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International Journal of Marketing, Innovation and Strategy (IJMIS) is an open access double-blind peer-reviewed scientific journal which publishes original, high-quality theoretical and empirical research focusing on the fields of marketing, innovation and strategy. All articles published in IJMIS must provide a significant contribution to these fields and focus on topics that are new and advance the current state of scientific knowledge in marketing, innovation and strategy.

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Specific attention will be given to:

- business reorientation as a result of Covid-19 pandemics;
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- data science, artificial intelligence, machine learning, social media strategy, marketing and business intelligence;
- destination marketing and niche tourism;
- digital / integrated communication, advertising and promotion;
- entrepreneurship, competitiveness and innovation in small and medium-sized companies;
- innovative approaches to teaching & learning in marketing, innovation and strategy;
- open innovation, business models and business model innovation;
- social marketing, corporate social responsibility and circular economy;
- other topics in marketing, innovation and strategy.

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Editorial

Volume 2, Issue 2

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Editorial

In the fourth edition of our journal, we present a selection of scholarly works encompassing four traditional papers: two systematic literature reviews related to green brand equity and artificial intelligence for innovation, and two empirical papers focused on artificial intelligence and internal marketing orientation in higher education.

Kicking off this edition is the systematic literature review by Pedro Magalhães and Irina Saur-Amaral, which explores the emerging concept of Green Brand Equity (GBE). Drawing on 41 academic articles sourced from Web of Science and Scopus, the study examines the dimensions, antecedents, and impacts of GBE, namely green trust, satisfaction, and brand image, highlighting its importance in aligning environmental responsibility with competitive advantage. The authors provide both a conceptual synthesis and practical guidance, noting the detrimental effects of greenwashing and calling for more cross-cultural studies to refine the framework. Results may be useful (from a theoretical perspective) for companies committed to sustainability and reputation building in increasingly eco-conscious markets.

The second paper, by Irina Saur-Amaral, Teresa Aragonez, and João Miguel Lopes, also employs a systematic literature review methodology, focusing this time on the connection between Artificial Intelligence (AI) and innovation management in business and engineering. Analyzing 858 articles from the ISI Web of Science, the authors identify key application areas, ranging from healthcare to aerospace, and emphasize AI's role in enhancing operational efficiency, decision-making, and sustainability. The paper maps out major research clusters and methodologies, while also raising critical issues such as data privacy, explainability, and ethical concerns. The study concludes by outlining promising directions for integrating AI with other technologies, e.g., Internet of Things, and proposes an agenda for future research.

The third contribution, authored by Bruno Costa and colleagues, explores perceptions of AI in the context of rapid technological change, combining theoretical perspectives (notably dynamic capabilities theory) with original survey data from 143 respondents. The study uses descriptive analysis and chi-square tests to examine demographic differences in AI awareness and attitudes, revealing interesting gender and cultural patterns. Results suggest a shared optimism about the role of AI in facilitating modern life, despite persistent concerns regarding job displacement, data security, and ethical implications. This paper provides a reflection on the human dimensions of technological disruption.

Closing the edition is a quantitative study by Carla Brás and Irina Saur-Amaral, which researches Internal Marketing Orientation (IMO) in a Portuguese public university. Using a validated multidimensional model and responses from 67 staff members, the authors combine regression and cluster analysis to assess perceptions of communication and responsiveness across different staff segments. Their findings identify three distinct profiles (Disconnected, Ambivalent, and Engaged) and highlight the need for differentiated communication strategies within higher education institutions. The study makes both methodological and practical contributions to internal marketing research, particularly in academic contexts where employee engagement is key to institutional performance.

We thank all contributing authors, the editorial team, reviewers, and our community for their invaluable support in shaping this third edition. We trust that these four papers will serve as a valuable resource for scholars interested in the realms of branding, internal marketing and artificial intelligence.

Happy readings!

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Green Brand Equity:
A Systematic Literature Review

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Abstract

This paper presents a systematic literature review on Green Brand Equity (GBE), an emerging concept integrating sustainability and environmental responsibility within brand equity frameworks. The review synthesizes findings from 41 academic articles sourced from Web of Science and Scopus, employing a rigorous selection and filtering process. Through descriptive and qualitative analyses, this study explores the dimensions, antecedents, and impacts of GBE, including green trust, satisfaction, and brand image. Results highlight the growing academic interest in GBE since 2010, with significant increases post-2021. The study underscores GBE's role in fostering competitive advantages, enhancing customer loyalty, and supporting sustainability goals. Additionally, it identifies the negative effects of greenwashing on consumer trust and GBE. While significant advancements are noted, the review calls for more cross-cultural and sector-specific studies to broaden GBE frameworks. These insights provide strategic guidance for businesses aiming to align environmental responsibility with market success.

Keywords: Green Brand Equity, Systematic Literature Review, Green Trust, Green Satisfaction, Brand Image

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1. Introduction

Due to the increasing focus on environmental sustainability, brands worldwide are increasingly turning to conspicuous sustainability as a development strategy and are attempting to act in more environmentally friendly ways to gain competitive advantage (Li et al., 2019). The task for companies is to identify opportunities to augment their products' environmental credentials to strengthen their brand equity (Chen, 2010). In this context, companies must actively recalibrate their brand management strategies toward the concentrated construction and development of green brand equity (GBE) (Hue, 2024).

This study conducts a systematic literature review of academic articles focusing on green brand equity, aiming to synthesize existing research and identify key trends, challenges and opportunities. A systematic literature review is a methodology that allows identifying, evaluating and interpreting available research relevant to a particular research question, or topic area, or phenomenon of interest (Kitchenham, 2004). According to Kitchenham (2004), performing systematic reviews is a key to summarize the existing evidence concerning a specific topic, to identify any gaps in current research to suggest areas for further investigation, and to provide a background to appropriately position new research activities.

By analyzing published studies, this review provides a retrospective evaluation of the evolution of the GBE concept while also highlighting emerging patterns that could inform future research. It draws on scientific articles indexed in Web of Science and Scopus, covering studies on GBE, obtained through rigorous search and filtering protocols. An initial sample of 163 academic papers was identified and, after validation, a final sample of 41 papers was used.

