cynical about such affirmations and consider them another marketing element (Johnstone & Tan, 2015). Such situations leave the green consumer with an uncertain feeling or blind trust because they cannot identify legitimate green products, also denoting a lack of regulation in green food products to allow consumers to make better choices.

The greenwashing phenomenon constitutes a threat to green market products, which is why it is crucial to evaluate the impact that these practices have on the market to provide the government and consumers with relevant information to the first ones to make necessary adjustments or create indispensable policies to regulate and avoid, as far as it can, greenwashing because it deceives consumers in a straightforward form; and to the consumers so they can make responsible and informed purchases.

For example, Boncinelli et al. (2023) proved that simply changing the color of a chocolate package to green (giving the understanding that it was a green product) was enough to make consumers more propensity to acquire it. However, the researcher could not conclude the profile of consumers that fall the most in these types of practices. With these, it is clear the lack of policies that regulate green products and the way green consumers could be deceived and induced consumption they assume is green.



It is how many green consumers end up making purchases that are not green, although, in appearance and perception, they are. That is also why they believe the government should take a more significant responsibility and provide better regulations about these green products (Johnstone & Tan, 2015).

All of these put green consumers in an awkward position, where their environmental commitment clashes with the uncertainty of their actual green consumption, making it necessary to access accurate information, make informed decisions, and stop making non-green consumptions that they need to be aware of.

## CONCLUSIONS

Green consumers have a clear intention when they initiate their purchasing process: to reduce their environmental impact and to support ethical and environmentally friendly business practices. However, when exploring the options in the market, it faces a series of challenges

that threaten its commitment. One of the main obstacles is the need for more information in terms of production and about the service or product itself (Polonsky, 2011).

Green food represents products and practices prioritizing environmental sustainability, accompanied by locally and ethically organic products. On the other hand, green consumers are individuals who express genuine concern about environmental problems and consciously look to align their purchasing and their values. As shown before in the text, the main paradox is that there is a disconnection between the availability of green products, the veracity of the information that green consumers can count on, and the difficulty of motivating a good part of these consumers to stick to green food consumption choices.

The paradox of the green consumer and green food represents a big challenge towards a more sustainable future. Reaching a medium point between the ecological consciousness of consumers and green food products depends on a diversity of factors and actors involving greenwashing, consumers' knowledge, and informed decisions. In this context, collective intelligence could be a powerful tool for bridging these contradictory factors.

Green consumers' contradiction reflects current food systems. Lack of availability, economic accessibility, and unclear information are challenges to those who try to align their food choices with their values. Also, the variables that influence food consumption behavior offer an amplitude of information about the contradiction between consumption and the beliefs of green consumers.



To overcome this contradiction, conjunct efforts are required, involving the government to implement policies that encourage the production, distribution, and commercialization of sustainable products. On the other hand, companies should be more transparent about their practices and the content of their products.

Through collective intelligence, ways can be found to strengthen the most critical information consumers have to receive about food security, environmental sustainability, and public health. This way, green consumers can be empowered to achieve informed and truly sustainable decision-making. However, as previously studied, alimentation does not only depend on the information a consumer has because other aspects, such as the social ones, greatly influence final consumption decisions.

It remains pending for posterior analysis if green consumer decisions are affected mostly by collectivities or individualities. Another question would be whether green consumption can be improved, influenced, and informed truly by collective intelligence or collective stupidity. Green consumers face a collective ambivalence. In this case, green consumers should be able to discern when collectivity guides them to better food options and when they do not.

In this way, after analyzing variables and the discrepancies among each one with green consumption, it can be defined that even if there are significant efforts by consumers to make greener consumption, collective intelligence, food availability, economy, and social influence are factors that, without noticing them, might be defining their eating behavior and food consumption toward options with unethical productions and friendly with the environment, concluding that green consumers are unconsciously not green.

**ACKNOWLEDGMENTS**

This essay is a product of the Seminar on Collective Intelligence, Inclusion, and Resilience I, in the doctoral program Innovación y Sustentabilidad en los Negocios.. Dr. Tania Elena González Alvarado coordinates the Seminar.

**REFERENCES**

Aithal, P., & Aithal, S. (2016). *Opportunities & Challenges for Green Technologies in 21st Century.* Munich Personal RePEc Archive (MPRA).

Akhila, P., Sunooj, K., Aaliya, B., Navaf, M., Sudheesh, C., George, J., & Pottakkat, B. (2022). Historical Developments in Food Science and Technology. *Journal of Nutrition Research*, *10*(1), 36-41. https://doi.org/10.55289/jnutres/v10i1_22.12

Alam, S., Ahmad, M., Ho, Y., Omar, N., & Lin, C. (2020). Applying an Extended Theory of Planned Behavior to Sustainable Food Consumption. *Sustainability*, *12*(20), 8394. https://doi.org/10.3390/su12208394

Alam, S., Wang, C., Masukujjaman, M., Ahmad, I., Lin, C., & Ho, Y. (2023). Buying Behaviour towards Eco-Labelled Food Products: Mediation Moderation Analysis. *Sustainability*, *15*(3), 2474. https://doi.org/10.3390/su15032474

Ariani, M., Gantina, A., Mauludyani, A., & Suryana, A. (2021). Environmentally friendly household food consumption behavior. *IOP Conference Series: Earth and Environmental Science*, *892*(1), 012023. https://doi.org/10.1088/1755-1315/892/1/012023

Boncinelli, F., Gerini, F., Piracci, G., Bellia, R., & Casini, L. (2023). Effect of executional greenwashing on market share of food products: An empirical study on green-coloured packaging. *Journal of Cleaner Production*, *391*, 136258. https://doi.org/10.1016/j.jclepro.2023.136258

Boye, J., & Arcand, Y. (2013). Current Trends in Green Technologies in Food Production and Processing. *Food Engineering Reviews*, *5*(1), 1-17. https://doi.org/10.1007/s12393-012-9062-z

Carroll, A., & Shabana, K. (2010). The Business Case for Corporate Social Responsibility: A Review of Concepts, Research and Practice. *International Journal of Management Reviews*, *12*(1), 85-105. https://doi.org/10.1111/j.1468-2370.2009.00275.x

Chen, P., & Antonelli, M. (2020). Conceptual Models of Food Choice: Influential Factors Related to Foods, Individual Differences, and Society. *Foods*, *9*(12), 1898. https://doi.org/10.3390/foods9121898

Connolly, J., & Prothero, A. (2008). Green Consumption: Life-politics, risk and contradictions. *Journal of Consumer Culture*, *8*(1), 117-145. https://doi.org/10.1177/1469540507086422

Dwivedi, Y., Ismagilova, E., Hughes, D., Carlson, J., Filieri, R., Jacobson, J., Jain, V., Karjaluoto, H., Kefi, H., Krishen, A., Kumar, V., Rahman, M., Raman, R., Rauschnabel, P., Rowley, J., Salo, J., Tran, G., & Wang, Y. (2021). Setting the future of digital and social media marketing research: Perspectives and research propositions. *International Journal of Information Management*, *59*, 102168. https://doi.org/10.1016/j.ijinfomgt.2020.102168

European Commission (2020). *The European Green Deal. Striving to be the first climate-neutral continent*. European Commission

Fanzo, J., Davis, C., McLaren, R., & Choufani, J. (2018). The effect of climate change across food systems: Implications for nutrition outcomes. *Global Food Security*, *18*, 12-19. https://doi.org/10.1016/j.gfs.2018.06.001

Flatters, P., & Willmott, M. (2009). Understanding the post-recession consumer. *Harvard Business Review*, 87(7/8), 106-112.

Giacalone, D., & Jaeger, S. (2023). Consumer acceptance of novel sustainable food technologies: A multi-country survey. *Journal of Cleaner Production*, *408*, 137119. https://doi.org/10.1016/j.jclepro.2023.137119

Gobierno de México (2022). *El sobrepeso y la obesidad se ha incrementado en todo el mundo durante las últimas tres décadas*. Servicio de Información Agroalimentaria y Pesquera. Link: https://www.gob.mx/siap/articulos/el-sobrepeso-y-la-obesidad-se-ha-incrementado-en-todo-el-mundo-durante-las-ultimas-tres-decadas?idiom=es

Higgs, S., & Thomas, J. (2016). Social influences on eating. *Current Opinion in Behavioral Sciences*, *9*, 1-6. https://doi.org/10.1016/j.cobeha.2015.10.005

Jakubczak, A., & Gotowska, M. (2020). Green Consumerism vs. Greenwashing. *European Research Studies Journal,* 23(Special 2), 167-181.

Johnstone, M., & Tan, L. (2015). Exploring the Gap Between Consumers' Green Rhetoric and Purchasing Behaviour. *Journal of Business Ethics*, *132*(2), 311-328. https://doi.org/10.1007/s10551-014-2316-3

Joshi, Y., & Rahman, Z. (2015). Factors Affecting Green Purchase Behaviour and Future Research Directions. *International Strategic Management Review*, *3*(1-2), 128-143. https://doi.org/10.1016/j.ism.2015.04.001

Kreidenweis, U., Lautenbach, S., & Koellner, T. (2016). Regional or global? The question of low-emission food sourcing addressed with spatial optimization modelling. *Environmental Modelling & Software*, *82*, 128-141. https://doi.org/10.1016/j.envsoft.2016.04.020

Lartey, J. (2021). *Digital Food Technologies and Our Everyday Lives: A Social Practice Analysis of Sustainable Food Consumption among Young Adults*. Lund University.

Loureiro, M., & Lotade, J. (2005). Do fair trade and eco-labels in coffee wake up the consumer conscience? *Ecological Economics*, *53*(1), 129-138. https://doi.org/10.1016/j.ecolecon.2004.11.002

McCluskey, J. (2015). Changing Food Demand and Consumer Preferences. *Agricultural Symposium*.

McHugh, K., Yammarino, F., Dionne, S., Serban, A., Sayama, H., & Chatterjee, S. (2016). Collective decision making, leadership, and collective intelligence: Tests with agent-based simulations and a Field study. *The Leadership Quarterly*, *27*(2), 218-241. https://doi.org/10.1016/j.leaqua.2016.01.001

Narula, S., & Desore, A. (2016). Framing green consumer behaviour research: Opportunities and challenges. *Social Responsibility Journal*, *12*(1), 1-22. https://doi.org/10.1108/SRJ-08-2014-0112

Nguyen, H., Nguyen, C., & Hoang, T. (2019). Green consumption: Closing the intention-behavior gap. *Sustainable Development*, *27*(1), 118-129. https://doi.org/10.1002/sd.1875

Paço, A. do, Shiel, C., & Alves, H. (2019). A new model for testing green consumer behaviour. *Journal of Cleaner Production*, *207*, 998-1006. https://doi.org/10.1016/j.jclepro.2018.10.105

Polonsky, M. (1995). A stakeholder theory approach to designing environmental marketingstrategy. *Journal of Business & Industrial Marketing*, *10*(3), 29-46. https://doi.org/10.1108/08858629510096201

Polonsky, M. (2011). Transformative green marketing: Impediments and opportunities. *Journal of Business Research*, *64*(12), 1311-1319. https://doi.org/10.1016/j.jbusres.2011.01.016

Pratama, F. (2022). Green Technology in Food Processing: Creating a Better Future for the Next Generation. *IOP Conference Series: Earth and Environmental Science*, *995*(1), 012014. https://doi.org/10.1088/1755-1315/995/1/012014



Rahman, S., & Nguyen-Viet, B. (2023). Towards sustainable development: Coupling green marketing strategies and consumer perceptions in addressing greenwashing. *Business Strategy and the Environment*, *32*(4), 2420-2433. https://doi.org/10.1002/bse.3256

Reisch, L., Eberle, U., & Lorek, S. (2013). Sustainable food consumption: An overview of contemporary issues and policies. *Sustainability: Science, Practice and Policy*, *9*(2), 7-25. https://doi.org/10.1080/15487733.2013.11908111

Salazar, H., Oerlemans, L., & Van Stroe-Biezen, S. (2013). Social influence on sustainable consumption: Evidence from a behavioural experiment: Social influence in sustainable consumption. *International Journal of Consumer Studies*, *37*(2), 172-180. https://doi.org/10.1111/j.1470-6431.2012.01110.x

Shen, X., Xu, Q., & Liu, Q. (2022). Predicting sustainable food consumption across borders based on the theory of planned behavior: A meta-analytic structural equation model. *PLOS ONE*, *17*(11), e0275312. https://doi.org/10.1371/journal.pone.0275312

Smelser, N., & Baltes, P. (Eds.). (2001). *International encyclopedia of the social & behavioral sciences* (1st ed). Elsevier.

White, K., Hardisty, D., & Habib, R. (2019). *People say they want sustainable products, but they don't tend to buy them. Here's how to change that.*

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J., De Vries, W., Majele Sibanda, L., … Murray, C. J. (2019). Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, *393*(10170), 447-492. https://doi.org/10.1016/S0140-6736(18)31788-4

Xu, Z., Sun, D., Zeng, X., Liu, D., & Pu, H. (2015). Research Developments in Methods to Reduce the Carbon Footprint of the Food System: A Review. *Critical Reviews in Food Science and Nutrition*, *55*(9), 1270-1286. https://doi.org/10.1080/10408398.2013.821593

Yang, X., & Lo, K. (2021). Environmental health research and the COVID-19 pandemic: A turning point towards sustainability. *Environmental Research*, *197*, 111157. https://doi.org/10.1016/j.envres.2021.111157

Zhang, B., & Zhang, B. (2018). Precise marketing of precision marketing value chain process on the H group line based on big data. *Journal of Intelligent & Fuzzy Systems*, *35*(3), 2837-2845. https://doi.org/10.3233/JIFS-169637

Mercados y Negocios
1665-7039 printed
2594-0163 on line
Year 25, n. 51, January-April (2024)

# Management of Intellectual Property as a Generator of Resources in Mexican Higher Education Institutions

*Gestión de propiedad intelectual y captación de recursos en las Instituciones Mexicanas de Educación Superior*

https://doi.org/10.32870/myn.vi51.7715

Fernando Rodríguez
Universidad Autónoma de Querétaro (México)
ferrodriguezuaq@gmail.com
https://orcid.org/0000-0002-6867-770X
Martín Vivanco Vargas
Universidad Autónoma de Querétaro (México)
martinvivanco@uaq.mx
https://orcid.org/0000-0002-0637-579X
Moisés Gómez Salazar
Universidad Autónoma de Querétaro (México)
aeronauticogomez@hotmail.com
https://orcid.org/0000-0002-4103-8940

Received: November 22, 2023
Accepted: December 28, 2023

**ABSTRACT**

This paper was developed to analyze the level of implementation of intellectual property management processes in Higher Education Institutions (HEI). Intellectual Property management processes in the public sector have been reduced, at least in understanding the concept, to the processes of protecting and maintaining intellectual property titles; however, it is a more extensive process than conceptualized. In this sense, Martinez et al. (2018) generated a methodology involving 19 indicators (processes) of intellectual property management implemented during the R&D&I process. These indicators were used to measure their implementation in Mexican public sector HEIs with information from the transparency portal. The research shows the importance of generating multidisciplinary groups in R&D&I processes, enhancing the financial redundancy of research investment.

Keywords: Public Sector, Intellectual Property, Research Development and Innovation, High Education Institutions.

JEL code: I23

Mercados y Negocios por Departament
o de Mercadotecnia y Negocios Internacionales. Universidad de Guadalajara se distribuye bajo una Licencia Creative Commons Atribución-NoComercial 4.0 Internacional. Basada en una obra en http://mercadosynegocios.cucea.udg.mx/index.php/MYN.

**RESUMEN**

El presente trabajo se desarrolló con el objetivo de analizar el nivel de implementación de procesos de gestión de la propiedad intelectual en las Instituciones de Educación Superior (IES). Los procesos de gestión de la Propiedad Intelectual en el sector público se han reducido, al menos en el entendimiento del concepto, a los procesos de protección, y mantenimiento de los títulos de propiedad intelectual, sin embargo, es un proceso más extenso de lo conceptualizado. En este sentido, Martínez y Col. (2018) generaron una metodología que involucra 19 indicadores (procesos) de gestión de la propiedad intelectual implementados durante el proceso de I+D+i. Estos indicadores fueron usados para medir su implementación en las IES del sector público mexicano, con información obtenida a partir del portal de transparencia. La investigación muestra la importancia de generar grupos multidisciplinarios en los procesos de I+D+i, potenciando la redundancia financiera de la inversión en investigación.

Palabras clave: Sector Público, Propiedad Intelectual, Investigación Desarrollo e Innovación, Instituciones de Educación Superior

Código JEL: I23

## INTRODUCTION

This paper was developed to analyze the importance of the different intellectual/industrial property management processes for acquiring economic-financial resources within Higher Education Institutions (HEI) of the Mexican public sector. Intellectual property management in Mexican HEIs has yet to be internalized comprehensively, and only some of the processes are adopted within the institutions. It can be observed in a search of the institutional procedures related to this topic. However, it is of great importance to adopt a whole process of intellectual property management, which, if carried out correctly, can generate an economic benefit for the institutions that make up the Mexican public sector.

In the present research, the analysis was developed from a general concept of intellectual/industrial property management, from the gestation process of a technological development project to the point at which a possible adoption or transfer of the developed technologies may or may not occur.

The complexity of an efficient intellectual property management process means that the different indicators are interconnected, so their study and implementation represent a significant challenge. Meeting this challenge will substantially impact public policies, focusing the institutions' efforts on the processes that require more attention within the institutions —that help attract financial resources, increasing the capital for reinvestment that generates more technological development.



To achieve this resource capture through Intellectual/Industrial Property Management, the concept must be internalized not only in the regulations but also in the Research, Development, and Innovation processes related to the importance of the intangible assets owned by the institutions, their identification, and even the future vision for research.

## INTELLECTUAL/INDUSTRIAL PROPERTY

According to the World Intellectual Property Organization (WIPO) (2023), intellectual property refers to all products developed from human creativity, including literary and artistic works, original technological developments, and new processes. Intellectual property rights can be divided according to their application. Derived from this, within the classification, we can identify industrial property, whose governing body is the Mexican Institute of Intellectual Property (IMPI).

The basis of intellectual property law consists of granting exclusive economic exploitation rights for a determined period to inventors, authors, and technological developers with the potential for implementation in specific markets with an impact on society. According to WIPO (2023), several objects are covered by IP.

- Literary, artistic, and scientific works.
- Performances by performing artists and performances by performing artists.
- Phonograms and radio broadcasting.
- Inventions in all fields of human activity.
- Scientific discoveries.
- Industrial designs.
- Trademarks, trademarks, service marks, and trade names.
- Among others.

It is the set of elements such as trademarks, copyrights, patents, and trade secrets or those the company uses to exercise its activities. Since the creation of IMPI, the rules, regulations, and public policies in which this agency of the Ministry of Economy (SE) is immersed have constantly evolved. It is because organizations have focused to a greater extent on quantifying the value that can be granted to technological developments and other intangible assets, due to the great importance they have demonstrated, mainly for technological innovation, fostering more significant growth in the country (DOF, 2020).



In addition to IMPI's laws, regulations, and legislation, higher education institutions (HEI) are also subject to compliance with the laws of the humanities, science, technology, and innovation.

## INTELLECTUAL PROPERTY IN THE LAW ON HUMANITIES, SCIENCE, TECHNOLOGY, AND INNOVATION

In 2023, the then Law on Science, Technology, and Innovation was replaced by the Law on Humanities, Science, Technology, and Innovation, which provides the parameters on which the strategies for the development of Research, Development, and Innovation (R&D&I) in the priority areas identified by the government are required to be based. This law (Congreso de la Unión, 2023) has articles on intellectual property and its management within Mexican public sector institutions. The law states that:

- Article 11, Section XI: The National Council of Humanities, Science, Technology, and Innovation (Conahcyt) is an essential part of the public sector's technology transfer processes, developing general strategies to bring the technologies developed to the productive and industrial sectors so that they can be within the reach of the market, users, and society.

- Article 11, Section XXIII: Likewise, the Conahcyt must generate strategies for protecting intellectual property in such a way that it favors the national public interest. Furthermore, Article 33, Section IX mentions that IP rights shall respond to the national public interest and the welfare of the people of Mexico.

- Article 38: Copyright and Intellectual Property rights derived from research financed by Conahcyt must generate returns for this organization:
    - Paragraph 2: Conahcyt will be the holder of the IP rights derived from the projects financed by this entity, without prejudice to the moral rights. However, it also comments that in technological development projects where the institutions contribute concurrently, the rights may be shared according to the contribution provided by each of the different actors.

- Articles 49 and 50: As part of the integrated intellectual property management process, Conahcyt must promote the establishment of science and technology-based companies with public participation, as well as technology transfer for the integral development of the country.

- Article 72, paragraph VIII: Conahcyt centers must implement science and technology to improve or generate new products, services, and productive processes.