The paper is organized as follows. First, we describe the methodology adopted for the systematic literature review, detailing the search protocol and filtering criteria. Second, we present the results of the review, including descriptive statistics and a qualitative analysis of the core themes and contributions to the literature.

2. Methodology

Based on the suggestions made by Tranfield et al. (2003) and Saur-Amaral (2012), a systematic literature review was carried out.

The bibliographic research was directed to the theme "green brand equity" and was conducted in Web of Science Core Collection and Scopus, selected for their recognized quality. The choice of two databases aimed to guarantee a higher number of results. The keywords defined for the search were "green brand equity", "green" and "brand equity".

Specific search equations were established for each database: (TOPIC (green AND "brand equity")) OR (TOPIC ("green brand equity")) for Web of Science and (TITLE-ABS-KEY (green AND "brand equity")) OR (TITLE-ABS-KEY ("green brand equity")) for Scopus.

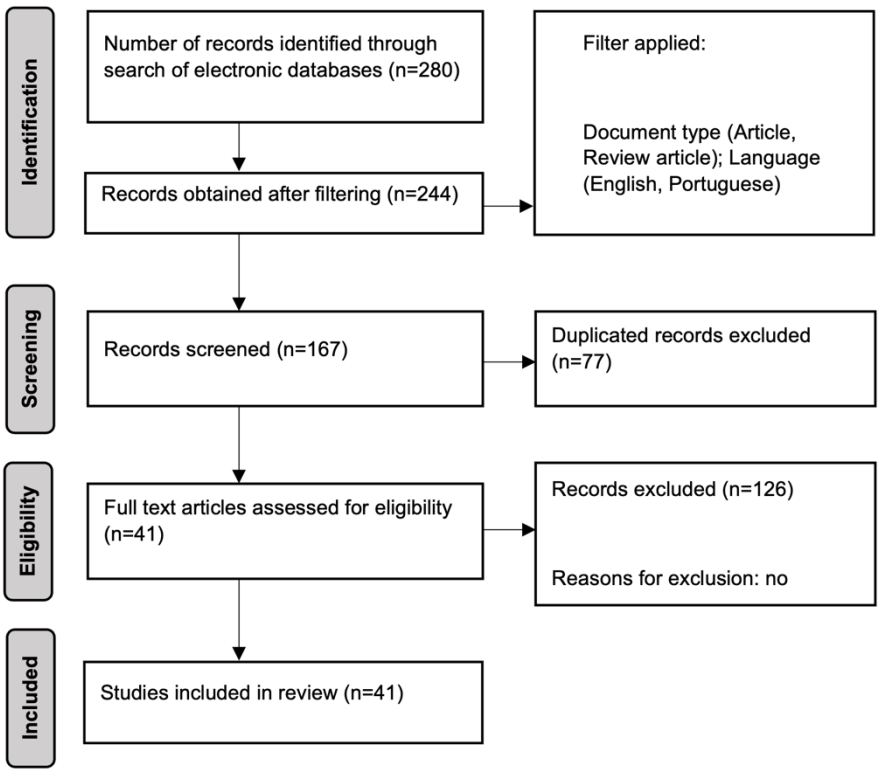

Figure 1 – Representation of the methodological approach

Source: Own elaboration

Filters were applied to refine the search results – a filter was applied regarding the type of document, making the results only Article or Review Article and a filter related to the language, keeping only documents in English and Portuguese.

A total of 141 scientific articles were obtained from Web of Science and another 103 from Scopus. A comparative analysis of the results from both databases was then carried out to eliminate possible duplicate articles, which resulted in the exclusion of 77 articles. This left 167 articles for analysis. Each article was carefully reviewed to ensure its relevance to the research topic. After this analysis, 123 articles that did not meet the study objective were excluded, leaving 44 final articles. Subsequently, three scientific articles were excluded because their access was blocked, leaving 41 articles for analysis.

An overview of the search and selection process is summarized in Figure 1.

3. Results

3.1. Descriptive Statistics

As illustrated in Figure 2, the first paper publications related to green brand equity appeared in 2014. Between 2014 and 2020, the publication frequency was rather low. After 2021, there was an increase in the number of publications, reaching the peak of publications in 2023, with 10 paper publications. In 2024, the number of publications was slightly lower than the year before, but the search was made in October, which indicates that, by the end of the year, the number of publications may reach a new peak. Although the number of publications related to green brand equity is low, these results indicate an increasing interest in this topic.

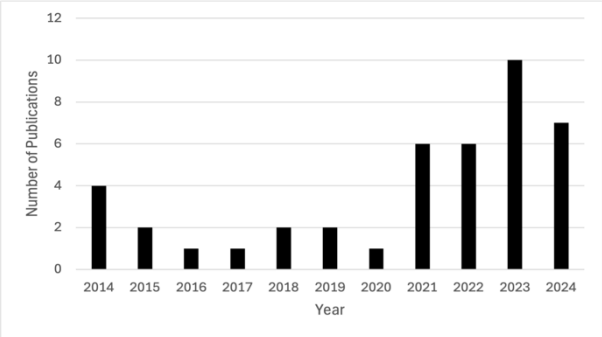

Figure 2 – Paper distribution per year

Source: Own elaboration

Most journals listed in Figure 3 have only one publication on this topic. The journals with the highest number of publications are Environment Development and Sustainability (n=3) and Sustainability (n=3), followed by Cogent Business and Management, Corporate Social Responsibility and Environmental Management, Journal of Business Ethics, Journal of Promotion Management and Quality and Quantity, with two publication each. The journals where the publications related to Green Brand Equity were made cover various areas, including environmental science, business, marketing, and management, reveling that green brand equity is being studied from different perspectives.

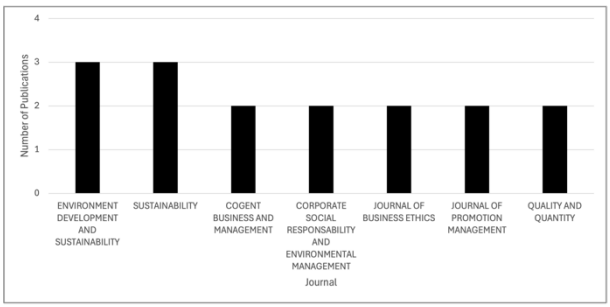

Figure 3 – Number of papers per journals (minimum 2 papers)

Source: Own elaboration

Figure 4 depicts the authors with more than one publication. The author with the most publications on green brand equity is Ha, T., with a total of four publications in the analyzed period.