- Article 74: The National System of Public Research Centers attached to Conahcyt must generate the necessary strategies to recognize the IP rights corresponding to the Technological Developments and Innovations carried out by the researchers that are part of the same institutions.

Intellectual property is part of public sector institutions' intellectual and technological capabilities. It can be generated in an inter-institutional manner, increasing the capacity of the products of research and technological development. In addition to this, the institutions have already installed technological capabilities and the intellectual capital represented by each of the researchers that compose them. One of the ways to take advantage of technological and intellectual capabilities is through inter-institutional collaboration. In this regard, the General Law of Humanities Science, Technology, and Innovation (Congreso de la Unión, 2023) establishes that:

- Article 8: The government shall encourage the government to meet, associate, and collaborate nationally and internationally.
- Article 9, Section III: It is public policy to develop and consolidate national capacities ... as well as to maintain and continuously improve the infrastructure and equipment

necessary for R&D&I, in addition to the pertinent collaboration mechanisms for efficient use.

- Article 26, Section VIII, and Article 27: It is public policy for state and local governments to promote collaboration, cooperation, and metropolitan and regional articulation for the best design of projects in the humanities, science, technology, and innovation.
- Article 33 Section II: The activities and projects supported by the state must foster the articulation of national and regional capacities through the collaboration of academics and community members with knowledge, experience, and professional solvency.

These public policies should be inserted into the Research, Development, and Innovation processes, even if they still need to be implemented.

## INTELLECTUAL PROPERTY IN R&D&I

Intellectual/industrial property is a fundamental part of the intangible assets of the institutions dedicated to R&D&I. However, its development has not been fully achieved within public institutions due to a group of barriers such as the lack of culture in the researchers of the institutions, the level of bureaucracy of the institutions themselves, and the lack of rules, regulations, legislation, and public policies focused on the management of intellectual property (Garrido, 2023).



In Science, Technology, and Innovation, the importance of securing intellectual/industrial property through the corresponding titles has the potential to contribute to prosperity and social and economic competition in Mexico, as long as there are the necessary strategies to bring technological developments to the market (Garrido, 2023), including those of the public sector, and thus be within the reach of society, avoiding that they remain as empty research, or generation of sterile technology.

It is necessary to implement public policies such as those already mentioned. However, it has been observed that there needs to be more congruence between these and their implementation. They leave, to a certain extent, the Public Research Centers and Higher Education Institutions unprotected (Rodriguez & Morgan, 2020), which are the institutions that have the most qualified personnel for technological development at the national level and which should be considered as one of the primary "concurrent" resources for the projects. Intellectual/industrial property is fundamental for the development of organizations, taking better advantage of their technological and intellectual capabilities.

An example of this is NASA, which, according to GreyB (2022), 2021 obtained profits of 1.5 billion dollars from patents that are currently active, or the Massachusetts Institute of Technology (MIT), an institution that in 2022 obtained, according to data from the same institution, 87.4 million dollars from the licensing of its technological developments.

As in the large institutions in the United States, a policy that promotes the management of industrial property in the Mexican public sector is of great importance, as well as a great need, to increase the competitiveness of the institutions in charge of technological development, generate resources for the same institution, and potentiate the generation of new projects that generate new technologies, with intellectual/industrial property titles, and in this way become a virtuous circle. However, reducing spending in this area in the public sector is one of the most significant barriers to technological development in our country.

Lederman and Maloney (2003) mention at least four main reasons for the inhibition of spending on technological development, where the low appropriation of the same forms an essential part, reducing the redundancy of the investment due to the use of information, developments, and technology by third parties of the information that has been made available to the public domain, through publications in journals, without the need for the authorization of the developers; This, however, could be modified through a change in internal policies related to the management of intellectual property, encouraging the distribution of scientific and technological knowledge through an intellectual property management system, to obtain not only moral recognition but also a recovery of the investment made in the R+D+i processes of the Mexican public sector.



The work in inter and multidisciplinary schemes for obtaining intellectual property titles, and therefore the exclusive right of exploitation (via products and services or technology transfer), is necessary as part of the care and safeguarding of the technological heritage, intellectual capital, and investment that all development represents (Gómez, 2016).

Achieving this represents an arduous task since an intellectual property management scheme must start from the moment of the gestation of a research project (both basic and applied), carrying out a constant process of identification of technologies susceptible to protection, from the products to the processes that have been developed or improved during the research. In addition, it also involves commercial processes, such as technology foresight and market studies, and transfer, commercialization, and/or exploitation processes by the institutions involved in the development, including those of the public sector.

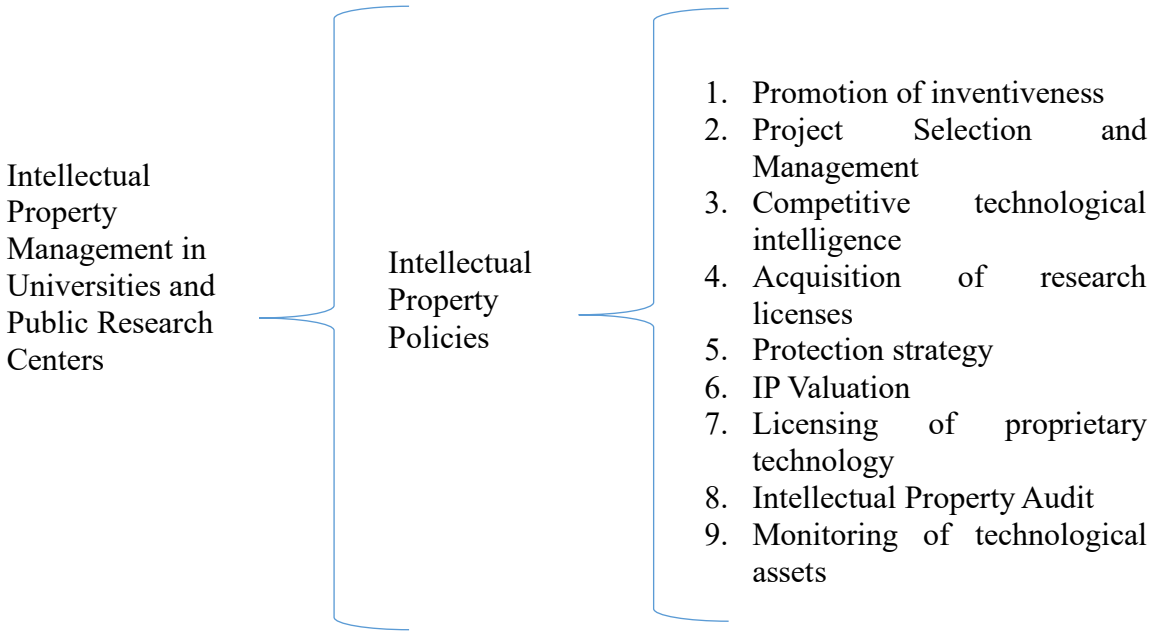
## INTELLECTUAL PROPERTY MANAGEMENT IN THE PUBLIC SECTOR

Intellectual Property Management (IPM) is one of the main processes for technologies developed by public institutions, including HEIs, to reach society and thus directly benefit the sectors in which they are inserted (Salazar & Henríquez, 2010). Likewise, Salazar and Henríquez (2010) mention that this process would achieve the redundancy of the financial resources invested in R&D&I processes, thus achieving an increase in the levels of research and technological development.

According to Masó (2015), one of the most effective tools for academic institutions in the public sector to truly achieve scientific and technological progress, by the practical and ethical commitments they have inherent to society, is the management of technology through the identification, protection, administration, and transfer of technological developments susceptible to be protected. Solleiro (2003) mentions that nine elements make up the management of intellectual property (Figure 1).

Figure 1. Elements of Industrial Property Management






Source: Luna and Solleiro (2007) based on Solleiro (2003).

These elements are immersed in all research and development processes within public sector institutions. However, not all processes are given the same importance in the country due to

the socio-technical system in which these types of institutions are immersed, in such a way that innovation in the institutions is inhibited.

The concept of innovation is comprehensive. This concept has tried to be described as "what did not exist and now exists," "creativity and inventiveness," "research and discovery," and "design and technological development" (Echeverría et al., 2010, p. 0). However, they require the characteristics Schumpeter (1934) described as effectiveness, transcendence, and permanence (Echeverría et al., 2010).

According to Echeverría et al. (2010), the process of innovation per se consists of transforming reality and generating new combinations of what already exists, related to creativity, inventiveness, and the materialization of inventions into products, following the fundamental laws of conservation of matter and energy. This concept is closely related to the emergence of emergent properties inserted within Wilber's holoarchical theory, where everything is part of something and simultaneously is a whole within an integral vision of things (Medina, 2018).

Intellectual property management, as part of a generalized process in R&D&I, can be analyzed within this theory, where management is not only the obtaining of property titles but is part of a more complex process, which goes from the conceptualization of an idea to the arrival of knowledge to society through a product or service.

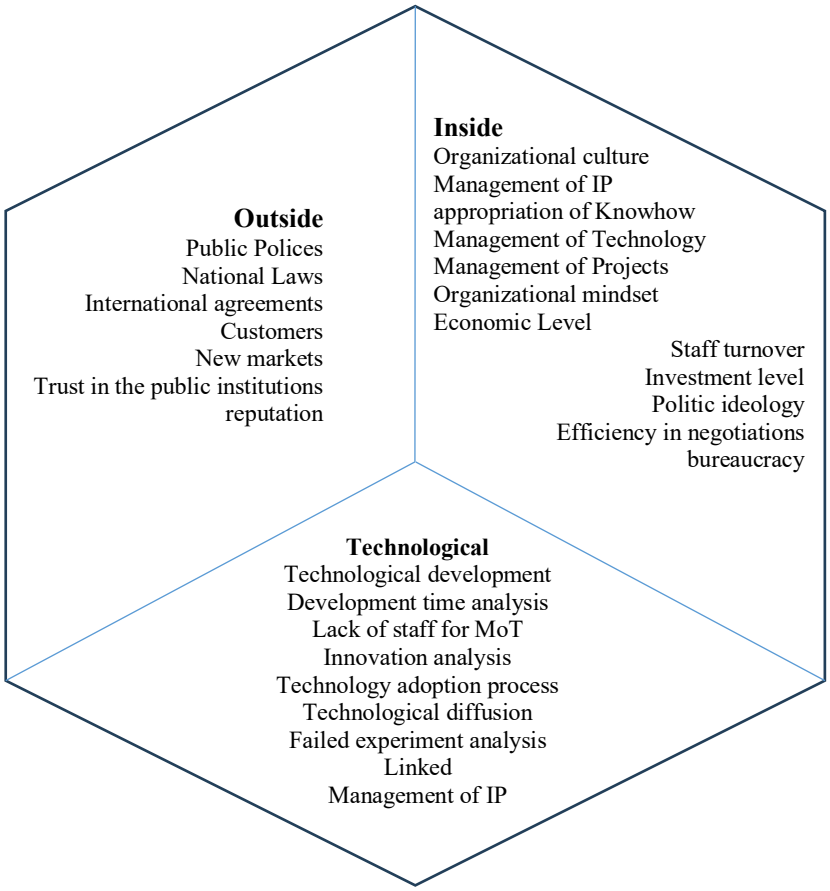


Similarly, institutions should be considered as a subsystem of a more extensive system (socio-technical system), in which internal, external, and technological factors are mainly involved (Figure 2), making the innovation process of Mexican public sector institutions more complex.

These elements should be considered within the processes of Industrial Property Management developed in the public sector, where, through public policies, the internal factors that inhibit the exploitation of technologies developed in this sector, such as Higher Education Institutions, can be influenced. Such is the case of bureaucracy, which, according to Garrido (2023), is one of the main factors inhibiting innovation within Mexican public sector institutions.

Several models have been developed related to the management of intellectual property that involve, more directly, the processes of the different institutional areas, achieving the intermediation between them.

Figure 2. Elements of the socio-technical System of Innovation in the Public Sector




Source: Own elaboration (Lepratte, 2012; Moore, 2005; Levén, Holmström & Mathiassen, 2014; Bommert, 2010; Díaz et al., 2018; Vega, 2015; Colunga, Molina & Armenteros, 2016; Bernier, Hafsi & Dechamps, 2015; Rodríguez & Cerda, 2017).

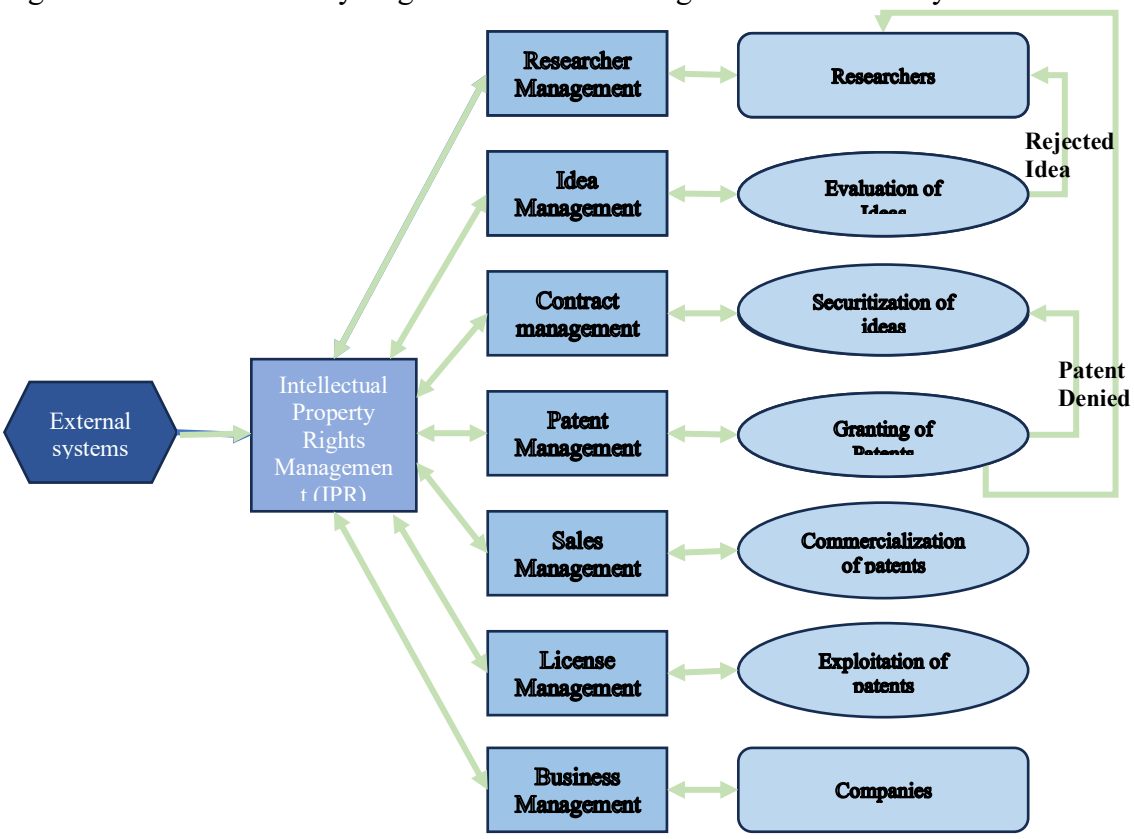
Table 1. Processes and sub-processes of Patent Management in Universities

| University Patent Management | |
|---|---|
| Physical Subprocesses | Administrative Subprocesses |
| Evaluation of ideas/projects and search for funding | Researcher management |
| Formalization of projects | Idea/project management |
| Granting of patents | Contract management |
| Commercialization of patents | Patent management |
| Exploitation of patents | Sales Management |
| | License management |
| | Business Management |

Source: Lopez et al. (2009).

López et al. (2009) developed a Model of Processes by Regulation for University Patent Management (Figure 3) based on information obtained from universities in Chile, Colombia, and Spain. In this model, he presents the main subprocesses of intellectual property management identified in this research, dividing them into physical and administrative subprocesses (Table 1).

Figure 3. Process Model by Regulation for the Management of University Patents




Source: Lopez et al. (2009).

Using the above model as part of their theoretical framework, Martinez et al. (2018) developed a methodology for the management of Intellectual Property, in which they included the 19 indicators with the most significant influence on the measurement process, where they identified an insufficiency of implementation in the use of specialized patent information, prospective studies, valuation of intangible assets and in the granting of permissions for the use of third parties through licenses.

Well-managed Intellectual Property Management contributes to the mission of public sector institutions, making information related to the results of applied research processes available to the public domain through Intellectual Property titles, facilitating access to new products, services, and technologies through transfer, adaptation, and adoption to the target sectors

(Salazar & Henríquez, 2010). In this way, technological developments impact society, facilitating access to the public through the massification that the private sector can achieve.

Intellectual Property Management requires highly specialized knowledge to carry out the necessary technical analysis successfully, in addition to being an expert in background and prior art research, and finally implementing the appropriate methodologies for the evaluation of technical, commercial feasibility and productivity (Gómez, 2016), including a high-level analysis of financial, marketing and production process issues.

In Mexico, investment in intellectual, technical, and technological capabilities has increased significantly in the public sector; however, this effort has not had a financial impact on the institutions due to the low implementation of intellectual property management processes within this sector (Luna & Solleiro, 2007).

Several fundamentals encourage the management of intellectual property. According to Gómez (2016), they correspond to technological development and can be summarized to:

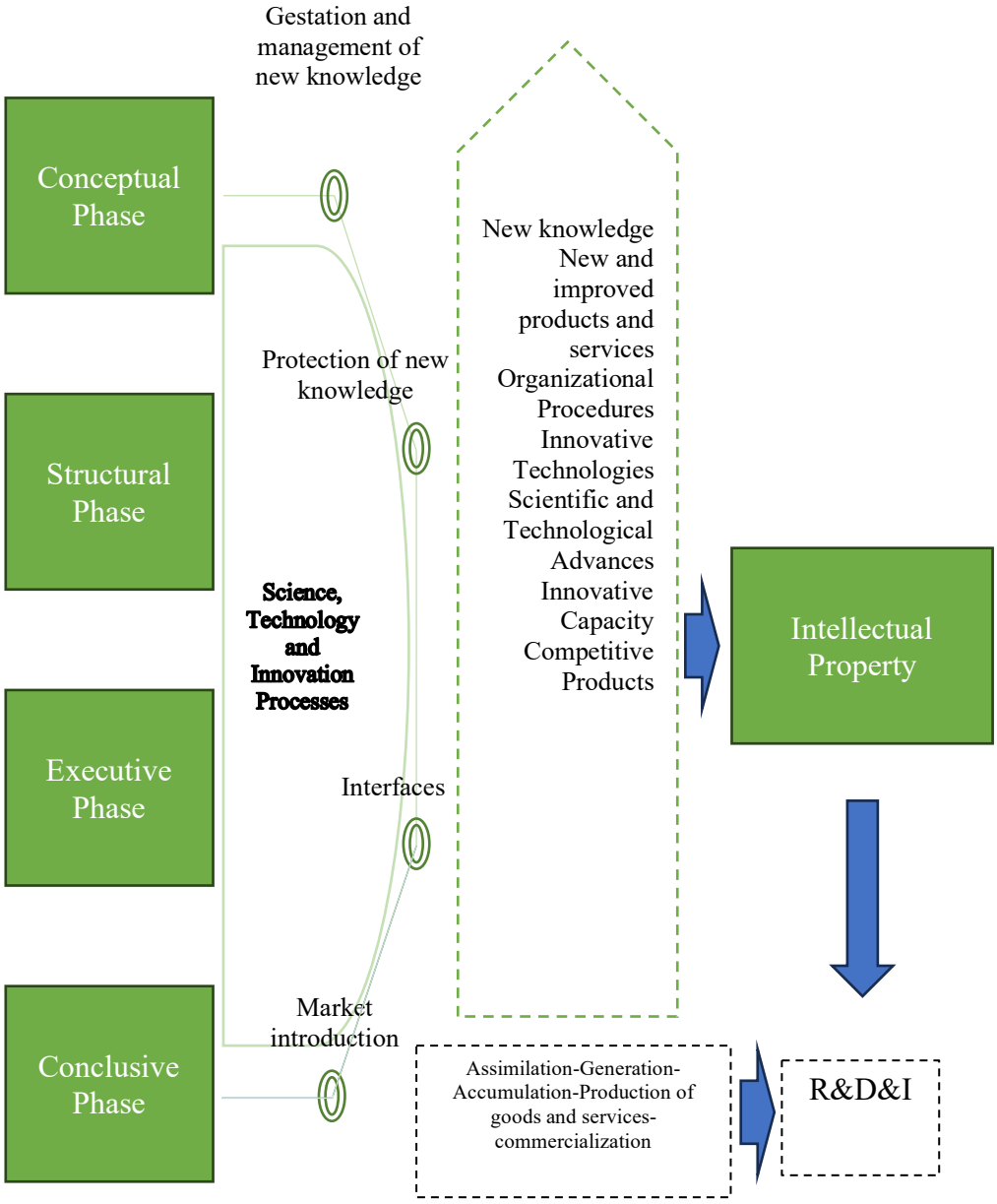
- Technology is a creative process that encourages companies to improve products, production processes, marketing, and services.
- It is a catalyst for economic, scientific, and social development.
- Supports the management of support or incentives to improve technological development.
- It is a negotiating factor in the framework of the treaties signed by Mexico.
- Understanding intellectual property assets improves and streamlines intellectual property trading practices and procedures.



Much of the research talks about the institutionalization of intellectual property, where it is included in their regulations and procedures. However, the appropriation of technology is not an essential source of income for institutions since researchers focus R&D&I processes on developing products with academic value rather than searching for technology transfer to the private sector and, therefore, to society (Garrido, 2023).

Martinez et al. (2018) divide their methodology into 4 phases: conceptual, structural, executive, and conclusive, interrelating the management of Science, Technology, and Innovation projects with Intellectual Property rights (Figure 4), in which the 19 indicators that they identified as primary for the measurement of Intellectual Property Management are integrated (Table 2).

Figure 4. Relationship between R&D&I projects and intellectual property




Source: Martinez et al. (2018).

Table 2. Relationship between the phases of Intellectual Property Management and its processes.

| Conceptual Phase | Structural Phase | Executive Phase | Conclusive Phase |
|---|---|---|---|
| Prospective Studies | Contractual provisions in TT and investment projects | | Valuation of intangible assets |
| Degree of Technological Up-to-Date | | Budget for IP protection | Sale of the product |
| Search for technological background | | | Licensing of third parties |
| Research of competitive opportunities | Prospective studies | Strategic alliances and cooperative productions | |
| Investigation of the applicable legal framework | Market research | Use of specialized patent information | Maintenance and upkeep |
| Use of specialized patent information | Evaluation of forms of protection | | Assimilation and Technology Transfer |
| Infringement of third party rights | Preparation of confidentiality agreements | Human capital training | |
| | Aesthetic image design | | |

Source: Own elaboration based on Martínez et al. (2018).

Although these indicators were analyzed about their implementation of an Intellectual Property Management process within the R&D&I projects developed in a public institution, they should also be analyzed about the economic benefit of implementing each process for institutions of this type. However, the validation of the indicators by the authors provides a window of opportunity for the analysis of public institutions and their relationship with the generation of financial resources through an efficient intellectual property management process.

## METHODOLOGY

The project was developed through a quantitative methodology. The present research was conducted in a sample of 10 Mexican public sector Higher Education Institutions (Table 3) randomly selected through Microsoft® Excel® software.

Table 3. Sample of Higher Education Institutions

| Institution |
|---|
| Universidad Veracruzana |
| Autonomous University of Baja California |
| University of Chihuahua |
| Autonomous University of Nuevo Leon |
| University of Colima |
| Benemérita Universidad Autónoma del Estado de Puebla (Autonomous University of the State of Puebla) |
| University of Guadalajara |
| Autonomous University of Tamaulipas |
| Autonomous University of Chapingo |
| Autonomous University of Querétaro |

Source: Own elaboration

The information for the analysis was obtained through the public universities' transparency portal comprising the sample (Table 3), seeking to ensure information related to the total number of projects and property titles active in each institution. This information was entered into Minitab® statistical software for processing.



For the research, the indicators identified by Martinez et al. (2018) (Table 4) were analyzed and validated for the 256 research projects active in the year of the research at the University of Pinar del Río. In addition, information was requested on generating own resources by project development, technology transfer, royalties, and commercialization of products or services.

Table 4. Indicators of the Martinez et al. (2018) methodology

| Indicator |
|---|
| Use of specialized patent information |
| Degree of Technological Up-to-Date |
| Background Search |
| Maintenance and preservation of IP rights |
| Market research |
| Confidentiality agreements |
| Research of competitive opportunities |
| Aesthetic image design |
| Applicable legal framework |
| Infringement of third-party rights |
| Prospective studies |
| Budget for processing and maintenance of IP rights |

| |
|---|
| Valuation of Intangible Assets |
| Technology assimilation and transfer |
| Contractual provisions of IP rights |
| Permission for use by third parties |
| Evaluation of other forms of protection |
| Strategic alliances and cooperative productions |
| Training of human capital |

Source: Martinez et al (2018).

The study was carried out in 2 phases. Phase 1: Analysis of the implementation of Intellectual Property Management processes in Higher Education Institutions. The implementation analysis was carried out by obtaining descriptive statistics from the information provided by the institutions using Minitab® software.

Phase 2. Relation of Intellectual Property Management indicators and the obtaining of resources. This phase was developed to analyze the relationship between obtaining one's resources and the different figures for obtaining economic resources related to intellectual property management through a Spearman correlation analysis. Similarly, a correlation analysis of the different indicators proposed by Martínez et al. (2018) was performed with the income obtained through the project development, technology transfer, royalties, and commercialization of products or services to analyze which indicators, from the information provided in the transparency portal, have a more significant relationship.



## RESULTS

Analysis of the implementation of Intellectual Property Management processes in Higher Education Institutions.

The analysis of the Technological Management indicators showed a high culture in the implementation of essential processes for research. However, it showed a significant lag in the implementation of processes related to the commercialization of intellectual property rights and the development and evolution of the market (Table 5).

The indicator that has a lower implementation, according to the data obtained through the Transparency Portal, is the analysis of the possible violation of third-party rights (Market evolution), which is implemented in 7% of the projects and can trigger future legal and economic problems for the institutions, leaving them unprotected from the beginning of the R&D&I processes.

Table 5. Implementation of IP Management Processes in Higher Education Institutions

| Variable | N | Media |
|---|---|---|
| Use of specialized patent information | 10 | 0.819 |
| Degree of Technological Up-to-Date | 10 | 0.330 |
| Background Search | 10 | 0.700 |
| Maintenance and preservation of IP rights | 10 | 0.900 |
| Market research | 10 | 0.294 |
| Confidentiality agreements | 10 | 0.600 |
| Research of competitive opportunities | 10 | 0.220 |
| Aesthetic image design | 10 | 0.274 |
| Applicable legal framework | 10 | 0.620 |
| Infringement of third party rights | 10 | 0.0700 |
| Prospective studies | 10 | 0.280 |
| Budget for processing and maintenance of IP rights | 10 | 0.650 |
| Valuation of Intangible Assets | 10 | 0.300 |
| Technology assimilation and transfer | 10 | 0.290 |
| Contractual provisions of IP rights | 10 | 0.376 |
| Permission for use by third parties | 10 | 0.400 |
| Evaluation of other forms of protection | 10 | 0.580 |
| Strategic alliances and cooperative productions | 10 | 0.400 |
| Training of human capital | 10 | 0.680 |

Source: Own elaboration with the data



The implementation of indicators presented in Table 4 also shows us the reduced importance given in the institutions to the investigation of competitive opportunities (.220), design of the aesthetic image (0.2740), generation of prospective studies (0.2800), assimilation and transfer of technologies (0.2900), generation of market studies (0.2940), valuation of intangible assets (0.3000), analysis of the degree of technological actuality (0.3300), review of contractual provisions related to IP rights (0.3760), licensing or permission of use to third parties (0.4000) and development or generation of strategic alliances and cooperative productions (0.4000).

However, there is a high implementation of the processes necessary to maintain and conserve intellectual property rights, which may result in a high investment. However, due to the need for more implementation of processes related to the market, there is a low redundancy of this to the HEIs.

*Relationship between Intellectual Property Management indicators and resource acquisition*

In the Spearman correlation analysis of the obtaining of resources (Table 6), it is observed that there is a negative correlation between the obtaining of own resources and the obtaining

of resources related to the management of intellectual property (technology transfer, royalties, and commercialization of products and services), evidence of the need to increase the attention on the processes of Intellectual Property Management to consider this as an essential source of income.

Table 6. Spearman's correlation of own resource revenues and IP management

| Indicator 1 | Indicator 2 | Correlation |
|---|---|---|
| Revenues from project development | Own resources | 0.321 |
| Income from technology transfer | Own resources | -0.401 |
| Royalty income | Own resources | -0.401 |
| Revenues from commercialization of products or services | Own resources | -0.214 |

Source: Own elaboration

*Relationship between Intellectual Property management Indicators and Resource Procurement*

Spearman's correlation analysis between the indicators and the obtaining of resources through technology transfer (Table 7) shows a positive correlation (although low) mainly with the market processes of technological developments, such as the application of technology foresight methodologies and the analysis of competitive opportunities (technological development initiation process), market studies (intermediate process) and the valuation of intangible assets, the design of the aesthetic image and the maintenance and conservation of IP rights (final process).



Table 7. Correlation analysis of technology transfer with Intellectual Property Management

| Indicator | Source of Income | Correlation |
|---|---|---|
| Use of specialized patent information | Technology Transfer | -0.316 |
| Degree of Technological Up-to-Date | Technology Transfer | 0.217 |
| Background Search | Technology Transfer | -0.074 |
| Maintenance and preservation of IP rights | Technology Transfer | 0.216 |
| Market research | Technology Transfer | 0.217 |
| Confidentiality agreements | Technology Transfer | 0.071 |
| Research of competitive opportunities | Technology Transfer | 0.297 |
| Aesthetic image design | Technology Transfer | 0.217 |
| Applicable legal framework | Technology Transfer | -0.291 |
| Infringement of third-party rights | Technology Transfer | -0.216 |
| Prospective studies | Technology Transfer | 0.297 |
| Budget for processing and maintenance of IP rights | Technology Transfer | 0.009 |
| Valuation of Intangible Assets | Technology Transfer | 0.297 |
| Contractual provisions of IP rights | Technology Transfer | 0.145 |

| | | |
|---|---|---|
| Permission for use by third parties | Technology Transfer | 0.221 |
| Evaluation of other forms of protection | Technology Transfer | 0.082 |
| Strategic alliances and cooperative productions | Technology Transfer | -0.33 |
| Training of human capital | Technology Transfer | -0.074 |

Source: Own elaboration

About the generation of resources through the figure of royalties (Table 8), some processes are directly related to the market, repeating in this sense the analysis of technological foresight, market studies research of competitive opportunities, and the design of the aesthetic image. This analysis also shows an increase in the relationship of all indicators concerning technology transfer, which could indicate that not all technology transfer processes are considered intellectual property and, therefore, generate a constant income for the institutions.

Table 8. Correlation analysis of royalty income with Intellectual Property Management.

| **Indicator** | **Source of Income** | **Correlation** |
|---|---|---|
| Use of specialized patent information | Royalties | -0.214 |
| Degree of Technological Up-to-Date | Royalties | 0.336 |
| Background Search | Royalties | 0.065 |
| Maintenance and preservation of IP rights | Royalties | 0.283 |
| Market research | Royalties | 0.468 |
| Confidentiality agreements | Royalties | 0.25 |
| Research of competitive opportunities | Royalties | 0.567 |
| Aesthetic image design | Royalties | 0.336 |
| Applicable legal framework | Royalties | -0.102 |
| Infringement of third party rights | Royalties | 0.283 |
| Prospective studies | Royalties | 0.567 |
| Budget for processing and maintenance of IP rights | Royalties | 0.179 |
| Valuation of Intangible Assets | Royalties | 0.567 |
| Technology assimilation and transfer | Royalties | -0.236 |
| Contractual provisions of IP rights | Royalties | 0.359 |
| Permission for use by third parties | Royalties | 0.452 |
| Evaluation of other forms of protection | Royalties | 0.287 |
| Strategic alliances and cooperative productions | Royalties | 0 |
| Training of human capital | Royalties | 0.065 |

Source: Own elaboration

Likewise, the above may indicate the functioning of technological development in HEIs, where technological developments of this type are commissioned, as mentioned by Rodriguez and Morgan (2021), and probably need to be considered within the indicator of the analysis of contractual provisions of Intellectual Property.

Regarding income from the commercialization of products and services (Table 9.), Spearman's correlation analysis showed that most of the indicators show a negative correlation, probably because the purpose of Mexican public institutions is not commercialization, being the granting of permission for use to third parties (.227) the best form of commercialization by the institutions; however, focusing efforts on intellectual property management processes, mainly about services, could increase the level of income from this item.

Table 9. Correlation analysis of revenues from commercializing Products and Services with Intellectual Property Management

| Indicator | Source of Income | Correlation |
|---|---|---|
| Use of specialized patent information | Marketing of products and services | -0.737 |
| Degree of Technological Up-to-Date | Marketing of products and services | 0.212 |
| Background Search | Marketing of products and services | -0.34 |
| Maintenance and preservation of IP rights | Marketing of products and services | -0.581 |
| Market research | Marketing of products and services | -0.18 |
| Confidentiality agreements | Marketing of products and services | 0.274 |
| Research of competitive opportunities | Marketing of products and services | -0.145 |
| Aesthetic image design | Marketing of products and services | -0.045 |
| Applicable legal framework | Marketing of products and services | -0.625 |
| Infringement of third party rights | Marketing of products and services | -0.498 |
| Prospective studies | Marketing of products and services | -0.145 |
| Budget for processing and maintenance of IP rights | Marketing of products and services | -0.564 |
| Valuation of Intangible Assets | Marketing of products and services | -0.145 |
| Technology assimilation and transfer | Marketing of products and services | -0.657 |
| Contractual provisions of IP rights | Marketing of products and services | 0.112 |
| Permission for use by third parties | Marketing of products and services | 0.227 |
| Evaluation of other forms of protection | Marketing of products and services | -0.365 |
| Strategic alliances and cooperative productions | Marketing of products and services | -0.317 |
| Training of human capital | Marketing of products and services | -0.34 |

Source: Own elaboration

In addition, the negative correlation indicates a need to increase efforts in intellectual property management processes focused on commercializing services.

## CONCLUSIONS

Higher Education Institutions are a source of technology in technological and intellectual capabilities. However, in the Mexican public sector, public policies, regulations, legislation, incentive mechanisms for researchers, and even the culture and vision of these institutions have left them lagging in the technological development markets.

Although all knowledge is valuable, R+D+i should be projected to generate products or services that benefit society, focused on problems, needs, and future advances. The lack of investment or focus on technology foresight processes in Mexican public sector Higher Education Institutions generates a sterile field of knowledge, with knowledge that, for the most part, will not be applied, representing more of a cost than an investment. Implementing a constant process of technological foresight, which focuses on the efforts of R+D+i, will favor the redundancy of the resources invested in R+D+i, awakening the interest of the market and the public sector and representing a real benefit to society.



Similarly, market studies are an essential part of the intellectual property management process. Higher Education Institutions should include personnel specialized in marketing in the technological development projects to support the approval decisions of R&D&I projects in such a way that they seek to have a tangible impact on society to subsequently focus efforts on the design of the image of the products.

In addition, the institutions must implement processes for a specialized valuation of intangible assets to increase their bargaining power during the review of IP contractual provisions and ensure that the investment generated in technological developments redounds through the figures of income from technology transfer and royalties.

Finally, it is essential that, in Higher Education Institutions, R&D&I projects are developed in a multidisciplinary way, involving personnel from different areas at different levels, and in this way, cover a general process of intellectual property management, where lawyers, administrators, financiers, engineers, and others, generate large-scale projects to impact the market, thus generating their resources that support the generation of new research, in a fertile ecosystem for progress and technological evolution that is part of today's society.

## ACKNOWLEDGMENTS

To the Postgraduate Program of the School of Accounting and Administration of the Universidad Autónoma de Querétaro for the support provided during the research. To the National Council of Science and Technology as a benefactor through the National Scholarship. This work was supported by the Universidad Autónoma de Querétaro (UAQ) through the Fondo Especial de Rectoría.

## REFERENCES

Bernier, L., Hafsi, T., & Deschamps, C. (2015). Environmental Determinants of Public Sector Innovation: A study of innovation awards in Canada. *Public Management Review,* 17(6), 834-856.

Bommert, B, (2010). Collaborative innovation in the public sector. *International Public Management Review,* 11(1).

Borja V., & Ramírez A. (2006). *Innovación de Producto. Cuadernos de Gestión de Tecnología*. Fundación Premio Nacional de Tecnología. Ciudad de México, México



Colunga, A., Molina, V., & Armenteros, M. (2016). Determinant factors for success in self-sustaining research & development technology centers. *Global Journal of Business Research*, 10(4), 83-93.

Congreso de la Unión (2023) *Ley General de Humanidades, Ciencia, Tecnología e Innovación*. Diario Oficial de la Federación. Gobierno de México. Ciudad de México, México

Díaz, G., & Espinosa, D. (2018). La innovación: baluarte fundamental para las organizaciones. *INNOVA Research Journal*, 3(10), 212-229.

Diario Oficial de la Federación (DOF) (2020) *Programa Institucional del Instituto Mexicano de la Propiedad Industrial 2020-2024. Instituto Mexicano de la Propiedad Industrial. Publicado el 12 de noviembre de 2020.* Gobierno de México. Link: https://www.gob.mx/cms/uploads/attachment/file/592840/13._Programa_Institucional._IMPI.pdf.

Echeverría, S., Trejo, C., & Nava, H. (2010) Reflexión sobre los caminos de la innovación en metrología. *Simposio de Metrología 2010.* Centro Nacional de Metrología.

Querétaro, Mexico. Link: https://www.cenam.mx/Sm2010/info/pviernes/sm2010-vp02d.pdf

Gamba, M., & Mocciaro, A. (2016) Vínculo entre el sector público y privado en el ámbito de la Ciencia y Tecnología: desarrollo de patentes durante el gobierno kirchnerista. *IX Jornadas de Sociología de la UNLP.* Universidad Nacional de La Plata Ensenada Provincia de Buenos Aires, Argentina.

Garrido, A. (2023) *Propiedad Intelectual en los desarrollos interinstitucionales del sector público mexicano especializado en biocombustibles.* Universidad Autónoma de Querétaro. Facultad de Contaduría y Administración. Tesis de Licenciatura. Querétaro, México.

Gómez, L. (2016). *Monografía: Fundamento de la propiedad intelectual y la administración de los derechos de Propiedad Intelectual.* Universidad Autónoma del Estado de México. Facultad de Arquitectura y Diseño. Licenciatura en diseño industrial.

GreyB (14 de Septiembre de 2022). *NASA Patents – Key Insights and Stats*. Insights by GreyB. Link: https://insights.greyb.com/nasa-patents/#:~:text=Of%20these%202662%20patents%2C%20more,billion%20in%20the%20year%202021.

Lederman, D., & Maloney, W. (2003). *Innovación en México*. Washington D.C.: Oficina del Economista en jefe para América Latina y el Caribe del Banco Mundial.

Lepratte, L. (2012) *Complexity, socio-technical, systems and sustainable development, a research program for Latin America*. Universidad Tecnológica Nacional. Concepción del Uruguay-Entre Rios.

Levén, P., Holmström, J., & Mathiassen, L. (2014). Managing research and innovation networks: Evidence from a government sponsored cross-industry program. *Research policy*, 43(1), 156-168.

López, M., Simón, R., Cabrales, F., & García, C. (2009). Los procesos en un modelo de gestión de patentes universitarias. *Ingeniería e Investigación*, 29(2), 135-141.

Luna, K., & Solleiro, J. (2007). La gestión de la propiedad intelectual en centros de investigación mexicanos: el caso del Instituto Mexicano del petróleo. *Journal of Technology Management & Innovation*, 2(2), 157-169.

Martínez, K., Pacheco, A., Echeverría, L., & Medina, M. (2016). Barreras en la transferencia de la tecnología: Un estudio cualitativo de las intervenciones breves y los centros de atención a las adicciones. *Salud mental*, 39(5), 257-265.

Martínez, M., Rodríguez, I., Pérez, M., Almeida, G., & Velazquez, Y. (2018). Metodología de gestión de la propiedad intelectual en los proyectos de ciencia, tecnología e innovación. *Revista de Ciencias Médicas de Pinar del Río*, 22(6), 1090-1102.

Masó, Y. (2015) Valor estratégico de la gestión de la propiedad intelectual en instituciones de enseñanza superior, Seminario *Gestión del talento universitario. La universidad emprende*. Universidad Abierta, Innovación Educativa y Educación a Distancia de la UNAM.

Medina, G. (2018). El enfoque integral holónico de Ken Wilber, otra visión a la hora de investigar. *Salus*, 22(1), 8-11.

Moore, M (2005). Break-Through Innovations and Continuous Improvement: Two Different Models of Innovative Processes in the Public Sector. *Public Money & Management,* 25(1), 43-50.



Neffa, J. (2000) *Las Innovaciones científicas y tecnológicas: Una introducción a su economía política.* Buenos Aires, Argentina: Asociación trabajo y Sociedad, CEII-Piette-CONICET. Ed. Lumen.