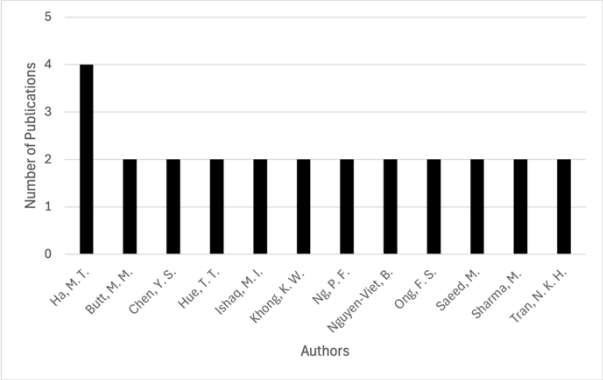

Figure 4 – Number of papers per author (authors with at least 2 publications)

Source: Own elaboration

3.2. Qualitative Analysis

After the descriptive analysis was completed, the selected papers were imported into NVivo 15, where a comprehensive content analysis was conducted to identify key themes and patterns. Regular coding was used to systematically organize the data (see Figure 5), while specific coding focused on identifying key themes to provide deeper insights into the research topic.

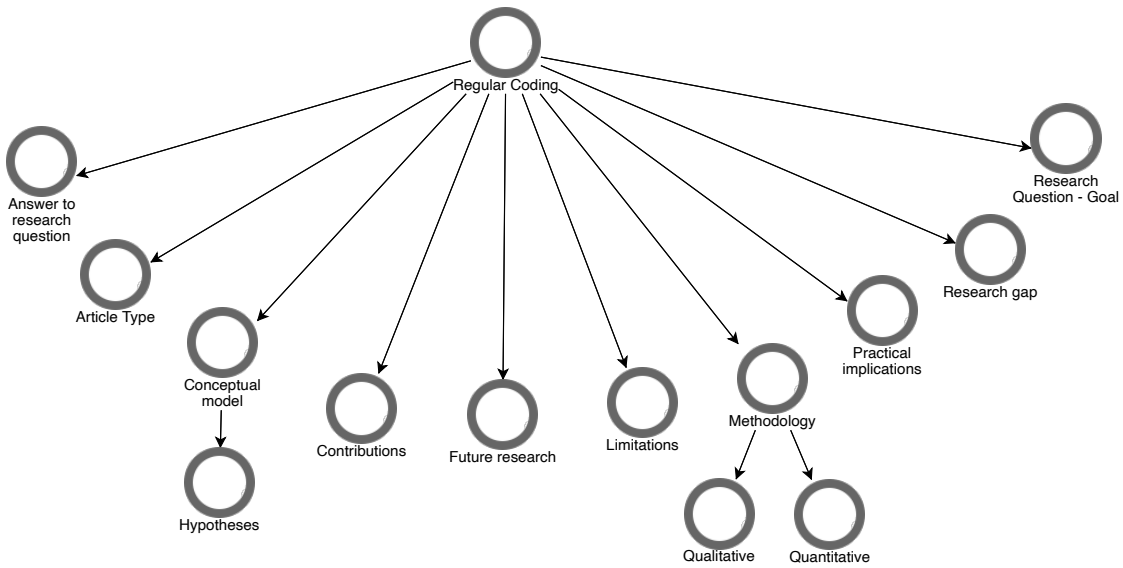

Figure 5 – Coding structure used for content analysis

Source: Own elaboration

3.2.1. Article Type

An extensive review of 41 articles was conducted, where the article type of each one was analyzed (see Figure 6), revealing a strong emphasis on quantitative research methods, especially through questionnaire-based surveys (e.g., Chen, 2010, Chang and Chen, 2014, Butt et al., 2017, Saeed et al., 2023). In addition to these studies, the review noted a smaller quantity of conceptual and qualitative works that provides theoretical insights using approaches like focus groups and group discussions to explore their subjects thoroughly (e.g., Bulsara et al., 2014, Chahal et al., 2014, Hue and Oanh, 2023). This combination of methodologies highlights the variety of research approaches within the examined literature.

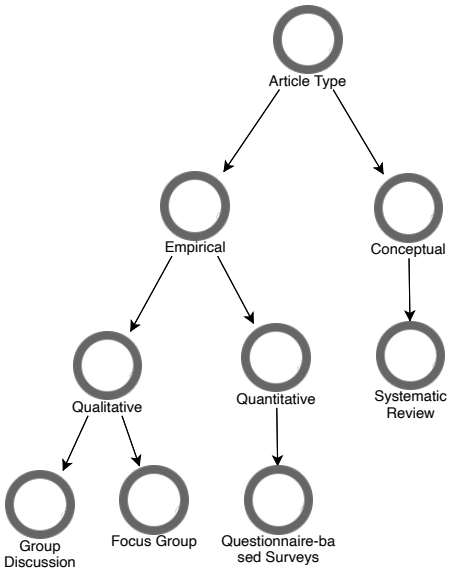

Figure 6 – Coding structure for Article Type

Source: Own elaboration

3.2.2. Research Goals

Research goals are diverse. Some examples are presented in Table 1.

Table 1 – Example of research goals for the quantitative papers included in the sample

Research Goal	Author
"develop a process for Green brand management by categorizing the existing literature on the basis of Green business functions, Green business issues and Green brand equity"	(Bulsara et al., 2014)
"examine and analyze the antecedents of SGMO and also to examine the moderating role of education and role of income between antecedents and SGMO"	(Chahal et al., 2014)
"explore the relationships among green perceived quality, green brand awareness, green perceived risk, and green brand equity"	(Chang and Chen, 2014)
"examine the relationships between brand concepts (perceived brand quality and brand credibility) and the concepts of green brand (green brand image (GBI), green brand-perceived value (GBPV), and green brand equity (GBE))"	(Delafrooz and Goli, 2015)
"investigate the direct impact of promotion tools (attitude toward green advertising and attitude toward green sponsorship) on green CBBE components, as well as green purchase intention" and "examine the interrelationships between these green CBBE components.."	(Dinh et al., 2023)
"examine (1) the outcome of green trust, green satisfaction and green brand image on green brand equity, (2) whether the association between green brand equity and green brand image is mediated by green trust, and green satisfaction, and (3) whether green trust operates as a mediator for the relationship between green brand equity and green satisfaction"	(Ha, 2020)

Research Goal	Author
"examine the impact of greenwash on green brand equity and analyse the mediation effects of green brand image, green satisfaction and green trust as well as the moderating effect of information and knowledge"	(Ha et al., 2022)
"investigate the effects of green brand equity (GBE) on green brand attachment (GBA), green self-brand connection (GSBC), green brand attitude (GBAT) and green word of mouth (GWOM)"	(Mehdikhani and Valmohammadi, 2022)
"investigate the relationship between three dimensions of green customer-based brand equity (green brand awareness, green brand quality, and green brand image) and green brand buying behavior (GBBB) directly and through green brand loyalty (GBL)"	(Saeed et al., 2023)

Source: Own elaboration

3.2.3. Keywords and Topic Analysis

To provide a visual representation of the most frequently used keywords in the literature, a word cloud was created, showcasing the occurrence of each keyword (see Figure 7).

Figure 7 – Word Frequency Query based on all abstracts in the sample

Source: Own elaboration

The 10 most frequent used keywords are presented in Table 2. The most prominent keywords are "green brand equity", "green brand image", "green marketing", "green trust" and "green satisfaction" suggesting that the core focus of the literature revolves around between branding and consumer perceptions.

Table 2 – Word Frequency Query based on all keywords in the sample

Words	Occurrences
Green brand equity	32
Green brand image	13
Green marketing	11
Green trust	11
Green satisfaction	7
Green purchase intention	6
Brand credibility	5
Green advertising	4
Vietnam	4
Word-of-mouth	4

Source: Own elaboration

The sample was uploaded to VOS Viewer, which was utilized to identify the most frequently cited words in the abstracts, providing a visual representation of the central concepts and themes emerging from the literature on green brand equity.

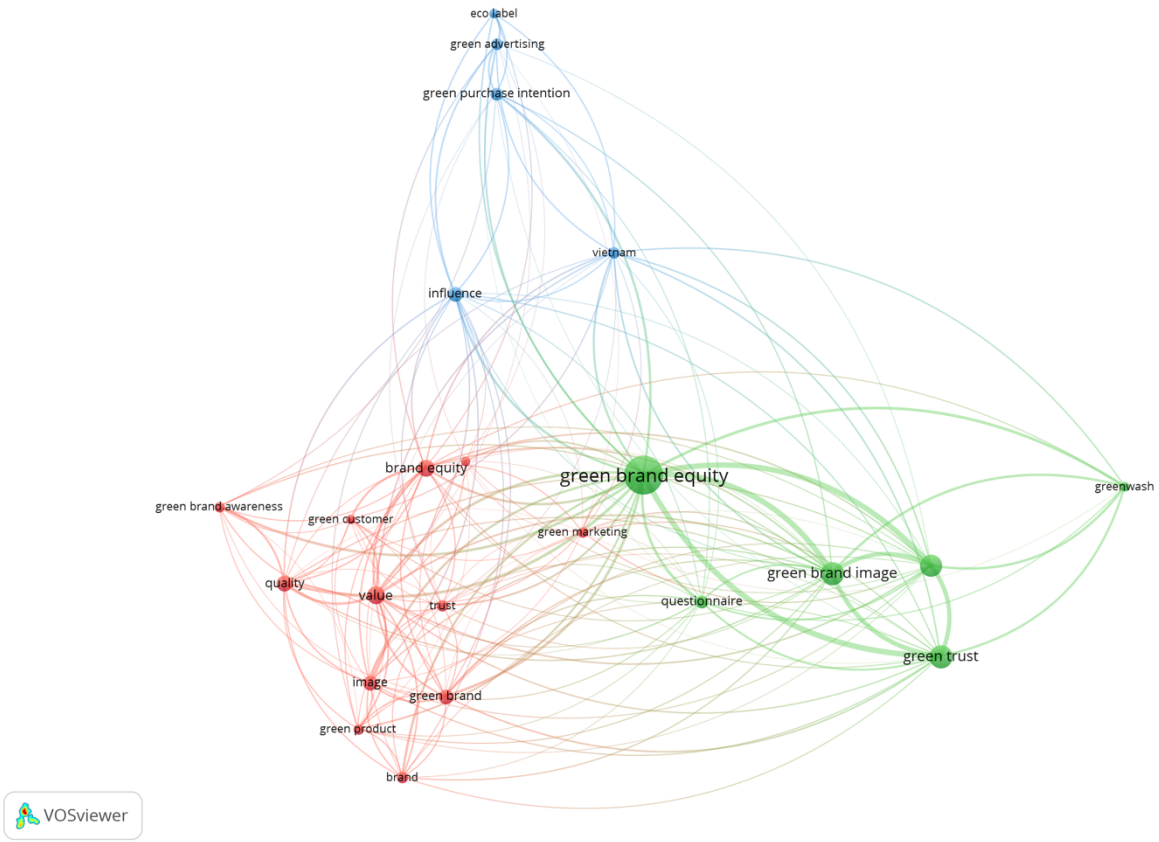

Figure 8 – VOS Viewer map: central concepts

Source: Own elaboration

As shown in Figure 8, "green brand equity" occupies a central position in the network, highlighting its pivotal role as the focal concept of this research. When analyzing the abstracts, three clusters can be identified: (1) green cluster including terms such as "green brand image" and "green trust"; (2) red cluster including terms such as "brand equity" and "green brand"; (3) blue cluster including terms such as "green purchase intention" and "green advertising".

3.2.4. Thematic Analysis

The qualitative analysis was performed in NVivo 15 and the full texts of the 41 papers were screened and coded.

3.2.4.1. Green Brand Equity and related concepts

Green Brand Equity (GBE) is an evolving concept that integrates the principles of sustainability and environmental responsibility into the traditional framework of brand equity. It is defined as the collection of brand-related assets and liabilities linked to a brand's commitment to environmental concerns, which add to or subtract from the value provided by a product or service (Chen, 2010, Ishaq, 2021). As consumer preferences increasingly favor eco-friendly brands, GBE has become a critical strategy for firms seeking competitive advantage, differentiation, and compliance with international environmental regulations (Chang and Chen, 2014, Ha, 2021).