Rodríguez, F., & Morgan, J. (2020). Análisis de la situación actual de las políticas públicas en Ciencia, Tecnología e Innovación mexicanas. *Revista Gestión de las Personas y Tecnología,* 14 (40). 78-93.

Rodríguez, O., & Cerda, H. (2017). Innovación en la gestión pública, el Centro de Investigación en Química Aplicada y su modelo de gestión de tecnología e innovación. Gestión de la Innovación para la Competitividad. *XVII Congreso Latino-iberoamericano de gestión tecnológica.* 16 al 18 de octubre de 2017. Ciudad de México, México.

Salazar, S., & Henriquez, P. (2010). *Guía para la gestión de la propiedad intelectual en consorcios regionales de investigación agrícola.* Instituto Interamericano de Cooperación para la Agricultura. San José, Costa Rica.

Schumpeter J. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle, translated from the German by Redvers Opie*. New Brunswick (U.S.A) and London (U.K.): Transaction Publishers.

SEP (2021). *Proyectos de fortalecimiento de la excelencia de la capacidad y competitividad académicas y de sus principales procesos de gestión y de vinculación comunitaria para la inclusión y la equidad de las UI. Convocatoria 2021.* Secretaría de Educación Pública. Link:https://dgesui.ses.sep.gob.mx/sites/default/files/2021-07/05_Consolidacion_UUII.pdf.

Solleiro (2003). Gestión de la Propiedad Intelectual. *Working Paper*. México.

UN (2013). *Las alianzas entre el sector público y el privado para fomentar la participación de las pequeñas y medianas empresas en las cadenas de valor mundiales.* Conferencia de las Naciones Unidas sobre Comercio y Desarrollo. Reunión multianual de expertos sobre la evaluación del impacto de las alianzas público-privadas en el comercio y el desarrollo de los países en desarrollo. Ginebra, Suiza.

Vega, L. (2015). Lessons Learned in Fifteen Years of Evolution of the Linking and MoT Office of a R&D Public Center.". *Case Studies in Business and Management,* 3(1).

World Intellectual Property Organization (WIPO) (2023). World Intellectual Property Indicators 2023. Geneva: WIPO. DOI: 10.34667/tind.48541

Mercados y Negocios
1665-7039 printed
2594-0163 on line
Year 25, n. 51, January-April (2024)

# A Proposal of a Pension Plan Design Based on Collective Pension Funds

*Una propuesta para un plan de pensiones basado en fondos de pensión colectivos*

https://doi.org/10.32870/myn.vi51.7723

Denise Gómez-Hernández
Universidad Autónoma de Querétaro (México)
denise.gomez@uaq.mx
http://orcid.org/0000-0001-5562-9541
Humberto Banda-Ortiz
Universidad Autónoma de Querétaro (México)
humberto.banda@uaq.mx
https://orcid.org/0000-0002-2542-5166

Received: August 16, 2023
Accepted: December 28, 2023

**ABSTRACT**

This work proposes a design of an alternative pension plan based on collectivity with the characteristics of hybrid plans. Based on actuarial methods and financial modeling of some of the variables involved, numerical modeling of collective plans is performed to achieve this objective. Then, various scenarios were carried out to simulate a pension fund based on an institution database. At the end of each period, the replacement rate value for each plan member is calculated with a target of 30% of the last salary. As the plan works collectively, surpluses and deficits are distributed uniformly among the plan members. The results are that it is possible to achieve a replacement rate of 70% in the form of a life annuity due with 30 years of service, a contribution rate of 15% of the salary, and an investment portfolio of 60% of assets invested in equities and 40% in bonds.

Keywords: Public Sector, Intellectual Property, Research Development and Innovation, High Education Institutions.

JEL code: J32

Mercados y Negocios por Departamento de Mercadotecnia y Negocios Internacionales. Universidad de Guadalajara se distribuye bajo una Licencia Creative Commons Atribución-NoComercial 4.0 Internacional. Basada en una obra en http://mercadosynegocios.cucea.udg.mx/index.php/MYN.

**RESUMEN**

Este trabajo propone un diseño para un plan de pensiones alternativo basado en la colectividad con las características de los planes híbridos. Con base en métodos actuariales y modelización financiera de algunas de las variables involucradas, para lograr este objetivo se realiza la modelización numérica de los planes colectivos. Luego, se realizaron diversos escenarios para simular un fondo de pensiones a partir de una base de datos de una institución. Al final de cada período, se calcula el valor de la tasa de reemplazo para cada afiliado al plan con un objetivo del 30% del último salario. Como el plan funciona de forma colectiva, los superávits y déficits se distribuyen uniformemente entre los miembros del plan. Los resultados son que es posible alcanzar una tasa de reemplazo del 70% en la forma de una renta vitalicia con 30 años de servicio, una tasa de contribución del 15% del salario y una cartera de inversiones del 60% de los activos invertidos en acciones y 40% en bonos.

Palabras clave: pensiones, planes de pensiones colectivos, simulación numérica, tasa de reemplazo.

Código JEL: J32

## INTRODUCTION

There is a growing concern about the future of pensions that is wider than a single country. It is mainly due to the aging of the population or the Risk of longevity, which is why the governments of several countries have been forced to look to the future and seek reforms in the pension systems to guarantee their financial sustainability. These reforms are focused on ensuring that the number of pensioners continues to grow slowly, making it unsustainable to be able to pay pensions. Some strategies have been to increase the retirement age and eligibility rules or reduce the size of pensions by adjusting benefit formulas (Amaglobeli et al., 2019).

Even with various projections made with Permanent Plan Balance (PPB), Constant Contribution Rate (CCR), or Constant State Effort (CSE), the deficit measurements are between 8 and 20 billion euros (166 and 415 billion Mexican pesos). For Spain, Cordoba-Bueno et al. (2016) propose a model that assumes that between 2019 and 2050, the effect on the public deficit will be overwhelming for the Spanish economy unless measures such as a combination of raising the retirement age, a constant benefit, tax increases, and higher contributions; are taken.



Further reforms may be needed, such as reducing benefit ratios in Argentina and Brazil and reducing early retirement benefits in Russia. The reforms also involve creating additional funds for workers and migrating from defined benefit schemes to defined contribution schemes (Amaglobeli et al., 2019).

The design of a pension plan that guarantees an adequate pension to workers without compromising its financial sustainability for the institutions is of greater importance in these times of financial crisis in the pension field. For example, various media have published for several years that public universities in Mexico are in technical bankruptcy due to the lack of financial solvency to meet their labor liabilities or pension payments (Blancas Madrigal, 2018; Mendoza, 2017; Martínez, 2010).

In 2004 alone, the actuarial liabilities of the 32 public universities amounted to MXN $250 billion (USD $12 133 million), representing 3% of GDP (ANUIES, 2004). A similar situation can be observed in other countries, for example, in France, which is expected to have a deficit of 12 billion euros (USD $13 700 million) by 2027 (Consorci d'Estudis, Mediació I Conciliació a l'Administració Local, 2019).

For Spain, it is assumed that between 2019 and 2050, the effect on the public deficit will be overwhelming for the Spanish economy unless measures such as a combination of raising

the retirement age, a benefits freeze, tax increases, and higher contributions are taken (Córdoba-Bueno et al., 2016).

Various types of hybrid pension plans have been adopted to counteract the abovementioned situation of financial unsustainability. In recent studies, Fu (2023) explores the optimal investment in a hybrid pension plan; this analysis considers intergenerational risk-sharing and longevity trends.

The results are that postponing retirement can help alleviate the stress of an aging population. Also, Kilgour (2021) discusses hybrid plans from the perspective of shifting from defined benefit to defined contribution pension plans, highlighting the increasing importance of hybrid cash balance and pension equity plans. Perlman (2021) examines the shift to alternative retirement plans based on well-funded pensions. Kilgour (2021) discusses funding, financial status, and congressional and national efforts to save these plans for state single-employer pension plans.

Other studies promote and analyze pension plans that are alternatives to traditional ones (Gómez & Demmler, 2023). Some examples are the collective defined contribution (CDC) plans, tontine, and tenuity pension plans. The Collective Defined Contribution Scheme (CDC) is considered a solution for this type of institution that suffers financial insolvency to meet its actuarial liabilities. According to the British House of Commons (2017), a CDC scheme has the following main characteristics:



> "1. Collective: the risks associated with any pension scheme (e.g., longevity, investment, and inflation risk) are shared collectively among scheme members rather than being absorbed individually. 2. Defined contribution: Employee and employer contribution amounts are defined in advance, with no obligation to contribute to the plan".

That is why it is mentioned that CDC plans offer their members the possibility of better pensions, compared to a traditional defined contribution scheme, through the absorption of collective risks. In that sense, these plans are attractive for workers who want an adequate income at retirement and attractive for institutions that want to offer decent pensions but are not willing to assume potentially high labor liabilities as in defined benefit plans.

According to the Melbourne Mercer Global Pension Index (2018), CDC pension plans ranked first and second in the last four years because this is considered a robust and first-class pension system, as well as offering good benefits, and these benefits are sustainable and have a high level of integrity. It is why several countries around the world have adopted these plans. For example, in the Netherlands, the CDC plan is mandatory, and the Central Bank regulates it; and in Denmark, the CDC plan is complementary to the mandatory state pension.

Furthermore, according to Aon (2015), the average pension of a CDC plan is higher than that of defined contribution plans; on average, the CDC pension is up to twice that of a defined contribution plan. Likewise, the CDC plan pension only varies between 20% and 30% of salary. It avoids large fluctuations from one period to another, while in a defined contribution plan, it varies between 15% and up to 50% of salary.

It is worth mentioning that, in the case of the United Kingdom, it is suggested that it is feasible to design plans of this type because the members collectively assume the risks associated with the investment (among others). They can expect a higher average pension than a defined contribution plan. Also, the accumulated pensions are more stable and predictable for members of such plans (British House of Commons, 2017).

There are also other types of pension plans called Tontines (or tontines in English), which have also been explored by various authors (Sabin, 2010; Milevsky & Salisbury, 2015, 2016; Gründl & Weinert, 2016; Bams et al., 2016) and which seek to counteract longevity risk as well. Tontines comprise a collective asset pool, where pension plan participants contribute a fixed amount of money and whose returns are distributed among the group survivors. When a participant dies, his or her contribution is distributed among the rest of the surviving group (Vega, 2021).



One of the disadvantages of these collective plans is that the payments become uncertain payments that depend on the number of survivors in the group and that the fluctuations of these payments are higher at advanced ages, which is not desirable. Also, a new pension plan called Tonuity, a combination of an individual annuity scheme and a tontines scheme, is proposed. That is, up to a certain age, the demographic group will rely on a tontine so that after which (and which is considered the optimal age) the group can obtain a deferred annuity.

The tenuity scheme can offer tailor-made pension products since the age at which the demographic group will enjoy one or the other schemes can be optimized (Chen et al., 2018). Therefore, this paper aims to propose an alternative pension plan design to the traditional ones based on the characteristics of the previously mentioned hybrid plans and through numerical modeling of collective plans. To achieve the objective of this paper, section 2 shows a review of the literature, section 3 the methodology defined to perform the numerical modeling, section 4 the results of this modeling, section 5 a proposal for the design of a collectively defined contribution plan and section 6 the conclusions of the paper.

## LITERATURE REVIEW

*Hybrid pension plans*

Hybrid pension plans combine defined benefit and contribution elements and have become popular worldwide. Also, these plans have been studied extensively by several authors, including Boelaars and Broeders (2019) and Booth et al. (2005), who explore these plans' valuation and risk-sharing aspects. Boelaars and Broeders (2019) focus explicitly on valuing liabilities in hybrid pension plans, incorporating equity and interest rate risk.

Booth et al. (2005) propose a risk-sharing model for these plans, demonstrating that these plans are efficient in controlling investment risk. Goodman (2014) provides a historical perspective, discussing an example of a successful hybrid co-operative pension plan.

Some recent studies, including Kilgour (2021), highlight the increasing importance of cash balance and pension equity plans. These plans offer a mix of defined benefits and contribution features, providing employees with more flexibility and security. Similarly, Owadally (2021) discusses the potential benefits of a hybrid plan called Collective Defined Contribution (CDC) schemes, which are prevalent in the Netherlands and are being considered in the UK.



These plans pool retirement savings and share investment and longevity risks, potentially offering higher income replacement rates and less uncertainty. D'Amato (2021) proposes a unique contractual scheme that allows individuals to obtain an immediate life annuity by transferring real estate rights to an insurer, addressing the need for structural changes in the pension sector.

These studies highlight the importance of hybrid pension plans in meeting the diverse needs of retirees. The studies on this kind of pension plan provide an alternative to retirement security concerning traditional ones. A range of hybrid pension plans have emerged in response to the evolving retirement landscape and the switching from defined benefit schemes to a combination of these and defined contributions.

## COLLECTIVE DEFINED CONTRIBUTION (CDC) PENSION PLANS

The collective defined contribution pension plans are a hybrid plan that is becoming popular mainly in Europe. Lans and Raymond (2015) mentioned that occupational plans were being reformed from defined benefit (DB) to defined contribution (DC) designs and that the case of Netherlands is an example of a country that explored an alternative type of pension plan

such as collective individual DC plans that are actuarially fair and that it is mentioned that these schemes maintain important strengths of collectivity, such as mandatory saving, collective procurement, and pooling of biometric risks.

These collective plans eliminate intergenerational conflicts about risk management through adequate individual property rights on financial assets and tailor-made risk profiles in individual accounts. However, Barajas-Paz and Donnelly (2023) mention that the design of a CDC scheme can have significant financial implications, with higher benefits for earlier generations and lower benefits for later generations. It underscores the need for careful analysis and regular review of contributions in such schemes.

Some of the countries that have opted for the implementation of these collectively defined contribution plans are the Netherlands, Denmark, and the United Kingdom. The latter is of particular attention because it has already been studied whether collective defined contribution (CDC) plans could operate. In this regard, authors such as Wesbroom et al. (2013) and Arends et al. (2015) have used models to analyze the use of these plans in the UK. These authors have found that if investment policies and control processes are correctly designed, CDC pension schemes for the UK case could be successful.



However, the primary support, and the reason why the process of creating legislation in the UK for these schemes was initiated, is the trade unions. Two unions that have promoted Collective Defined Contribution (CDC) pension plans in the United Kingdom are the Royal Mail and the Communication Workers Union (CWU). These organizations emphasize that these types of plans are perfectly adapted to their purposes, among them to provide sustained, accessible, and secure future retirements for their workers.

They also consider that collective defined contribution (CDC) pension plans are better designed than Individual Defined Contribution (IDC) plans. Thus, these organizations committed to working together to petition the government to introduce the necessary legislation to enable the introduction of Collective Defined Contribution (CDC) pension schemes through the House of Commons and the Work and Pensions Committee (Thurley & Davies, 2020; Royal Mail Group and Communication Workers Union, 2018; House of Commons and Work and Pensions Committee, 2018). Thus, the agreement between the CWU and the Royal Mail was formalized in November 2018 and has two essential elements: the use of a CDC pension scheme and a defined benefit sum in retirement. This pension plan used by both institutions is supervised and operated by the trustees as set out in the trust deed and rules.

In this regard, the pension section of the CDC shows that workers will be granted a pension when they retire. This section contains the legal definition of the CDC plans, which are

approved and registered by the pension regulator. Also, trustees must submit an actuarial plan to advise on the valuations used to set annual pension increases and show the options available to scheme members (Thurley & Davies, 2020; Royal Mail Group and Communication Workers Union, 2018).

Another issue is that Royal Mail Group (RMG) workers are automatically enrolled in the pension plan after 12 continuous months of working for the institution. On the other hand, it is established that the contributions of the CDC plan are 15.2% of the salary, divided into a contribution of the RMG of 11.2% and the active worker with 4%.

The pensions of this plan are a function of the amounts of the assets, which could be affected negatively or positively, depending on the pension adjustment mechanism, which is annual. Thus, the pensions are automatically rebalanced. It is also indicated that an actuarial valuation is performed each year to determine the increase in pensions for that year. Also, a reserve fund is created for the operating expenses of the pension plan (Royal Mail Group and Communication Workers Union, 2018).

This example of a pension plan is designed such that in the event of early or early retirement, the pension would be reduced and should be actuarially equivalent. However, when a member had health problems, the CDC plan would be paid early with no reduction. Moreover, the investment portfolios divide the fund's assets into instruments that seek adequate returns but with low Risk. Determining the investment portfolio profile can be done in two ways: the first is based on the actuarial valuation of liabilities, and the second is based on the decisions established by the trustees and an investment advisor (Royal Mail Group and Communication Workers Union, 2018).



For this kind of plan to be considered, the actuarial plan must consider some assumptions, rules, and requirements. One of these is that the actuarial plan must value actuarial liabilities using estimation assumptions that do not contain intentional biases of prudence or optimism. Another rule is that the actuarial plan must consider the opinions of the plan's investment advisors, the actuary nominated by the unions, subject matter experts, and others. Finally, a justification for each actuarial assumption considered in preparing the actuarial plan must be provided to the trustees (Royal Mail Group and Communication Workers Union, 2018).

As previously stated, all plan members will have their pension adjusted either negatively or positively each year, that is, by the adjustment mechanism. This pension mechanism in summary form is as follows. First, the current amount of assets is analyzed and compared with the cost of financing the payment of the pensions accumulated during the lifetime of the pensioners, assuming that there are no pension increases.

If the fund is above its obligations and there is a positive margin, then the pensions increase according to the rate of increase decided. In the opposite case, i.e., if the fund is below or does not have enough to pay the pensions, the pensions are reduced. There are several mechanisms; for example, one is to apply a 5% cut to pensions or less in a single exhibition (Royal Mail Group and Communication Workers Union, 2018).

The administrators of the CDC pension plan (trustees) must report the increase or decrease in pensions annually to the plan members. Also, they must explain the possible changes pensions could have in the future: pensions can change positively or negatively. Finally, pension plan members should receive their pension statement and be reminded that their pension may change (Royal Mail Group and Communication Workers Union, 2018).

## TONTINE AND TENUITY PENSION PLANS

Another plan that has been explored as a viable option is Tontines (Milevsky & Salisbury, 2015; 2016). Multiple annuity products have been designed as part of a pension plan to Reduce longevity risk. They propose a scheme where a portion of the fund is allocated to everyone who functions as a shareholder of the fund, thus sharing either dividends or losses of the fund among members, which is based on age and contribution amount.



The tenuity pension plan creates a collective fund with the participant's contributions. At the time of retirement, a tontine-type benefit is granted to the participant up to a certain age so that, after that age, the tontine is replaced by a contingent annuity. In a previous work done in Gómez-Hernández and Demmler (2023), a summary of some of the research done by several authors related to tenuity and tontine pension plans is found.

The most recent ones are by Chen et al. (2020) mention that these products can be combined to form a retirement plan that is cheaper than an annuity but provides a less volatile retirement income than a tontine. However, it is also mentioned that subjective mortality beliefs influence the optimal choice between annuities and tontines, with tontines being preferred by those who underestimate average life expectancy.

In previous work, Chen et al. (2018) optimized an age (switching time) to maximize the expected utility function, assuming constant risk aversion. It allows the authors to measure the relationship between longevity risk and the expected utility function and quantify it. Also, Chen and Rach (2019) mention that the volatile payouts with a tontine pension plan are replaced with secure payouts through annuities to create the tonuities plans.

Another study by Fullmer and Forman (2020) mention that state-sponsored pensions for private-sector workers can be enhanced through pooled annuities and tontines, which offer low-cost lifetime assurance funds. Hence, it can be said that tonuities plans combine the benefits of each of these products (annuities with tontines plans) because these plans reduce the capital solvency provision, assure payments or income at advanced ages, and each plan member can choose their optimal tenuity product with its corresponding switching time depending on their longevity risk, risk aversion, fund size and their cost of capital ratio.

Tabla 1. Principal advantages of pension plans tonuities

| General | With respect to annuities | With respect to tontines |
|---|---|---|
| The tonuities plans are a combination of two financial products: annuities and tontines. | The cost is lower than that of annuities, due to the lower capital requirement. | Provides retirement income with less volatility. |
| Due to the nature of the investment portfolios of these plans, members obtain higher levels of returns that translate into higher levels of retirement income. | Longevity risk is shared among plan members. | Provides greater utility for the life expectancy of plan members. |
| The insurance institution provides different types of customized retirement products that can vary depending on the risk aversion and liquidity needs of plan members. | Provides a better level of risk sharing between plan members and the insurance institution. | |
| | Drastically reduces the conditional expected loss of income than an annuity. | |

Source: Own elaboration (Chen et al., 2018; Chen & Rach, 2019; Chen et al., 2020).



Table 1 summarizes the advantages found in the literature regarding annuity pension plans. The characteristics of both pension plans (tonuities and collective defined contribution) can be considered innovative because they combine the characteristics of other plans to optimize their operation in the sense of providing higher retirement income for plan members and reducing costs for financial institutions and insurers. Thus, collectively defined contribution plans propose a shared fund of plan members' assets in which financial and longevity risks are shared and financially self-managed to reduce costs and obtain better retirement income.

The tonuities plan also proposes a shared fund of assets that works as a tontine plan at the beginning, and at a particular time called "switching time," the plan changes to an annuity. These plans aim to optimize the period when the change is made from one product to another. The results of these plans are that they provide higher retirement income with less volatility.

## METHODOLOGY

This section shows the methods used to simulate the numerical example of a collective pension plan. The methodology is based mainly on Nederlandsche Bank (2019), Aon (2015), and Royal Mail Group and Communication Workers Union (2018). This work is a continuation of the work done by Gomez and Demmler (2022), where a numerical simulation

with a group of individuals was shown to determine the financial and actuarial feasibility of a collectively defined contribution pension plan.

This paper extends the results obtained previously, using a complete database of individuals from an organization, performing several numerical scenarios to finally propose a pension plan design based on a collective pension fund that is financially and actuarially sustainable in the long term.

Define a methodology to simulate the accumulated value of the fund through the time for each member of the plan; the description found in Nederlandsche Bank (2019), Royal Mail Group and Communication Workers Union (2018), and Aon (2015) are used; similar than previous work in Gómez and Demmler (2022). The following methods will be described based on the methodologies of these authors.

A collective pension fund must be accumulated with a market value in a given period Royal Mail Group and Communication Workers Union (2018). Then, to accumulate the pension fund, the methodology found in Booth et al. (2005) is used, as shown in equation (1).

$$f(T) = f(0)(1+i)^T + (1-e_1)\sum_{t=1}^{T} c(t)(1+i)^{T-t} \qquad (1)$$



Where:

$f(T)$ the value of the fund at period $T$

$c(t)$ the value of the contribution at period $t$

$T$ the years of service at retirement age

$i$ the rate of return

$e_1$ the commission rate.

Equation (2) shows the accumulation model, based on equation (1) but by adapting it to the characteristics of collective defined contribution pension plans described in Royal Mail Group y Communication Workers Union (2018) and Nederlandsche Bank (2019), where it is mentioned that the level of pension is a function of the assets, which could be affected positively or negatively, depending on the adjustment mechanism of the level of pensions annually.

As ecuación (1) shows the value of the fund at period T, in this work, equation (2) is defined to calculate the value of the fund fi(t) for each i and at a period t (adapted from previous work in Stewart and Gomez-Hernandez, 2008). Also, no commissions of any type are assumed (e1=0), the initial value of the fund is assumed to be zero (f0=0) for all individuals, and the rate of return is assumed to be variable over time (i=jt). Many of these assumptions are made for the sake of simplicity.

$$f_i(t) = f_i(t-1)(1+j_t) + C_i(t)(1+j_t) \quad (2)$$

Where:

$f_i(t)$ the value of the fund for an individual $i$ at the period $t$

$C_i(t)$ the rate of contribution for an individual $i$ at the period $t$

$j_t$ the rate of return at the period $t$

Each member of the plan receives a benefit according to the retirement age. The level of payments must be given in the form of a lifetime annuity with no beneficiaries, and the fund needs to contemplate all pension payments to be made in the future, assuming the above benefit levels are constant (Royal Mail Group and Communication Workers Union, 2018).



At the end of the pension fund accumulation period, the projected actual pension shown in equations (3) and (4) is calculated, which corresponds to the conversion of the final fund value to an annuity to determine the pension benefit due to the individual or employee and which were adapted from Booth et al. (2005) and Organization for Economic Cooperation and Development (2017).

$$PRP_{T,i} = \frac{f_i(T)}{\ddot{a}_{R_i}\, g_i(s)} \quad (3)$$

Where:

$PRP_{T,i}$ the projected rate of pension benefit for an individual $i$ at the period $T$

$\ddot{a}_{R_i}$ the projected life annuity due at the age of retirement $R$ of an individual $i$

$g_i(s)$ the salary function for an individual $i$ (which may be a function of final salary, an average of the last number of salaries, etc.)

$$PRP_{t,i} = \frac{f_i(t)}{{}_{T-t|}\ddot{a}_{x_{t,i}}\, g_i(s)} \quad (4)$$

Where:

$f_i(t)$ the accumulated fund value for an individual $i$ at the period $t$

${}_{T-t|}\ddot{a}_{x_{t,i}}$ the value of the deferred lifetime annuity due at the period $T-t$ at a current age $x$ at the period $t$ for an individual $i$

$T-t$ the number of years for the individual $i$ to reach retirement age.

Equation (3) corresponds to calculating the actual projected pension for a worker who has reached his final accumulation period, while equation (4) corresponds to a worker who has not yet reached his final accumulation period. The formulas for calculating annuities are obtained from Bowers et al. (1997) and are defined in equations (5) and (6).

$$\ddot{a}_x = \sum_{k=0}^{\infty} v^k\, {}_kp_x \quad (5)$$

$$ {}_{n|}\ddot{a}_x = \sum_{k=n}^{\infty} v^k\, {}_kp_x \quad (6)$$



Where:

$\ddot{a}_x$ the value of the life annuity due for an individual at age $x$

${}_{n|}\ddot{a}_x$ the value of the $n$ years deferred life annuity due for an individual at age $x$

$v^k$ the discount factor to calculate the certain annuity and that is calculated as $(1+i)^{-k}$ with an annual rate of return $i$

${}_kp_x$ the probability that an individual at age $x$ survives at age $x+k$ taken from the mortality table EMSSA 09

Several assumptions are defined to perform the simulations of the value of fund $f_i(t)$ in equation (2), which are adapted from Aon (2015) and that are listed as follows:

- All plan members obtain a pension after working for 30 consecutive years in the company, independent of the individual's age.

- The plan contributions are 10% of the participant's yearly salary, paid only by the employer. However, this last part does not make a difference in the model since the individual could contribute a part of this percentage.
- The plan's target benefit is based on 1% for each year of service of the participant's current salary, i.e., the target replacement rate for all individuals is 30% of the final salary.
- This work assumes the salary in real terms, i.e., that it increases in line with inflation.
- A fund investment policy of 60% of the assets invested in equity and the remaining 40% in long-term government bonds is assumed.

The value of the rates of return jt is assumed stochastic simulated under the bootstrap sampling method (Forsyth & Vetzal, 2019) with 1,000 simulations and assuming a vector of historical returns of the Mexican IPC index for equities and long-term government bonds over a period from 2004 to 2021. Also, according to CONSAR (2022), a discount rate of 2.5% is assumed for the calculation of the value of the lifetime annuities.

Finally, and this is the part that defines the collectivity of the fund, at the end of each period t, the following process to calculate the value of the replacement rates for everyone is necessary, based on Aon (2015) and Royal Mail Group and Communication Workers Union (2018):



Suppose the replacement rates obtained are more excellent than 30%. In that case, the surplus is distributed equally or linearly among plan members with a replacement rate lower than this value (collectivity that characterizes these CDC plans). The surplus is added directly to the fund value of each of the individuals on a proportional basis, i.e., the surpluses are added to everyone to reach the 30% stipulated in the plan rules. If there is a case in which the surplus is insufficient to reach the target value of 30%, this needs to be reduced according to the fund's value.

If the replacement rates obtained are not greater than 30%, the surplus of the individuals who are not ready to retire is shared with those who are so that they reach the stipulated percentage of 30%. If there is no surplus or the surplus does not reach the 30% replacement rate, then the individuals who retire will do so with the replacement rate obtained, even if it is lower.

Through this process described above, each period t, which in this work is assumed an annual period, the individuals who retire stop accumulating funds, so they start their decumulation period, and a pension is granted in the form of a life annuity without beneficiaries according to equation (3). The following section shows the results of this process described above.

## RESULTS

A database of 1,990 workers of an institution with the characteristics of current age, current salary, year of entrance, and gender was obtained. All these data are effective as of 2015. We can mention that this database is gender equitable, given that 55% are men and 45% are women. It is also observed that 90% of the workers are between the ages of 17 and 44, and the majority are in the age range of 25 to 33.

Salary distribution is skewed since 12 workers receive a considerably higher salary than the rest. The majority receive an annual salary between MXN 33,000 and MXN 63,000, while the rest earn up to MXN 813,000. These characteristics are considered adequate, given that a database with heterogeneous worker characteristics is desirable for the results to be considered robust.

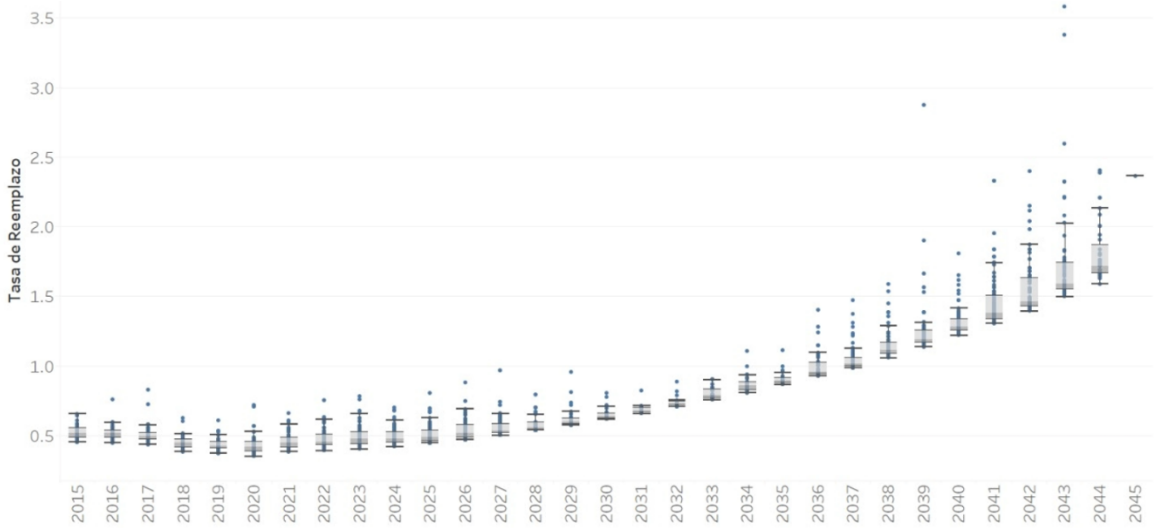
To show whether the objective of this paper is met, the value of the replacement rate at which workers retire after accumulating their funds for 30 years and with the characteristics described above is shown. Each result is shown by year of retirement in aggregate and starting in 2015 (the year the information is adequate). Figure 1 shows the results in the first scenario with the calculation of the replacement rate in equations (3) and (4), where the function for gi(s) is assumed to be the last salary received. However, this assumption needs to be clarified since the salary increase is assumed in real terms.



Graph 1 shows the relationship between the year of retirement (x-axis) and the value of the replacement rate in decimal value (y-axis). For each year of retirement, a box plot is shown corresponding to the number of workers retiring in that year and their respective replacement rates. The results show that all workers reach the target replacement rate of 30% of their last salary after 30 years of service and with a contribution from the employer or institution of 10% of their salary.

This result shows that collectively defined contribution plans under the proposed characteristics are viable, financially, and actuarially sustainable in the long term. It should be noted that, given that a pension plan is closed to new members, the last years of retirement results are unrealistic outliers. For the last workers in a position to retire under this scheme, the replacement rate they would reach would be extremely high given that the surplus accumulates in their accounts.

Graph 1. Replacement rate per year of retirement (target of 30% and 10% contribution).



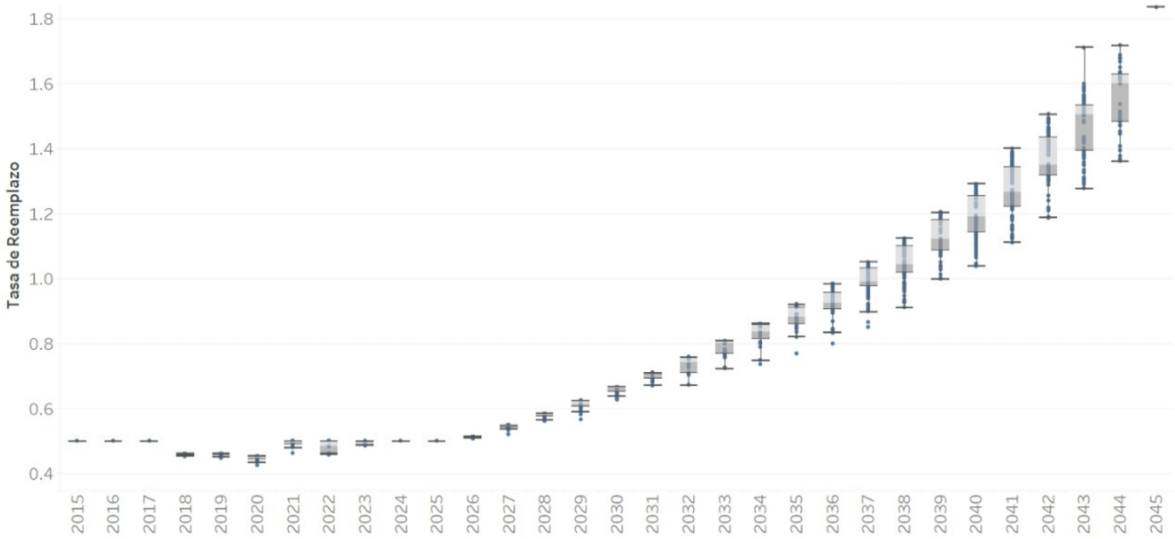

Source: Own elaboration.

Although the results in Graph 1 show the feasibility of these plans, from an economic point of view, a replacement rate of 30% of the last salary the worker receives needs to be an adequate income at retirement. According to the Organization for Economic Cooperation and Development (2016, 2017, 2019), an adequate replacement rate is at least 60 or 70% of the worker's salary, so it was considered to increase the value of the replacement rate in the simulations. Graphs 2 to 4 show the results under the same scenario above but considering a target replacement rate in the plan of 50, 60, and 70% of the worker's last salary.



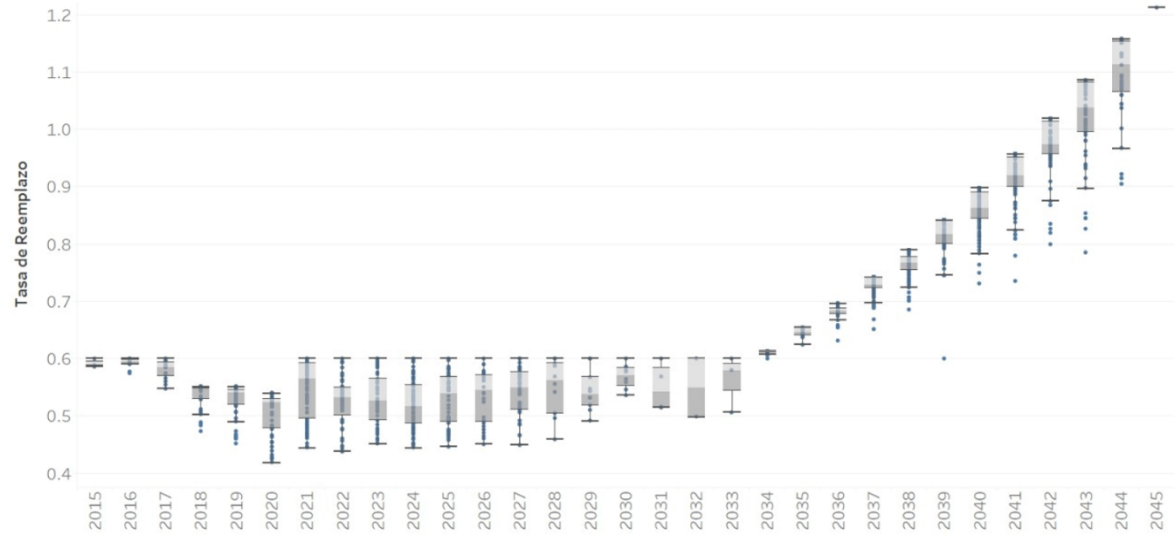
The results show that as the target replacement rate in the plan increases, the values on the y-axis decrease, as expected. The higher the replacement rate, the lower the extreme values decrease as the contribution rate remains fixed. Thus, with an employer contribution of 10%, reaching a target replacement rate of 50% is possible, but not 60% or 70%. It is because, in Graphs 3 and 4, for some of the values of the y-axis, a value of 0.60 and 0.70, respectively, is not reached. It is possible to grant the workers of this collective defined contribution pension plan a replacement rate of 50% of their last salary after 30 years of work in the institution, with the employer contributing 10% of the salary.

Graph 2. Replacement rate per year of retirement (target of 50% and 10% contribution).



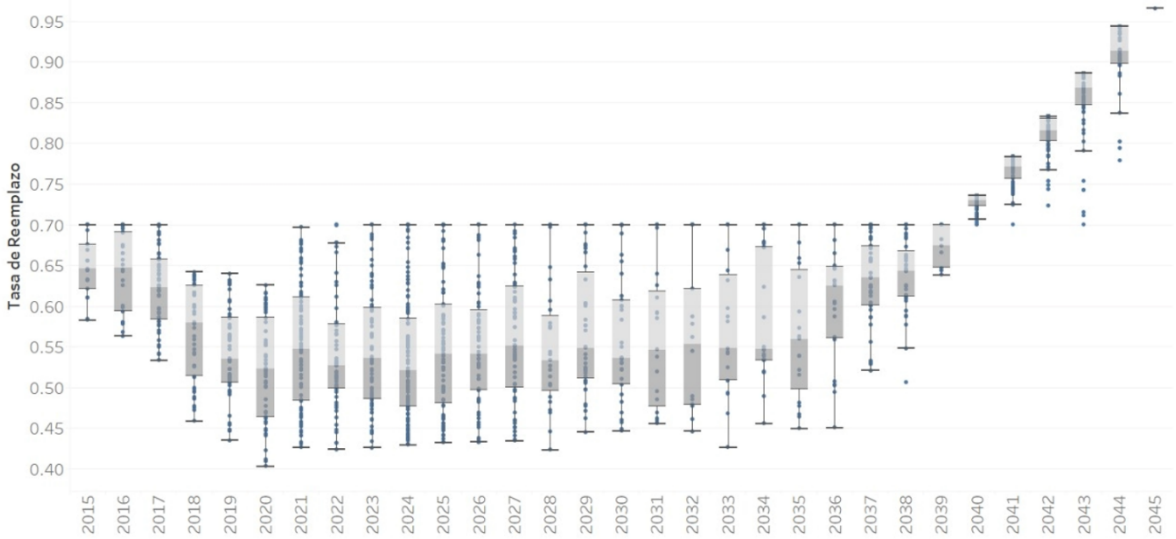

Source: Own elaboration.

Graph 3. Replacement rate per year of retirement (target of 60% and 10% contribution).




Source: Own elaboration.

Graph 4. Replacement rate per year of retirement (target of 70% and 10% contribution).

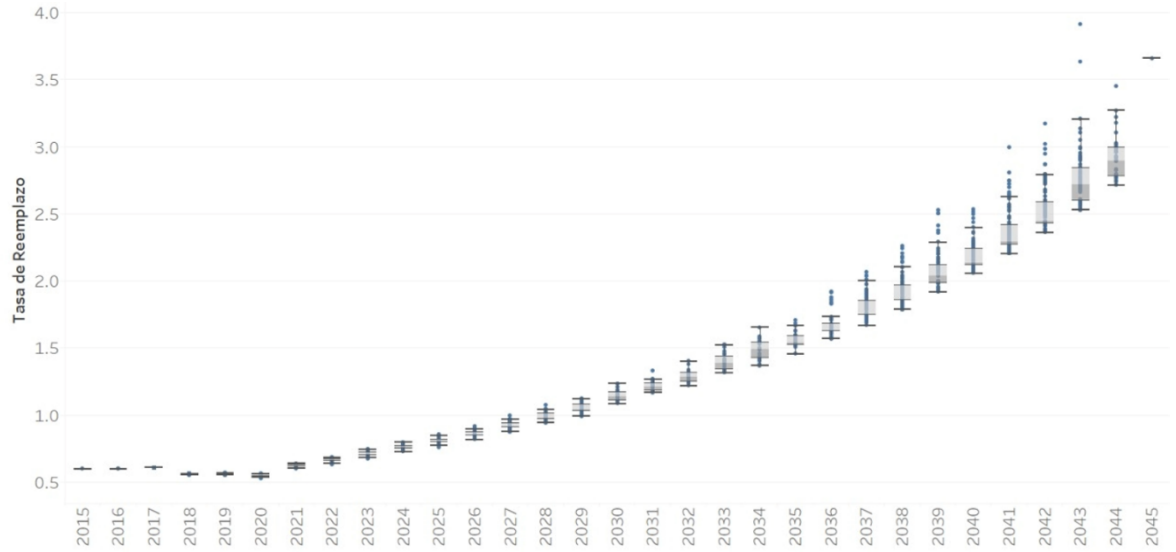



Source: Own elaboration.