Chen (2010) introduced GBE as "a set of brand assets and liabilities about green commitments and environmental concerns linked to a brand, its name, and symbol that add to or subtract from the value provided by a product or service". Later, Ishaq (2021) included economic, environmental, and social concerns, as well as a brand's eco-friendly commitments.

The primary objective of GBE is to raise environmental awareness, which firms can leverage to gain competitive advantage by targeting environmentally conscious consumers (Delafrooz and Goli, 2015).

Several studies have identified some dimensions and key components of GBE. Most of the GBE studies focused on its relationships with green-related antecedents, such as green brand image, green satisfaction and green trust (Górska-Warsewicz et al., 2021).

Chen (2010) defined **green brand images** as "a set of perceptions of a brand in a consumer's mind linked to environmental commitments and environmental concerns". A positive green brand image fulfills consumers' environmental desires, enhances trust, and reduces perceived risks, thereby strengthening GBE (Jannah et al., 2024). Bekk et al. (2016) defends that green brand image adds (or subtracts) value to the brand and, thus, increases the brand's green equity independent from the objective environmental characteristics of the economic good. It has been proved that green brand Image positively influences GBE (Chen, 2010, Kang and Hur, 2012, Ng et al., 2014, Bekk et al., 2016, Butt et al., 2017) and in green trust and green satisfaction (Chen, 2010, Ng et al., 2014, Bekk et al., 2016, Sharma, 2024).

Green trust is defined by Chen (2010) as "a willingness to depend on a product, service or brand based on the belief or expectation resulting from its credibility, benevolence and ability about its environmental performance". Green trust implies the willingness to rely on a brand based on trust or expectations stemming from its ability to carry out environmentally friendly activities (Chen, 2010).

There is a positive relation between green trust and GBE (Chen, 2010, Kang and Hur, 2012, Konuk et al., 2015, Bekk et al., 2016, Ha et al., 2022, Górska-Warsewicz et al., 2021). It was also proved that green trust positively influences green satisfaction (Chen, 2010; Kang & Hur, 2011) and leads to stronger green purchasing intentions (Górska-Warsewicz et al., 2021, Chang and Chen, 2014, Nguyen-Viet, 2022).

Green satisfaction is defined as a pleasurable level of consumption-related fulfilment to satisfy a customer's environmental desires, sustainable expectations and green needs (Chen, 2010). It has been demonstrated a positive influence of green satisfaction on green brand equity (Chen, 2010, Kang and Hur, 2012, Ng et al., 2014, Bekk et al., 2016). It has also a positively relationship with green brand image (Ng et al., 2014, Bekk et al., 2016) and green trust (Kang and Hur, 2012, Chang and Chen, 2014).

In addition to these, past research identified **green attitude, green loyalty, green brand perceived value, green perceived risk, green association, social influence, leadership, sustainability, brand association and green awareness** as GBE components (Chen, 2010, Kang and Hur, 2012, Bekk et al., 2016, Ng et al., 2014, Ishaq, 2021, Górska-Warsewicz et al., 2021). Conversely, **greenwashing** affects negatively GBE (Akturan, 2018, Qayyum et al., 2023).

Strong GBE positively impacts brand attitude, purchase intentions and positive word-of-mouth (Bekk et al., 2016, Butt et al., 2017). Also, high GBE reduces consumer perceived risk and provide competitive advantages for the companies, such as premium pricing, consumer loyalty and market differentiation (Chen, 2010, Butt et al., 2017, Ha, 2021).

3.2.5. Key Contributions

Some examples of the key contributions are presented in Table 3.

Table 3 – Examples of key contributions

Contributions	Author
"The results showed that green brand image, green satisfaction, and green trust are positively related to green brand equity. Furthermore, the positive relationship between green brand image and green brand equity is partially mediated by green satisfaction and green trust. Hence, investing on resources to increase green brand image, green satisfaction, and green trust is helpful to enhance green brand equity."	(Chen, 2010)
"This study demonstrates that investing resources in improving firms' green perceived quality and green brand awareness can not only decrease their green perceived risk, but also enable them to enhance their green brand equity."	(Chang and Chen, 2014)
"The results confirmed that a positive relationship exists between consumer concern for environmental values and general attitudes towards green products. Both these constructs influence consumers' knowledge structure of a green brand (image and associations). Furthermore, a strong relationship exists between consumers' knowledge structure (image and associations) and their relational preference (trust and brand equity) with green brands."	(Butt et al., 2017)
"Green brand associations and brand credibility positively affect green brand equity, and green brand equity has a positive and strong impact on purchase intention of consumers. In addition to that greenwashing negatively affects green brand associations and brand credibility, and therefore, indirectly influence green brand equity and purchase intention."	(Akturan, 2018)
"Green skepticism has a significant negative effect on green brand attachment, and green brand attachment has a significant positive effect on green brand equity."	(Khan et al., 2022)
"The results suggest that green marketing mix tools positively impact green customer-based brand equity creation."	(Nguyen et al., 2023)

Contributions	Author
"The findings of the study suggest that it is crucial to simultaneously focus on the following factors, with the preference order of brand perceived quality, green perceived value, green satisfaction, green trust, and green brand image."	(Hue and Oanh, 2023)
"Consumers' previous brand experience is important. The most promising indicators are brand image and green trust for GBE."	(Tung and Vigneron, 2023)
"The research results demonstrate that key components of GBE, including green satisfaction, green trust, and green perceived value, influence consumers' intention to engage in word-of-mouth communication about the green brand."	(Hue, 2024)
"Green Brand Image has a significant positive effect on Green Brand Equity, Green Brand Image has a significant positive effect on Green Trust, Green Satisfaction has a significant positive effect on Green Brand Equity, Green Trust has a significant positive effect on Green Brand Equity, Green Brand Image has a significant positive effect on Green Brand Equity mediated by Green Trust, and Green Satisfaction have a significant positive effect on Green Brand Equity mediated by Green Trust"	(Jannah et al., 2024)

Source: Own elaboration

3.2.6. Future Research

The future research directions in the analyzed studies are relatively limited. Most authors suggest testing their findings with different products or across a wider range of product categories. They also recommend exploring other sectors, countries, and cultures to see if the results hold in different contexts.

4. Conclusion

Conducting systematic reviews is essential for summarizing existing evidence on a specific topic (Kitchenham, 2004). This systematic literature review offers a comprehensive exploration of Green Brand Equity (GBE), a concept at the intersection of sustainability and brand management. Through the analysis of 41 papers, this study provides valuable insights into the core dimensions of GBE, including green trust, green satisfaction, and green brand image. These elements collectively form the foundation for building strong green brands that resonate with environmentally conscious consumers.

The findings reveal that GBE is a significant driver of competitive advantage, influencing brand loyalty, purchase intention, and positive word-of-mouth. In that way, consumers' preference for brands with credible environmental commitments enhances their trust and satisfaction, reinforcing GBE. In another way, practices such as greenwashing plays a critical role in GBE, reducing consumer confidence and undermining the authenticity of green branding efforts.

The temporal analysis of publications demonstrates a growing interest in GBE over the last decade, with a notable surge in studies after 2021. This trend reflects the increasing prioritization of sustainability in both academic and industry contexts. Furthermore, the thematic analysis highlights that much progress has been made in understanding GBE's components and impacts. However, there is a need for more cross-cultural and sector-specific studies to generalize GBE frameworks and future research should focus on emerging dimensions of GBE.

This study underscores the strategic importance of GBE as a tool for differentiation and market success in an era marked by environmental awareness. By embedding authentic green values into brand equity strategies, businesses not only enhance their reputation and customer loyalty but also contribute to broader sustainability goals. Addressing the challenges and leveraging the opportunities within GBE will be instrumental for organizations aiming to align profitability with environmental responsibility.

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Artificial Intelligence for Innovation in Business & Engineering

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Abstract

The increasing focus on artificial intelligence (AI) since 2023, especially due to ChatGPT, has left gaps in understanding its application and impact in research and development, as well as innovation management. This article aims to systematically analyze scholarly publications on AI and innovation, addressing questions about AI's use, benefits, challenges, and best practices in innovation management. Utilizing a systematic literature review methodology, the study analyzes 858 articles from ISI Web of Science, filtered by business economics and engineering fields. Results show a concentration of publications in top journals, with IEEE Access leading. Content analysis highlights AI's role in various sectors, such as healthcare and aerospace, and its contribution to operational efficiency and sustainability. The study provides insights into AI's potential, challenges like data privacy, and future research directions focusing on ethical considerations and integration with emerging technologies.

Keywords: Artificial Intelligence; Innovation Management; Systematic Literature Review; AI in R&D; Innovation Practices; Data Privacy; Operational Efficiency; Sustainable Development; AI Integration; Ethical Considerations.

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1. Introduction

Companies have been innovating using different strategies, and the artificial intelligence "revolution" has pushed forward the change from a traditional business model to a digitalized business model (Chatterjee et al., 2022). The way of managing innovation arguably requires renovation and change (Hutchinson, 2021).

With the increase in attention over the role of Artificial Intelligence (AI), that got into focus in 2023 mainly due to ChatGPT, there is still little knowledge over how scholars have been looking at its usage and impact in research and development, as well as innovation and innovation management. Do innovation managers use AI in their companies? If so, for what purpose? Are there good practices worth sharing? Are there hurdles that come with this new tool? Are there privacy or intellectual property concerns?

So, all these questions being raised, the focus of the current submission is on the systematic analysis of scholarly publication on the topic of AI and Innovation, aiming to analyze, integrate and seek relevant answers to the questions posed. The research uses a systematic literature review methodology and provides a more detailed and complex understanding of the roles, methodologies, contributions, and future directions of AI in innovation as typically discussed in scientific literature.

We start by presenting the methodology, then we look into the results, using a quantitative and a qualitative approach, and we finish with conclusions.

2. Methodology

Some reviews have been developed by scholars on the topic of AI (Akter et al., 2023, Cioffi et al., 2020, Kumar et al., 2023, Pereira et al., 2023, Whittaker et al., 2023, Zirar, 2023, Zirar et al., 2023), however they approach specific topics, e.g. the role of AI on workers, the impact on consumer – machine relationship (Pentina et al., 2023), the usage of AI technology per se, on sustainability (Di Vaio et al., 2020) or specific industries (Ali et al., 2023). In some cases, the sample of papers analyzed is not very high.

Systematic literature review is a methodology that has been used in several reviews (Ali et al., 2023, Ardito et al., 2022, Li et al., 2023, Pereira et al., 2023, Pentina et al., 2023), and that is the methodology we adopt in this research, as well. As mentioned by several scholars (e.g., Aragonez et al., 2021, de Santana Porte et al., 2015, Saur-Amaral et al., 2018, Tranfield et al., 2003), the systematic literature reviews are divided in three phases: planning, execution and reporting.

After an initial planning of the research goals, a search was performed on ISI Web of Science, in the Current Contents Content, with no time filter (from 1998 to date).

Results were filtered to include only scientific articles and reviews, and the research areas selected were business economics and engineering, as they are two key research fields related to innovation management.

All abstracts were read by both researchers and a total of 858 valid results were obtained, which were further exported to Endnote. VOS Viewer was used to cluster the topics before the qualitative analysis. Finally, the results were analysed in NVivo, using a content analysis approach.

3. Results

3.1. Descriptive Statistics

The final sample of articles was exported from Endnote and cleaned up for the descriptive statistical analysis. As we may observe in Figure 1, the publication of articles on the analyzed topic was rather scarce until 2016. In 2017, nine articles were published, and from 2018 onwards the number increased significantly, reaching a total of 296 articles in 2023.

There is a visible concentration of publications in the top journals. IEEE Access is the most prolific publication, with 76 articles from 2018 to 2023, and an average of 20 papers per year in 2022 and 2023. Applied Sciences – Basel and Journal of Business Research follow with 38 and 28 publications. Technovation is the 6th journal, with 22 publications and Journal of Innovation and Knowledge occupies the 10th place (see Figure 2).