Under the same statement above, a replacement rate of 50% could still be considered insufficient, so increasing the employer contribution rate is considered to increase the target replacement rate. Graphs 5, 6, and 7 show the results for a 15% contribution and replacement rates of 60, 70, and 80%, respectively.

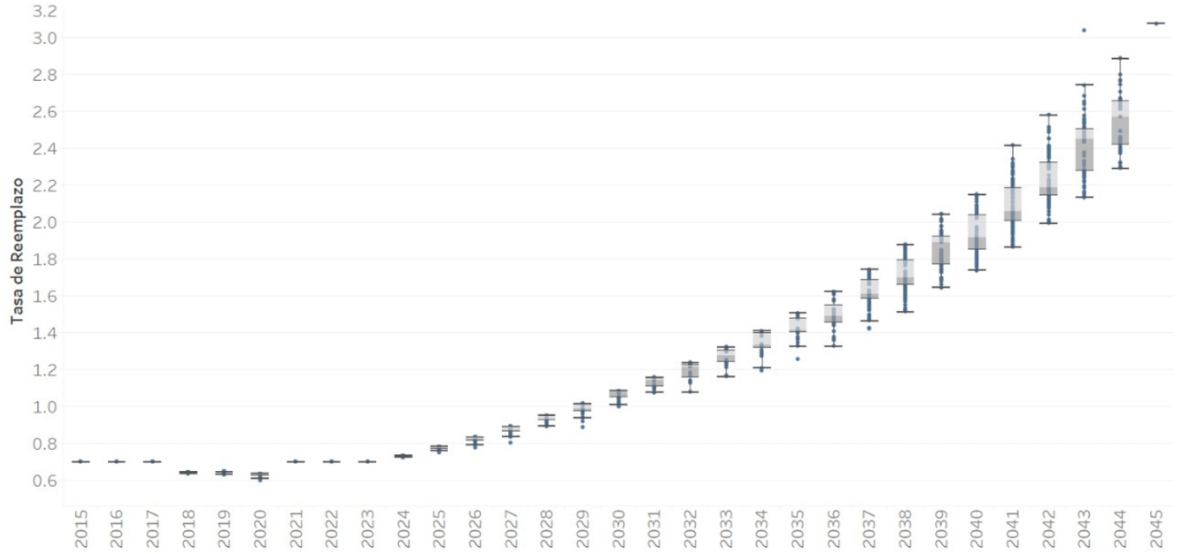


Graph 5. Replacement rate per year of retirement (target of 60% and 15% contribution).



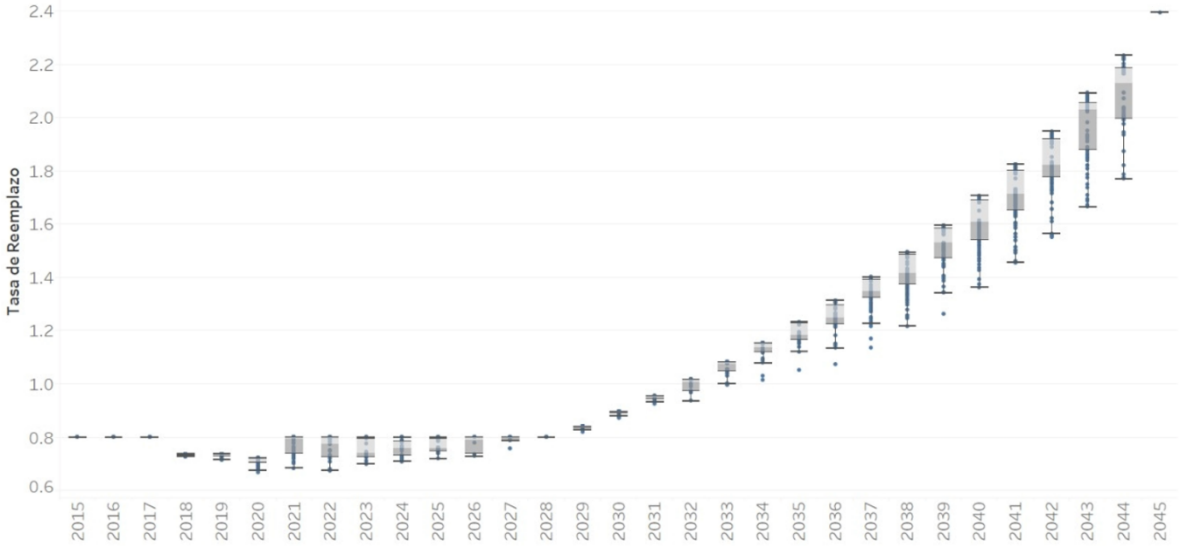

Source: Own elaboration.

Graph 6. Replacement rate per year of retirement (target of 70% and 15% contribution).




Source: Own elaboration.

Graph 7. Replacement rate per year of retirement (target of 80% and 15% contribution).




Source: Own elaboration.



The above results show that with a contribution of 15%, it is possible to reach a target replacement rate of up to 70% of the last salary received by the individual (see Figure 6). The target rate of 80% is not achievable because some plan members would obtain a lower rate in some of the retirement years (see Figure 7). However, this result may seem extremely attractive to those institutions that want to set up this collective defined contribution pension plan. A proposed plan design with these characteristics is shown in the following section.

## PROPOSAL OF A COLLECTIVE PENSION PLAN DESIGN

Several authors have proposed and analyzed diverse hybrid pension plan designs (Kilgour, 2021; Perlman, 2021). Melbourne Mercer Global Pension Index (2018) mentions that collective pension plans, such as the collective defined contribution pension plans, are among the most robust and first-class pension plans. Chen et al. (2018) propose hybrid plans based on a combination of individual pension schemes and the so-called tontines.

According to the methodology proposed in Nederlandsche Bank (2019), Aon (2015), and Royal Mail Group and Communication Workers Union (2018), the accumulation of a collective fund is based on allocating an amount of assets to each individual (equation (2)), calculating the value of the benefits based on the value of these assets (equation (3)) and by assuming that if the value of the fund is below a 30% replacement rate lifetime level, then the "deficits" are collectively shared.

The results are that assuming an initial value of the fund of cero, 30 years of service with a 10% salary for the contribution rate, and an investment portfolio of 60% in equities and 40% in bonds, the replacement rate level is reached at retirement age for every individual at a maximum of 50% of final salary. If the contribution rate increases to 15%, the replacement rate reached is as high as 70%. Then, the proposal for a collective pension plan design is shown in Table 2.



Table 2. A proposal of a collective pension plan.

| Contribution rate | Portfolio investment | Level of benefit | Form of payment |
|---|---|---|---|
| 10% of salary | 60% in equities and 40% in bonds | 50% of final salary | Lifetime annuity with no beneficiaries |
| 15% of salary | 60% in equities and 40% in bonds | 70% of final salary | Lifetime annuity with no beneficiaries |

Source: Own elaboration.

Both proposals can be implemented by an institution that wants to provide an additional benefit to its employees and either pay for the entire contribution rate as an ancillary benefit or propose to divide the contribution rate between the employer and the employee. Both scenarios are viable for the institutions that are willing to provide a pension benefit in addition to the mandatory one that governments provide.

## CONCLUSIONS

This paper presented specific characteristics of a new collective pension plan as an alternative to the traditional plans and based on the so-called collective defined contribution (CDC) and annuities, which have emerged in other countries as a response to the financial and actuarial problems faced by traditional pension plans, such as the defined contribution (DC) and defined benefit (DB) plans. However, it was also explained that these plans have yet to be fully explored, given that they are already being used as a novel plan design in some countries, although their results have not been proven. Their plans are relatively new in the countries where they are being explored, and it has yet to be proven that plan members receive a target replacement rate, as proposed in the plan rules.

The growing financial crisis faced by pension plans worldwide is a problem various authors address in the actuarial, financial, and economic literature. One of the solutions to this problem found in this literature is the design of mixed plans that combine the characteristics of various existing plans. Two recently created and analyzed plans are tonuities and collectively defined contribution plans.



Collective defined contribution (CDC) and annuities plans have specific characteristics that make them innovative. First, neither plan defines a retirement benefit; they propose a shared pool of assets among plan members, which allows for collective management with multiple benefits, one being that longevity risk is shared (Balter et al. 2018). Also, the Risk or uncertainty for the plan sponsor decreases because there is no promise in the retirement benefit; however, for the plan members, the retirement income is less volatile.

The differences are that the CDC plans to define a guaranteed minimum pension amount and that the fund is self-administered by plan members to reduce costs. In the tonuities plans, the difference is that there is a "switching time", which is not defined at the beginning but is optimized according to the specific characteristics of each plan member. Then, these two plans promise to solve the crisis faced by pension plans without compromising the amount of income received by plan members or increasing the financial Risk that plan sponsors may face. Finally, the design of a pension plan can be customized according to one or another plan, depending on the members' characteristics or the sponsors' needs and possibilities.

For this reason, this paper presents actuarial methods proposed by some authors for the simulation of the accumulation of a pension fund, as well as the formulas used in the literature to calculate the replacement rate obtained by the worker at the time of retirement. To achieve the objective of this work, the formulas found in the literature are adapted to the assumptions

under which collectively defined contribution plans operate and which are mentioned in the literature.

Since this work explores the financial and actuarial viability of these schemes as an alternative to traditional pension plans, several scenarios were developed for the simulation of a collective pension fund and to analyze whether, under the collectivity that characterizes them, they can solve the heterogeneity in the replacement rates received by the members of the plan at the time of retirement that is found in other pension plans. In other words, we sought to construct a methodology adapted to the traditional methodology of defined contribution (DC) plan accumulation but with the characteristics of collective plans found in the literature.

The results were that it is possible to reach a target replacement rate of 70% of the individual's last salary in the form of a life annuity due after accumulating a fund for 30 years and with an employer contribution rate of 15% of the individual's salary. The assumptions considered to obtain this result are that the initial value of the fund is MXN 0, that there is no commission of any kind, and that the investment portfolio of the fund is 60% of the assets invested in variable income instruments and 40% in fixed income instruments.



This result is the proposal for a collectively defined contribution pension plan design. However, suppose the employer or the institution is unwilling to assume the fixed contribution of 15% of the individual's salary because it is considered a high contribution. In that case, achieving a target replacement rate of 60% is possible if this contribution were 10%. Both scenarios are viable and sustainable proposals in the long term and represent an alternative to traditional plans.

This paper needs to explore the process for implementing this type of plan in Mexico, which is also a topic of study in pension plan design. As mentioned in several publications, including Van Hekken et al. (2022), the success in implementing reforms to existing traditional pension plans depends mainly on how participants react to and accept these proposed changes. Therefore, further studies could explore the participants' opinions of existing pension plans in Mexico and their reactions to a proposal for a new plan.

## REFERENCES

Aon (2015) *The Case for Collective DC. A new opportunity for UK pensions*. Aon.

Arends, M., Turnock, R., & Andy, H. (2015). *Collective DC - Stability and Fairness*. Aon.

Amaglobeli, D., Zhai, H., Dabla-Norris, E., Dybczak, K., Soto, M., & Tieman, A. F. (2019). *The Future of Saving: The role of pension system design in the aging world*. IMF Staff Discussion Note. International Monetary Fund.

ANUIES (2004). Editorial. *Revista de la Educación Superior*. XXXIII (1), 129.

Balter, A. G., Kallestrup-Lamb, M., & Rangvid, J. (2018). *The Move Towards Riskier Pension Products in the World's Best Pension Systems.* NETSPAR Network for Studies on Pensions, Aging and Retirement.

Bams, D., Schotman, P., & Tyagi, M. (2016). *Optimal Risk Sharing in a Collective Defined Contribution Pension System.* NETSPAR Network for studies on pensions, aging and retirement.

Barajas-Paz, A., & Donnelly C. (2023). An attribution analysis of investment risk sharing in collective defined contribution schemes. *Annals of Actuarial Science,* 17 (2), 385-414. https://doi.org/10.1017/S1748499523000015

Bennett, P., & Van Meerten, H. (2018). Apples and oranges: a comparison of the key features of the legislative and regulatory framework for UK and Dutch defined benefit pension schemes (including Dutch CDC Schemes). *The Pensions Institute Cass Business School City, University of London. Discussion Paper* PI-1803, 1-26.

Bennett, P., & Van Meerten, H. (2019). How do CDC Schemes Qualify Under the IORP II Directive? *VUZF Review, University of Sofia.*

Blancas Madrigal, D. (2018) Diez universidades del país, en quiebra financiera. *Crónica*. http://www.cronica.com.mx/notas/2018/1090632.html

Boelaars, I., & Broeders, D. (2019). Fair pensions. *De Nederlandsche Bank NV Working Paper.*

Booth, P., Robert C., Haberman, S., James, D., Khorasanee, Z., Plumb, R. H. & Rickayzen, B. (2005). *Modern Actuarial Theory and Practice*, Chapman and Hall/crc.

Bowers, N., Gerber, H., Hickman, J., Jones, D. & Nesbitt, C. (1997) *Actuarial Mathematics*. The Society of Actuaries.

British House of Commons (2017) *Work and Pensions Committee. Collective defined contribution pensions. Sixteenth Report of Session. 2017–19.* British House of Commons.

Chen, A., Hieber, P. & Klein, J. K. (2018) Tonuity: A Novel Individual-Oriented Retirement Plan. *Astin Bulletin,* 49(1), 5-30.

Chen, A. & Rach, M. (2019) Options on tontines: An innovative way of combining tontines and Annuities. Insurance: *Mathematics and Economics*, 89, 182–192.

Chen, A., Rach, M. & Sehner, T. (2020) On the Optimal Combination of Annuities and Tontines. *Astin Bulletin*, 50(1), 95-129.

CONSAR (2020) Estadísticas del Registro Electrónico de Planes de Pensiones 2020. CONSAR

CONSAR (2022) Estadísticas del Registro Electrónico de Planes de Pensiones 2022. CONSAR.



Consorci d'Estudis, Mediació i Conciliació a l'Administració Local (2019). *Rentabilidad de los planes de pensiones de empleo 2018.* Consorci d'Estudis, Mediació i Conciliació a l'Administració Local.

COR (2019). *Conseil d'orientation des retraites. Consejo de Orientación para Pensiones. Perspectives des retraites en France à l'horizon 2030. Rapport du COR – Novembre 2019.* Conseil d'orientation des retraites.

Córdoba-Bueno, M. Fernández-Avilés, G. & García-Centeno, M. C. (2016) A tsunami in the Spanish economy. Epicentre. The public pension system. *The IEB International Journal of Finance*, 12, 128-145.

D'Amato, V., Di Lorenzo, E., & Haberman, S. (2021) Pension schemes versus real estate. *Ann Oper Res*, 299, 797–809 (2021). https://doi.org/10.1007/s10479-019-03241-y

Department for Work and Pensions, (2019). *Delivering Collective Defined Contribution Pension Schemes.* Government Response to the Consultation. United Kingdom.

Forsyth, P. A., & Vetzal, K. R. (2019). Defined Contribution Pension Plans: Who Has Seen the Risk? *Journal of Risk and Financial Management,* 12, 70; https://doi.org/10.3390/jrfm12020070.

Fu, K., Rong, X., & Zhao, H. (2023). Optimal investment problem for a hybrid pension with intergenerational risk-sharing and longevity trend under model uncertainty. *Economics*, 1-34.

Fullmer, R. K. & Forman, J. B. (2020) State-Sponsored Pensions for Private Sector Workers: The Case for Pooled Annuities and Tontines (July 24, 2020). Wharton Pension Research Council Working Paper No. 2020-17, Published in Mitchell, O. (Ed.) (2022). *New Models for Managing Longevity Risk: Public-Private Partnerships.* Oxford, UK: Oxford University Press.

Goodman, B., & Richardson, D. (2014). *Back to the Future: Hybrid Co-op Pensions and the TIAA-CREF System. PRC WP2014-11 Pension Research Council The Wharton School*, University of Pennsylvania.

Gómez Hernández, D. & Demmler, M. (2022) Collective Defined Contribution Schemes as an Alternative to Pension Plans. *Mercados y Negocios*, 45. https://doi.org/10.32870/myn.vi45.7651.g6730

Gómez Hernández, D. & Demmler, M. (2023) *Nuevos esquemas de pensiones para sindicatos de universidades públicas*. Cromberger Editores e Impresores.



Gründl, H. & Weinert, J. H. (2016) The modern tontine: An innovative instrument for longevity provision in an aging society. *ICIR Working Paper Series No. 22/2016.*

House of Commons & Work and Pensions Committee (2018). *Collective defined contribution pensions. Sixteenth Report of Session. 2017–19*. House of Commons & Work and Pensions Committee

Kilgour, J. G. (2021). Hybrid Cash Balance and Pension Equity Plans: Origins and Development. *Compensation & Benefits Review*, 53(4), 175-187. https://doi.org/10.1177/08863687211005230

Kilgour, J. G. (2022). Single-Employer and Multiemployer Pension Plans: Problems and Prognosis. *Compensation & Benefits Review*, 54(1), 31-48. https://doi.org/10.1177/08863687211022274

Lans, B. & Raymond, G. (2015) Reforming occupational pension schemes: the case of the Netherlands, *Journal of Economic Policy Reform,* 18 (3), 244-257, https://doi.org/10.1080/17487870.2015.1041525

Martinez, J., Soto, I., Cortés, V., & Romero, G. (2014). Sustentabilidad de un esquema de pensiones basado en Contribuciones Definidas Nocionales: evidencia para México de un modelo de simulación estocástica. *Ciencia y Universidad,* 61(4), 7-50.

Martínez, N. (2010). 21 Universidades en Bancarrota. *El Universal.* http://archivo.eluniversal.com.mx/notas/718651.html

Martínez-Aldama, A. (2013). Sistemas de pensiones: experiencia internacional. En *Pensiones: una reforma medular.* Madrid: Fundación de Estudios Financieros. p. 157-174.

Melbourne Mercer Global Pension Index (2018). *Melbourne Mercer Global Pension Index 2018.* Australian Center. *Link:* https://australiancentre.com.au/wp-content/uploads/2018/10/MMGPI-Report-2018.pdf

Mendoza, G. (2017) Siete universidades en México al borde de la quiebra. *La Opinión.* https://laopinion.com/2017/11/13/siete-universidades-en-mexico-al-borde-de-la-quiebra/



Milevsky, M. & Salisbury, T. (2015) Optimal retirement income tontines. Insurance: *Mathematics & Economics*, 64, 91–105.

Milevsky, M.A. & Salisbury, T.S. (2016) Equitable retirement income tontines: Mixing cohorts without discriminating. *ASTIN Bulletin,* 46(3), 571–604.

Nederlandsche Bank (2019). *Annual report 2019*. Nederlandsche Bank.

OECD (2009). *Evaluating Risk Sharing in Private Pensions Plans. OECD, Financial Market Trends*. Paris: OECD

OECD (2016). *Estudio de la OCDE sobre los sistemas de pensiones: México*. http://dx.doi.org/10.1787/9789264250017.es

OECD (2017). *Pensions at a Glance 2017: OECD and G20 Indicators.* Paris: OECD http://dx.doi.org/10.1787/pension_glance-2017-en

OECD (2019). Pensions at a Glance 2019: OECD and G20 Indicators. Paris: OECD http://dx.doi.org/10.1787/b6d3dcfc-en.

Owadally, I., Ram, R., & Regis, L. (2022) An analysis of the Dutch-style pension plans proposed by UK policy-makers. *Journal of Social Policy.* 51(2), 325-345. http://doi.org/10.1017/S0047279421000155

Perlman, B. J., & Reddick, C. G. (2022). From Stand-Alone Pensions to Alternative Retirement Plans: Examining State and Local Governments. *Compensation & Benefits Review,* 54(1), 12-30. https://doi.org/10.1177/08863687211030795

Royal Mail Group & Comunication Workers Union (2018). *Anticipated Collective DC ("CDC") pension design.* Royal Mail and CWU's. https://www.royalmailgroup.com/media/10542/scheme-design-summary-booklet.pdf

Royal Mail Goup (2020). *Our Campaign for CDC Pensions*. Royal Mail Group. Link: https://www.royalmailgroup.com/en/responsibility/our-focus-areas/our-campaign-for-cdc-pensions/

Sabin, M. (2010) *Fair tontine annuity*. Coloquio. Link: https://sagedrive.com/fta/11_05_19.pdf

Stewart, F. & Gomez-Hernandez, D. (2008). Comparison of Costs and Fees in Countries with Private Defined Contribution Pension Systems. IOPS Working Paper No. 6. http://dx.doi.org/10.2139/ssrn.1809830

Thurley, D. & Davies, J. M. (2020). *Collective Defined Contribution Schemes*. The House of Commons Library research, Briefing Paper, 1-38.

Valero, D., Artís, M., Ayuso, M., & García, J. (2011). Una propuesta de reforma del sistema de pensiones español basada en un modelo de contribución definida nocional. *Revista de Métodos Cuantitativos para la Economía y la Empresa*, 11, 91-113.

Van der Zwan, N., Anderson, K., & Wiß, T. (2019). Pension Funds and Sustainable Investment. Comparing Regulation in the Netherlands, Denmark, and Germany. *Netspar academic series*, 1-34.

Van Hekken, A., Hoofs, J. & Brüggen, E. C. (2022). Pension Participants' Attitudes, Beliefs, and Emotional Responses to the New Dutch Pension System. *De Economist.* 170, https://doi.org/10.1007/s10645-022-09396-7

Van Meerten, H., & Schmidt, E. (2018). *The Legal Differences between CIDC and CDC*. The Pensions Institute, Cass Business School, City University London.

Vega, C. (2021) Las tontinas: el seguro en el que cuanto más vives, más cobras. Fundación Mapfre. Link: https://www.farodevigo.es/ideas/miralfuturo/tontinas.html

Wesbroom, K., Hardern, D., Arends, M., & Harding, A. (2013). The Case for Collective DC A new opportunity for UK pensions. *Aon*.

Wiman, H. (2019). An approach to post-growth pensions with reflections on Finland, Sweden and Denmark. *Conference paper: Towards Resilient Nordic Welfare State*s.

Mercados y Negocios
1665-7039 printed
2594-0163 on line
**Year 25, n. 51, January-April (2024)**

# FINANCIAL AND ECONOMIC INDICATORS

*Sensitivity Analysis and Finances*

https://doi.org/10.32870/myn.vi51.7724

Juan Gaytán Cortés
Universidad de Guadalajara (México)
jgaytan@cucea.udg.mx
https://orcid.org/0000-0002-4388-0138

The financial projections used in decision-making are associated with a degree of uncertainty regarding the correct choice of the hypotheses used or the certainty of the value of the variables, which is why it is necessary to place ourselves in several scenarios, in which the hypotheses and the value of the variables over which we have less control and which in turn have the greatest impact on the results must be varied. expected results. The above process is known as Sensitivity Analysis.

Purpose of sensitivity analysis: it consists of improving the quality of the information used so that the decision maker has additional tools that allow them to achieve better results and generate greater competitive advantages.

Sensitivity Analysis, also called Post-Optimization Analysis, also consists of determining how sensitive the optimal solution is to the change of some of the data or parameters, keeping the rest fixed (John & Faulín, 2023).

Intangible and intangible financial modeling, sensitivity analysis consists of analyzing how the different economic values of a set of independent variables affect a specific dependent variable, as well as knowing how it will respond, among the different economic scenarios.

In finance, sensitivity analysis is used to model the performance outcome of changes in interest rates, and asset prices, as well as changes in demand, in the formation of investment portfolios and the mix of their assets. Also, changes in systemic or market risk, unsystematic risk, as well as the change in the variables associated with different investment strategies.

Sensitivity analysis is the procedure by which it is possible to determine how much the objective function (IRR or NPV) is affected or how sensitive it is to changes in certain variables of the investment, considering that the others do not change. (Baca, 2022; Morales & Morales, 2009).

Mercados y Negocios por Departament
o de Mercadotecnia y Negocios Internacionales. Universidad de Guadalajara se distribuye bajo una Licencia Creative Commons Atribución-NoComercial 4.0 Internacional. Basada en una obra en http://mercadosynegocios.cucea.udg.mx/index.php/MYN.

Forms of study of sensitivity: according to research conducted by John and Faulín (2023).

The first is to solve the entire problem again every time some of the original data has been modified. This method can take a long time to determine all the variants when we are faced with a large set of possible changes.

The second way is that once a problem has been solved, we proceed to analyze how the optimal result obtained would be affected by the variation within a "tolerable" range, of the value of one of the variables, keeping the value of the remaining variables fixed.

If the effects of varying more than one parameter (or a parameter beyond the "tolerance range") are studied, the problem must be reprogrammed.

Methods to study sensitivity: to obtain a measure of the variability in the results according to the research of Tejeda and others (2015) and Pérez and others (2012), the following methods can be mentioned:

Informal method: the analyst assesses the stability of the variables.



Decision tree: Future decision points and possible uncertain events are displayed; in which case each alternative is presented as a branch of the tree.

Monte Carlo model: links sensitivities and probability distributions of input variables. An uncertainty analysis allows you to quantitatively assess the variability of the model components for a specific situation and deduce an uncertainty distribution for each state or output variable of the model (Monod et al., 2006). Generally, this analysis is carried out using Monte Carlo simulation (Saltelli et al., 2008).

Dupont Method: measures the company's profitability about sales, and total asset turnover, which indicates how efficiently assets have been used to generate sales.

Software and sensitivity: there are different software's on the market, among them we can mention the following: @RISK, Managerial Analyzer Delfos Pro, Oracle Crystal Ball, EasyPlanEx, RealiaSoft RENO, MultiPlanEx, these softwares perform financial analysis, investment projection, as well as the financial sensitivity analysis.

Economic and financial indicators are useful tools that benefit organizations by facilitating timely and appropriate decision-making in relation to 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 increase in prices in the country. It is calculated fortnightly by the Bank of Mexico and INEGI (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 December 2010.

**Table 1**

**Accumulated inflation in the year (Base: 2nd. Fortnight of December 2010 = 100 with data provided by *Banco de México*)**



| Periodo | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Enero | 1.48 | 0.77 | 0.98 | 0.79 | 0.90 | -0.09 | 0.38 | 1.70 | 0.53 | 0.09 | 0.48 | 0.86 | 0.59 | 0.76 |
| Febrero | 2.15 | 1.42 | 1.47 | 1.46 | 1.15 | 0.09 | 0.82 | 2.29 | 0.91 | 0.06 | 0.90 | 1.50 | 1.43 | 1.24 |
| Marzo | 2.52 | 1.84 | 1.55 | 1.99 | 1.43 | 0.51 | 0.97 | 2.92 | 1.24 | 0.44 | 0.85 | 2.34 | 2.43 | 1.51 |
| Abril | 1.98 | 0.72 | 0.69 | 1.81 | 1.24 | 0.25 | 0.65 | 3.04 | 0.90 | 0.50 | -0.17 | 2.67 | 2.98 | 1.47 |
| Mayo | 0.60 | -0.70 | -0.65 | 0.95 | 0.91 | -0.26 | 0.20 | 2.92 | 0.73 | 0.21 | 0.22 | 2.88 | 3.17 | 1.27 |
| Junio | 0.49 | -0.41 | -0.41 | 1.12 | 1.09 | -0.09 | 0.31 | 3.18 | 1.12 | 0.27 | 0.76 | 3.43 | 4.04 | 1.37 |
| Julio | 0.56 | -0.04 | 0.32 | 1.14 | 1.42 | 0.06 | 0.57 | 3.57 | 1.66 | 0.65 | 1.43 | 4.04 | 4.81 | 1.86 |
| Agosto | 0.91 | 0.30 | 0.92 | 1.31 | 1.73 | 0.27 | 0.86 | 4.08 | 2.26 | 0.63 | 1.82 | 4.24 | 5.54 | 2.42 |
| Septiembre | 1.27 | 0.73 | 1.12 | 1.61 | 2.18 | 0.27 | 1.47 | 4.41 | 2.69 | 0.89 | 2.06 | 4.88 | 6.19 | 2.88 |
| Octubre | 2.35 | 2.33 | 2.12 | 2.77 | 2.74 | 1.16 | 2.09 | 5.06 | 3.22 | 1.44 | 2.68 | 5.76 | 6.79 | 3.27 |
| Noviembre | 3.89 | 4.87 | 3.86 | 4.57 | 3.57 | 1.71 | 2.89 | 6.15 | 4.10 | 2.26 | 2.76 | 6.97 | 7.41 | 3.93 |
| Diciembre | 4.19 | 5.81 | 3.97 | 5.21 | 4.08 | 2.13 | 3.36 | 6.77 | 4.83 | 2.83 | 3.15 | 7.35 | 7.82 | 4.66 |

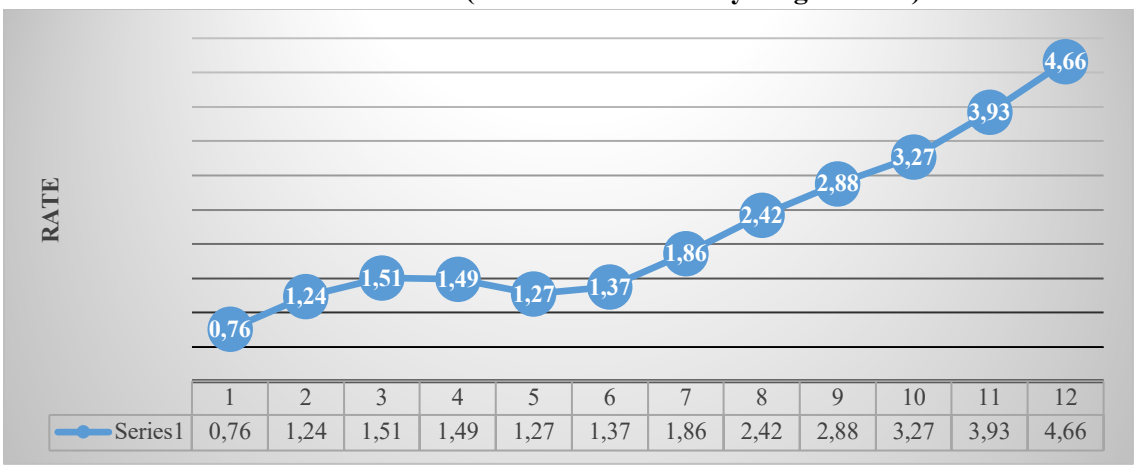
Source: Own elaboration (INEGI, 2024). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general

**Graph 1**
**Inflation in Mexico (2010-2023 accumulated at the end of the year)**


| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series1 | 4,19 | 5,81 | 3,97 | 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 2**
**Inflation in Mexico (accumulated January-August 2023)**




| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series1 | 0,76 | 1,24 | 1,51 | 1,49 | 1,27 | 1,37 | 1,86 | 2,42 | 2,88 | 3,27 | 3,93 | 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



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

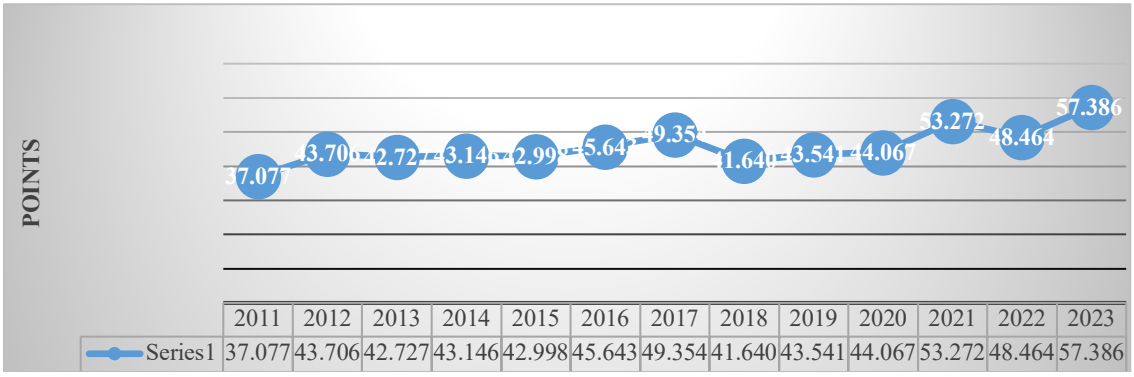
Represents the change in the values traded on the Mexican Stock Exchange concerning the previous day to determine the percentage of rising or falling of the most representative shares of the companies listed therein.

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

| 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36,982 | 37,422 | 45,278 | 40,879 | 40,951 | 43,631 | 47,001 | 50,456 | 43,988 | 44,862 | 42,986 | 51,331 | 54,564 |
| 37,020 | 37,816 | 44,121 | 38,783 | 44,190 | 43,715 | 46,857 | 47,438 | 42,824 | 41,324 | 44,593 | 53,401 | 52,758 |
| 37,441 | 39,521 | 44,077 | 40,462 | 43,725 | 45,881 | 48,542 | 46,125 | 43,281 | 34,554 | 47,246 | 56,537 | 53,904 |
| 36,963 | 39,461 | 42,263 | 40,712 | 44,582 | 45,785 | 49,261 | 48,354 | 44,597 | 36,470 | 48,010 | 51,418 | 55,121 |
| 35,833 | 37,872 | 41,588 | 41,363 | 44,704 | 45,459 | 48,788 | 44,663 | 42,749 | 36,122 | 50,886 | 51,753 | 52.736 |
| 36,558 | 40,199 | 40,623 | 42,737 | 45,054 | 45,966 | 49,857 | 47,663 | 43,161 | 37,716 | 50,290 | 47,524 | 53.526 |
| 35,999 | 40,704 | 40,838 | 43,818 | 44,753 | 46,661 | 51,012 | 49,698 | 40,863 | 37,020 | 50,868 | 48,144 | 54.819 |
| 35,721 | 39,422 | 39,492 | 45,628 | 43,722 | 47,541 | 51,210 | 49,548 | 42,623 | 36,841 | 53,305 | 44,919 | 53.021 |
| 33,503 | 40,867 | 40,185 | 44,986 | 42,633 | 47,246 | 50,346 | 49,504 | 43,011 | 37,459 | 51,386 | 44,627 | 50,875 |
| 36,160 | 41,620 | 41,039 | 45,028 | 44,543 | 48,009 | 48,626 | 43,943 | 43,337 | 36,988 | 51,310 | 49,922 | 49,062 |
| 36,829 | 41,834 | 42,499 | 44,190 | 43,419 | 45,286 | 47,092 | 41,733 | 42,820 | 41,779 | 49,699 | 51,685 | 54,060 |
| 37,077 | 43,706 | 42,727 | 43,146 | 42,998 | 45,643 | 49,354 | 41,640 | 43,541 | 44,067 | 53,272 | 48,464 | 57,386 |

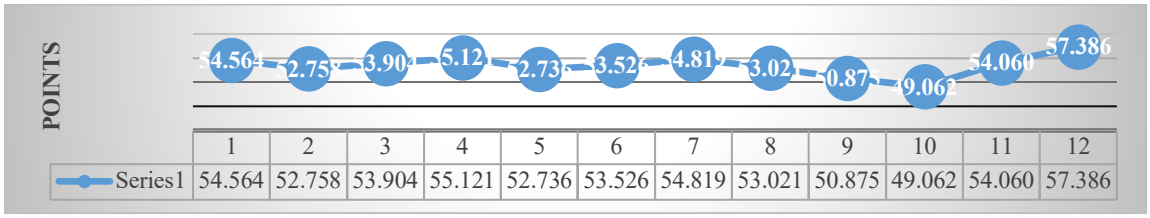
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=7&accion=consultarCuadro&idCuadro=CF57&locale=es

**Graph 3**
**The Price and Quotation Index of the Mexican Stock Exchange, 2011 - 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-December 2023 (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 concerning the dollar calculated with the daily average of the five most important banks in the country, which 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)**

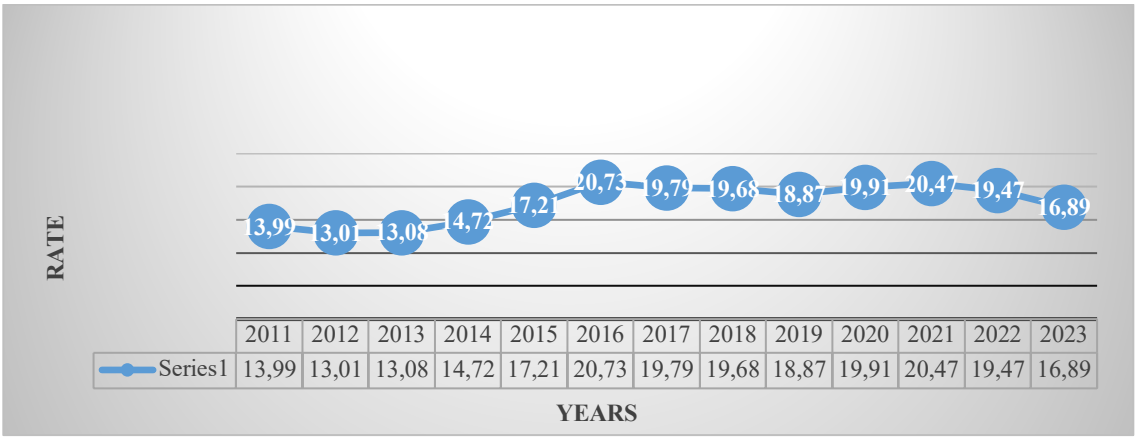
| Period | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **January** | 12.02 | 12.95 | 12.71 | 13.37 | 14.69 | 18.45 | 21.02 | 18.62 | 19.04 | 18.91 | 20.22 | 20.74 | 18.79 |
| **February** | 12.17 | 12.87 | 12.87 | 13.30 | 14.92 | 18.17 | 19.83 | 18.65 | 19.26 | 19.78 | 20.94 | 20.65 | 18.40 |
| **March** | 11.97 | 12.80 | 12.36 | 13.08 | 15.15 | 17.40 | 18.81 | 18.33 | 19.38 | 23.48 | 20.44 | 19.99 | 18.11 |
| **April** | 11.59 | 13.20 | 12.16 | 13.14 | 15.22 | 19.40 | 19.11 | 18.86 | 19.01 | 23.93 | 20.18 | 20.57 | 18.07 |
| **May** | 11.63 | 13.91 | 12.63 | 12.87 | 15.36 | 18.45 | 18.51 | 19.75 | 19.64 | 22.18 | 19.92 | 19.69 | 17.56 |
| **June** | 11.84 | 13.66 | 13.19 | 13.03 | 15.57 | 18.91 | 17.90 | 20.06 | 19.21 | 23.09 | 19.91 | 20.13 | 17.07 |
| **July** | 11.65 | 13.28 | 12.73 | 13.06 | 16.21 | 18.86 | 17.69 | 18.55 | 19.99 | 22.20 | 19.85 | 20.34 | 16.73 |
| **August** | 12.41 | 13.27 | 13.25 | 13.08 | 16.89 | 18.58 | 17.88 | 19.07 | 20.07 | 21.89 | 20.06 | 20.09 | 16.84 |
| **September** | 13.42 | 12.92 | 13.01 | 13.45 | 17.01 | 19.50 | 18.13 | 18.90 | 19.68 | 22.14 | 20.56 | 20.09 | 17.62 |
| **October** | 13.20 | 13.09 | 12.89 | 13.42 | 16.45 | 18.84 | 19.15 | 19.80 | 19.16 | 21.25 | 20.53 | 19.82 | 18.08 |
| **November** | 14.03 | 13.04 | 13.09 | 13.72 | 16.55 | 20.55 | 18.58 | 20.41 | 19.61 | 20.14 | 21.45 | 19.40 | 17.14 |
| **December** | 13.99 | 13.01 | 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

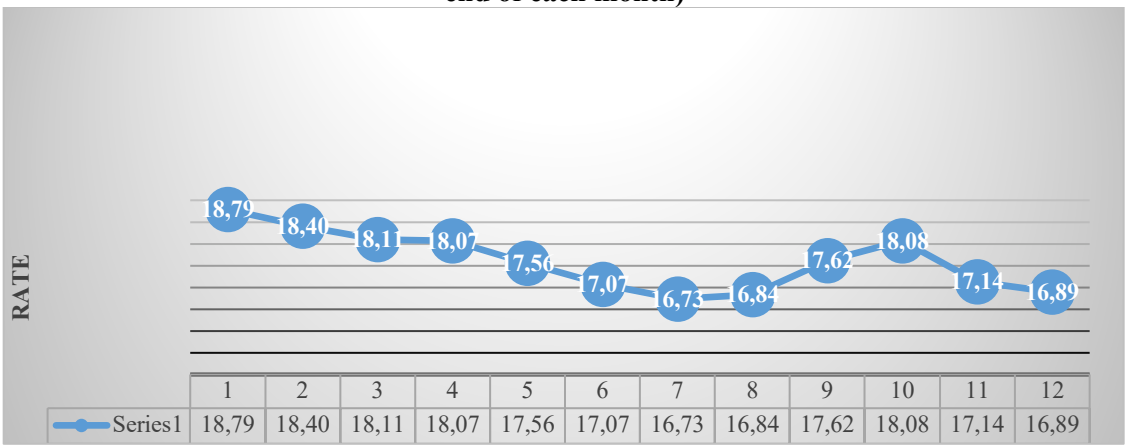
**Graph 5**

**Exchange rate (National currency per US dollar, 2011-2023, 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-December 2023, 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)



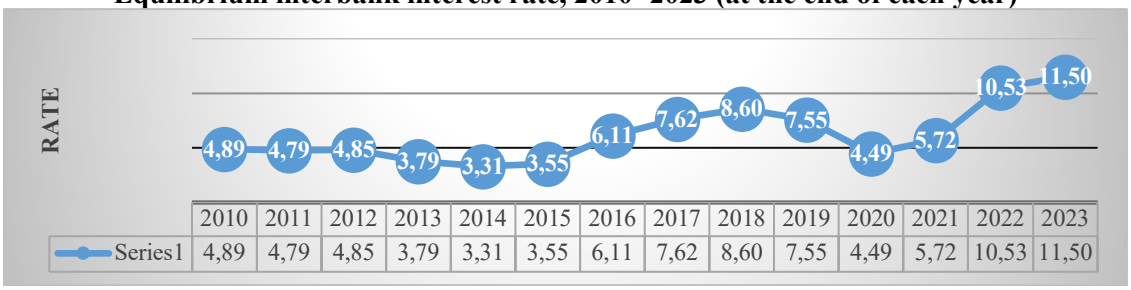
On March 23, 1995, the Bank of Mexico, to establish an interbank interest rate that better reflects market conditions, released the Interbank Equilibrium Interest Rate through the Official Gazette of the Federation.