The authors with most articles published are Vinit Parida (8 articles), Alexander Brem (7 articles), Yogesh K. Dwivedi and Francesco Schiavone (5 articles) (see Figure 3).

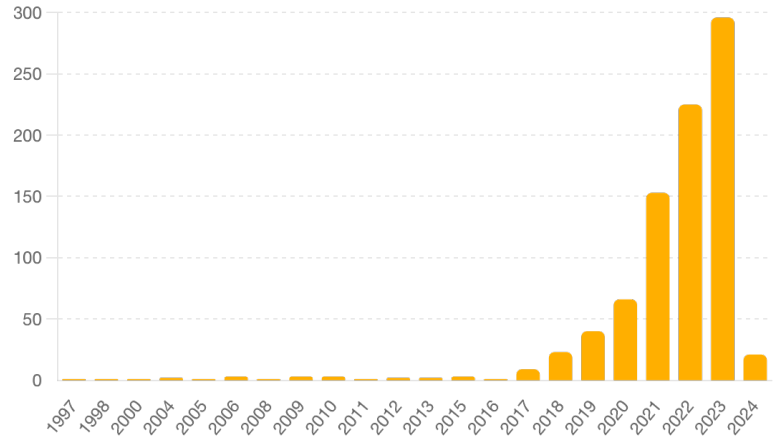

Figure 1 - Distribution of articles per publication year

Source: Own elaboration

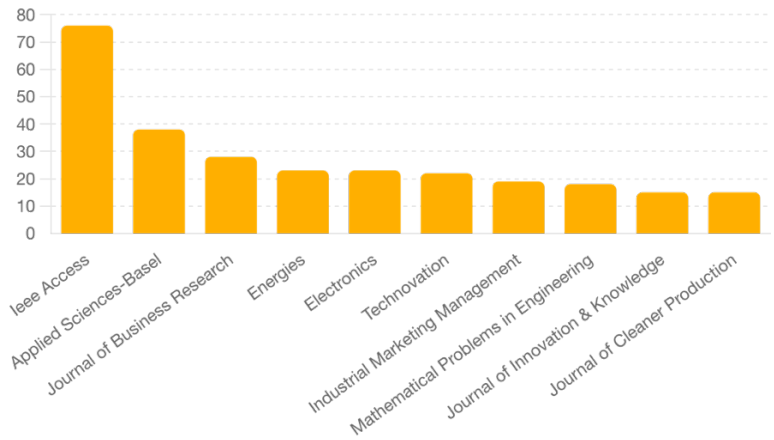

Figure 2 - Distribution of articles per scientific journal – Top 10

Source: Own elaboration

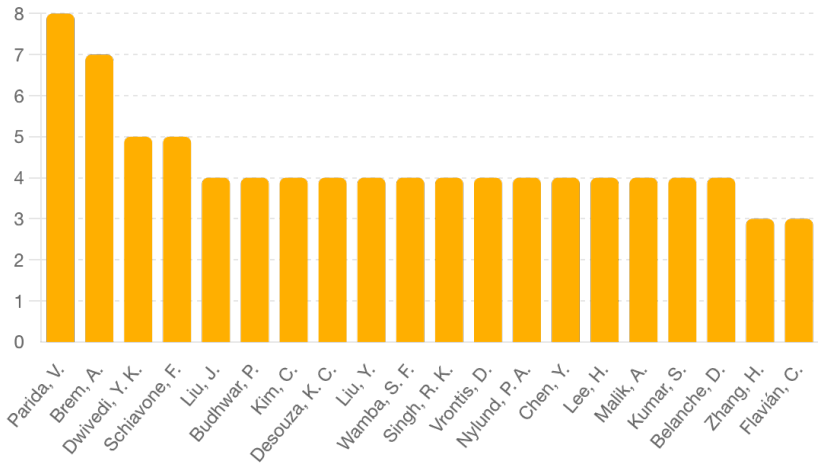

Figure 3 - Distribution of articles per author – Top 20

Source: Own elaboration

Vinit Parida's research focuses on AI business model innovation and transformation, particularly in manufacturing and industrial ecosystems. He emphasizes the need for aligning AI capabilities with value creation and capture mechanisms to commercialize AI technologies successfully. His studies cover digital servitization, the shift from traditional products to smart solutions, and the dynamics of revenue enhancement through digital offerings. Additionally, he explores agile co-creation processes for digital service innovations and smart factory implementation, providing frameworks for integrating AI into manufacturing to achieve efficiency and sustainability.

Alexander Brem's research addresses AI and digital technologies in innovation management, focusing on retail, manufacturing, and sustainability. He examines how digital entrepreneurs and public-private partnerships can leverage hybrid value creation to tackle showrooming in retail. His framework for AI in innovation management highlights AI's dual role as an originator and facilitator of innovation. He also explores digital transformation's broader implications and the support of frugal innovation for Sustainable Development Goals (SDGs). Additionally, his work on trust in AI-generated knowledge addresses ensuring stakeholder trust in AI applications.

Yogesh Dwivedi's research focuses on AI applications in healthcare, digital entrepreneurship, and innovation research. His systematic reviews provide insights into AI's benefits, challenges, and methodologies in healthcare. He explores touchless travel during pandemics through AI and robotics, and theorizes AI acceptance in digital entrepreneurship, offering a conceptual framework for adoption factors. Additionally, his research on machine autonomy for elderly rehabilitation highlights the importance of trust in AI applications for vulnerable populations, balancing machine intelligence with consumer trust.

Francesco Schiavone's research primarily focuses on AI's impact in the healthcare sector, examining innovation adoption, value co-creation, and competitive positioning within healthcare networks. He explores how AI enhances value co-creation in industrial markets and impacts human resources performance in healthcare organizations. He also investigates AI's role in improving the competitive positioning of healthcare organizations and its influence on the venture creation process, providing theoretical propositions. His work underscores AI's critical role in driving innovation and competitiveness in healthcare.

3.2. Thematic Analysis with VOS Viewer – Keywords and Topic Analysis

The sample was exported from Endnote and analysed with VOS Viewer to identify major research areas and topics. As it may be observed in Figure 4, the articles are from engineering and business and economics, which was expectable considering the nature of the search. When analyzing the abstracts and keywords, four clusters can be identified (see Figure 5): machine learning / deep learning, Internet of Things (IoT), digital technology / blockchain, business and innovation effects.