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

| Periodo | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Enero** | 4.91 | 4.86 | 4.79 | 4.84 | 3.78 | 3.29 | 3.56 | 6.15 | 7.66 | 8.59 | 7.50 | 4.47 | 5.72 | 10.78 |
| **Febrero** | 4.92 | 4.84 | 4.78 | 4.80 | 3.79 | 3.29 | 4.05 | 6.61 | 7.83 | 8.54 | 7.29 | 4.36 | 6.02 | 11.10 |
| **Marzo** | 4.92 | 4.84 | 4.77 | 4.35 | 3.81 | 3.30 | 4.07 | 6.68 | 7.85 | 8.51 | 6.74 | 4.28 | 6.33 | 11.34 |
| **Abril** | 4.94 | 4.85 | 4.75 | 4.33 | 3.80 | 3.30 | 4.07 | 6.89 | 7.85 | 8.50 | 6.25 | 4.28 | 6.73 | 11.53 |
| **Mayo** | 4.94 | 4.85 | 4.76 | 4.30 | 3.79 | 3.30 | 4.10 | 7.15 | 7.86 | 8.51 | 5.74 | 4.29 | 7.01 | 11.54 |
| **Junio** | 4.94 | 4.85 | 4.77 | 4.31 | 3.31 | 3.30 | 4.11 | 7.36 | 8.10 | 8.49 | 5.28 | 4.32 | 7.42 | 11.50 |
| **Julio** | 4.92 | 4.82 | 4.78 | 4.32 | 3.31 | 3.31 | 4.59 | 7.38 | 8.11 | 8.47 | 5.19 | 4.52 | 8.04 | 11.50 |
| **Agosto** | 4.90 | 4.81 | 4.79 | 4.30 | 3.30 | 3.33 | 4.60 | 7.38 | 8.10 | 8.26 | 4.76 | 4.65 | 8.50 | 11.50 |
| **Septiembre** | 4.90 | 4.78 | 4.81 | 4.03 | 3.29 | 3.33 | 4.67 | 7.38 | 8.12 | 8.04 | 4.55 | 4.75 | 8.89 | 11.50 |
| **Octubre** | 4.87 | 4.79 | 4.83 | 3.78 | 3.28 | 3.30 | 5.11 | 7.38 | 8.15 | 7.97 | 4.51 | 4.98 | 9.56 | 11.50 |
| **Noviembre** | 4.87 | 4.80 | 4.85 | 3.80 | 3.31 | 3.32 | 5.57 | 7.39 | 8.34 | 7.78 | 4.48 | 5.13 | 10.00 | 11.50 |
| **Diciembre** | 4.89 | 4.79 | 4.85 | 3.79 | 3.31 | 3.55 | 6.11 | 7.62 | 8.60 | 7.55 | 4.49 | 5.72 | 10.53 | 11.50 |

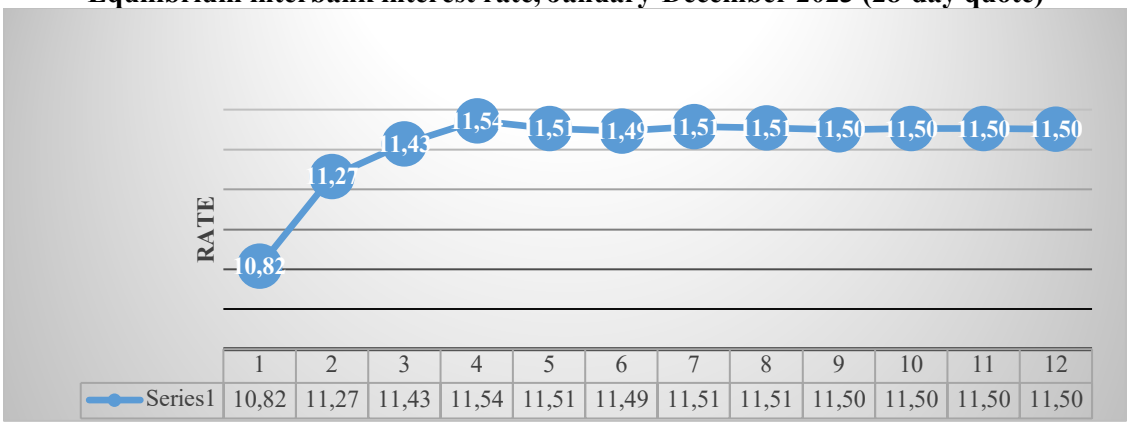
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es

**Graph 7**
**Equilibrium interbank interest rate, 2010- 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-December 2023 (28-day quote)**




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

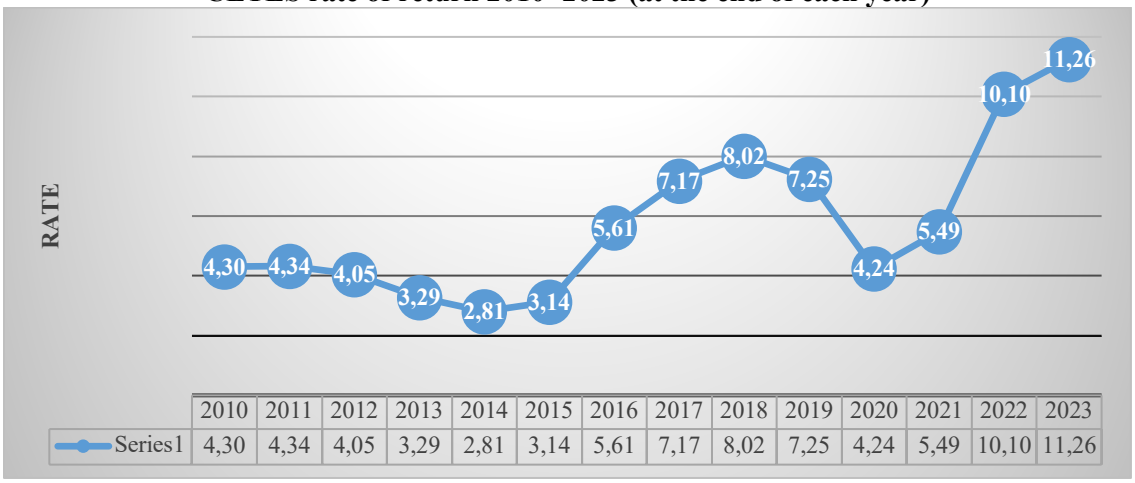
## 5. CETES RATE OF RETURN

**Table 5**
**CETES rate of return (28-day)**

| Period | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **January** | 4.49 | 4.14 | 4.27 | 4.15 | 3.14 | 2.67 | 3.08 | 5.83 | 7.25 | 7.95 | 7.04 | 4.22 | 5.50 | 10.80 |
| **February** | 4.49 | 4.04 | 4.32 | 4.19 | 3.16 | 2.81 | 3.36 | 6.06 | 7.40 | 7.93 | 6.91 | 4.02 | 5.94 | 11.04 |
| **March** | 4.45 | 4.27 | 4.24 | 3.98 | 3.17 | 3.04 | 3.80 | 6.32 | 7.47 | 8.02 | 6.59 | 4.08 | 6.52 | 11.34 |
| **April** | 4.44 | 4.28 | 4.29 | 3.82 | 3.23 | 2.97 | 3.74 | 6.50 | 7.46 | 7.78 | 5.84 | 4.06 | 6.68 | 11.27 |
| **May** | 4.52 | 4.31 | 4.39 | 3.72 | 3.28 | 2.98 | 3.81 | 6.56 | 7.51 | 8.07 | 5.38 | 4.07 | 6.90 | 11.25 |
| **June** | 4.59 | 4.37 | 4.34 | 3.78 | 3.02 | 2.96 | 3.81 | 6.82 | 7.64 | 8.18 | 4.85 | 4.03 | 7.56 | 11.02 |
| **July** | 4.60 | 4.14 | 4.15 | 3.85 | 2.83 | 2.99 | 4.21 | 6.99 | 7.73 | 8.15 | 4.63 | 4.35 | 8.05 | 11.09 |
| **August** | 4.52 | 4.05 | 4.13 | 3.84 | 2.77 | 3.04 | 4.24 | 6.94 | 7.73 | 7.87 | 4.50 | 4.49 | 8.35 | 11.07 |
| **Sep.** | 4.43 | 4.23 | 4.17 | 3.64 | 2.83 | 3.10 | 4.28 | 6.99 | 7.69 | 7.61 | 4.25 | 4.69 | 9.25 | 11.05 |
| **Oct.** | 4.03 | 4.36 | 4.21 | 3.39 | 2.90 | 3.02 | 4.69 | 7.03 | 7.69 | 7.62 | 4.22 | 4.93 | 9.00 | 11.26 |
| **Nov.** | 3.97 | 4.35 | 4.23 | 3.39 | 2.85 | 3.02 | 5.15 | 7.02 | 7.83 | 7.46 | 4.28 | 5.05 | 9.70 | 11.78 |
| **Dec.** | 4.30 | 4.34 | 4.05 | 3.29 | 2.81 | 3.14 | 5.61 | 7.17 | 8.02 | 7.25 | 4.24 | 5.49 | 10.10 | 11.26 |

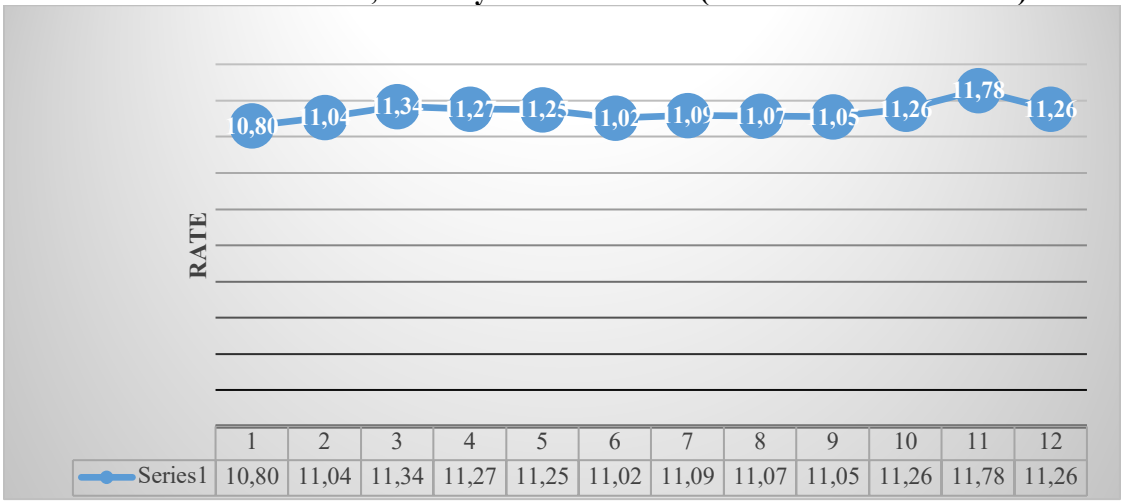
Source: Own elaboration (BANXICO, 2024).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es

**Graph 9**
**CETES rate of return 2010- 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-December 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)



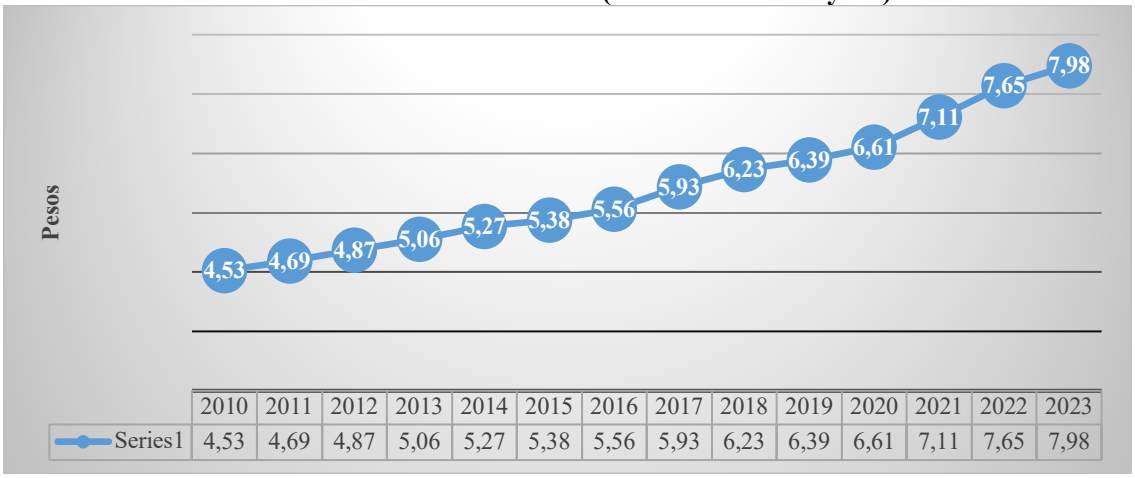
The UDI is a unit of account of constant real value to denominate credit titles. It does not apply to checks, commercial contracts, or other acts of commerce.

**Table 6**
**Investment units (value concerning pesos)**

| Period | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **January** | 4.37 | 4.56 | 4.73 | 4.89 | 5.10 | 5.29 | 5.41 | 5.62 | 5.97 | 6.25 | 6.44 | 6.64 | 7.12 | 7.69 |
| **February** | 4.41 | 4.57 | 4.75 | 4.92 | 5.13 | 5.29 | 5.43 | 5.69 | 6.00 | 6.25 | 6.46 | 6.70 | 7.18 | 7.74 |
| **March** | 4.44 | 4.59 | 4.75 | 4.94 | 5.15 | 5.30 | 5.44 | 5.71 | 6.02 | 6.26 | 6.49 | 6.75 | 7.24 | 7.77 |
| **April** | 4.46 | 4.59 | 4.75 | 4.97 | 5.15 | 5.32 | 5.45 | 5.75 | 6.03 | 6.28 | 6.43 | 6.79 | 7.31 | 7.78 |
| **May** | 4.43 | 4.58 | 4.71 | 4.96 | 5.13 | 5.29 | 5.42 | 5.75 | 6.01 | 6.27 | 6.42 | 6.81 | 7.33 | 7,78 |
| **June** | 4.41 | 4.55 | 4.74 | 4.95 | 5.13 | 5.28 | 5.42 | 5.75 | 6.01 | 6.26 | 6.44 | 6.83 | 7.36 | 7.77 |
| **July** | 4.42 | 4.57 | 4.77 | 4.95 | 5.14 | 5.28 | 5.42 | 5.76 | 6.04 | 6.27 | 6.49 | 6.87 | 7.43 | 7.79 |
| **August** | 4.43 | 4.58 | 4.78 | 4.95 | 5.16 | 5.29 | 5.44 | 5.79 | 6.07 | 6.29 | 6.52 | 6.90 | 7.47 | 7.83 |
| **September** | 4.44 | 4.59 | 4.80 | 4.97 | 5.18 | 5.31 | 5.45 | 5.82 | 6.11 | 6.29 | 6.55 | 6.92 | 7.53 | 7.87 |
| **October** | 4.47 | 4.61 | 4.83 | 4.99 | 5.20 | 5.33 | 5.49 | 5.84 | 6.13 | 6.31 | 6.57 | 6.97 | 7.57 | 7.90 |
| **November** | 4.50 | 4.64 | 4.85 | 5.02 | 5.23 | 5.36 | 5.53 | 5.89 | 6.17 | 6.35 | 6.60 | 7.04 | 7.62 | 7.94 |
| **December** | 4.53 | 4.69 | 4.87 | 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

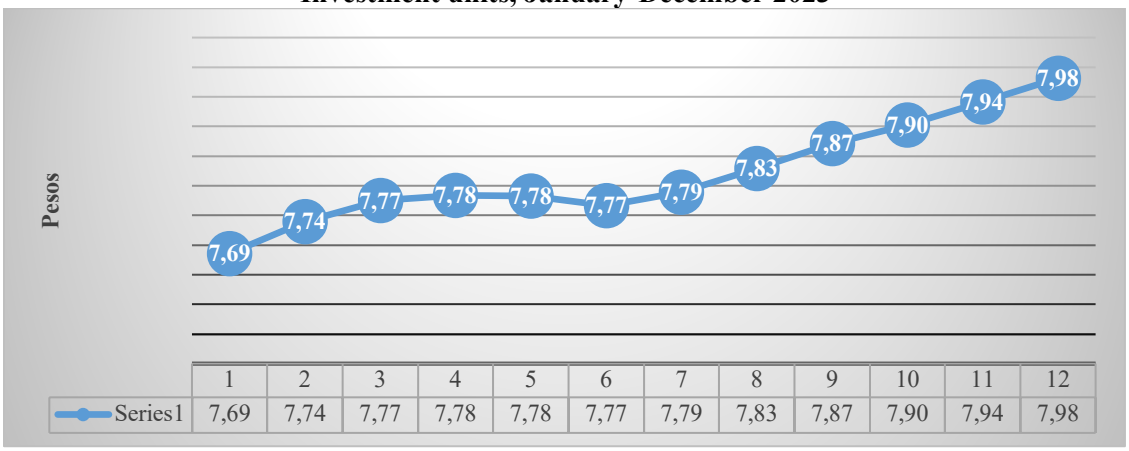
**Graph 11**
**Investment units 2010-2023 (At the end of the year)**




| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series1 | 4,53 | 4,69 | 4,87 | 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 12**
**Investment units, January-December 2023**




| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Series1 | 7,69 | 7,74 | 7,77 | 7,78 | 7,78 | 7,77 | 7,79 | 7,83 | 7,87 | 7,90 | 7,94 | 7,98 |

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



In these uncertain times, it is very important to apply the best mathematical models to carry out the appropriate analyzes that offer us the necessary information to make business decisions related, among others, to investment, opportunity costs, market share, sales forecasts, plans business, business valuation or risk assessment.

## REFERENCES

Baca, G. (2022). *Project evaluation*. México: McGraw Hill.

BANXICO. (2024). *Sistema de Información Económica. México*, Banco de México. Link: http://www.inegi.org.mx/sistemas/bie/

INEGI. (2024). *Banco de Información Económica*. Mexico: Instituto Nacional de Geografía y Estadística. Link: http://www.inegi.org.mx/sistemas/bie/

John, A. A, & Faulín, J. (2023). *Sensitivity Analysis with Excel and Lindo*. UOC, e-Math Project: Funded by the Secretary of State for Education and Universities (MECD).

Monod, H.; Naud, C. & Makowski, D. (2006). Uncertainty and sensitivity analysis for crop models, pp 55-96. In *Working with dynamic crop models. Evaluation, analysis, parameterization, and applications*. Wallach, D.; Makowski, D.; Jones, J.W. (eds). Elsevier. Amsterdam.

Morales, A., & Morales, J. (2009). *Investment projects. Evaluation and formulation*. McGraw Hill: Mexico.

Pérez, S., Cruz, D. & Quiroz, L. (2012). Sensitivity analysis of financial indicators in the evaluation of investments. In *MSMEs*. *VI Meeting of Research in Economic and Administrative Sciences.*

Saltelli, A.; Ratto, M.; Andrew, T.; Campolongo, F.; Cariboni, J.; Gatelli, D.; Saisana, M. & Tarantola, S. (2008). Global sensitivity analysis. The first. John Wiley and Sons. New Jersey, USA. 292 p. doi: 10.1002/9780470725184.oth1

Tejeda, R., Trueba, A., López, N., & Rodríguez, R. (2015). Development of an information system for the analysis of financial sensitivity for Mexican Micro, Small and Medium Enterprises. In *Micro, small and medium-sized enterprises in the economic, cultural and technological development of Mexico.*