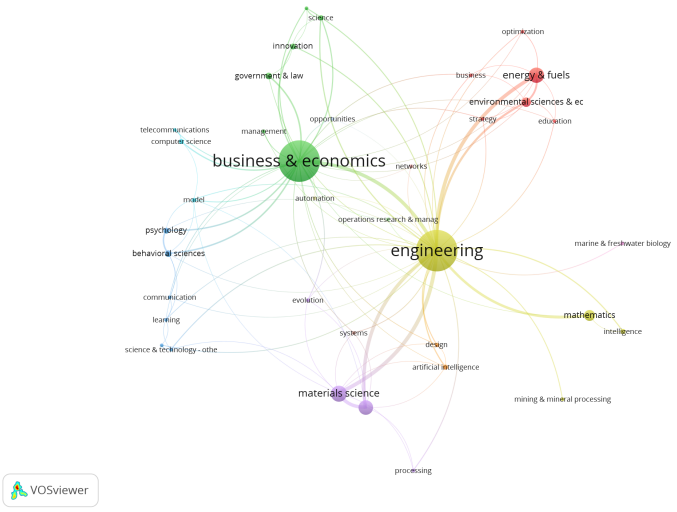

Figure 4 - Major topics in the sample – VOS Viewer graphical representation

Source: Own elaboration

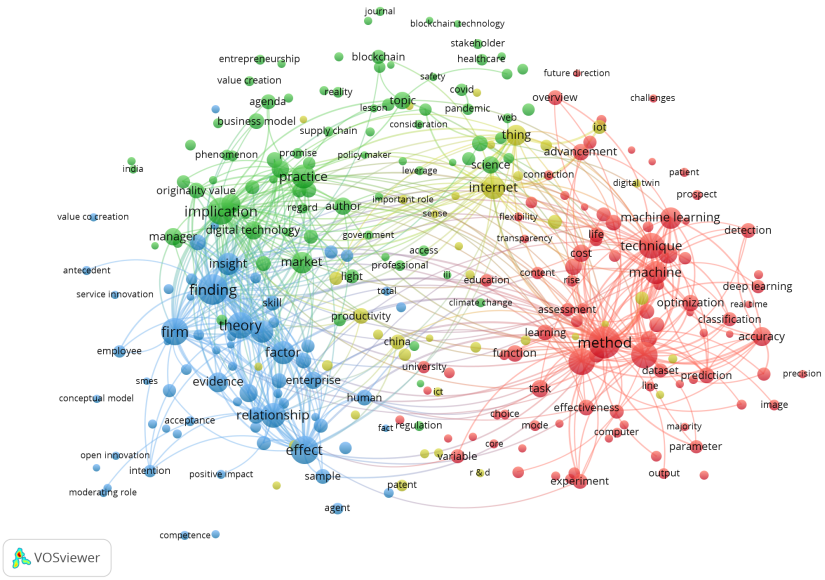

Figure 5 - Clusters of topics in the sample – VOS Viewer graphical representation

Source: Own elaboration

3.3. Thematic Analysis with NVivo

The qualitative analysis was performed in NVivo 15, based on the content analysis of the abstracts of the sample. It reflects that different lenses have been used by scholars.

3.3.1 Artificial Intelligence and Innovation

Authors often explore how AI drives advancements across various sectors, including healthcare, where it might predict patient outcomes or improve diagnostic accuracy and patient outcomes through machine learning and data analytics (Abbate et al., 2023, Schmidt et al., 2022, Lebovitz et al., 2022) or it might support the drug discovery process (Lou and Wu, 2021, Liu et al., 2019); in aerospace, for optimizing design and maintenance processes, integrated with blockchain to enhance the operational efficiency and the supply chain (Abdulrahman et al., 2023); in nuclear sector, to predict thermal-hydraulic parameters of nuclear reactors using deep learning algorithms (Lu et al., 2021); in environmental science, to support and monitor environmental parameters, to promote the use of renewable energy development (Liu et al., 2024) and sustainable development (Di Vaio et al., 2020, Ebolor et al., 2022, Jiang et al., 2021); and within business, to automate and refine decision-making processes (Goto, 2023).

The interplay between AI and blockchain reflects the concern for enhanced security and transparency in transactions and data management, in different industries (Abdulrahman et al., 2023, Akter et al., 2022, Chen et al., 2022).

AI applications in R&D focus on enhancing research capabilities through data analytics, automation, and predictive modelling (Zhai et al., 2023, Ahmed et al., 2023, Andronie et al., 2023, Balcioglu et al., 2023, Barro and Davenport, 2019, Nezhad et al., 2024). This includes areas like healthcare, materials science, and engineering.

AI drives innovation by enabling new product developments, improving service delivery, and creating novel business models (Botega and Silva, 2020, Broekhuizen et al., 2023, Chen et al., 2021, Kandampully et al., 2023, Payne et al., 2021, Wexler and Oberlander, 2021, Cioffi et al., 2020, Lebovitz et al., 2022). This spans various industries including digital entrepreneurship, financial services, and smart manufacturing.

AI contributes to innovation management by enhancing decision-making processes, optimizing operations, and fostering sustainable and ethical business practices (Acquarone et al., 2023, Agramelal et al., 2023, Schmid et al., 2022, Malik et al., 2021, Dahlke et al., 2024).

Scholarly contributions include insights into AI's potential for driving innovation, addressing challenges like data management and regulatory compliance (Rojek et al., 2023, Abbate et al., 2023, Ahmed et al., 2022).

The methodologies range from quantitative analyses, employing statistical or machine learning techniques to assess AI's impact on performance metrics (Abou-Foul et al., 2023, Baabdullah et al., 2021, Badini et al., 2023), to qualitative studies that explore the implementation and adoption of AI technologies within organizations (Allal-Chérif et al., 2023, Åström et al., 2022). Simulation models and algorithm development are also used to address specific industry challenges, e.g., optimizing supply chains or energy consumption (Borsato and Lorentz, 2023, Jacobsen et al., 2023).

Future research directions point at the need to improve AI's integration into industry practices (Amjad et al., 2020, Baabdullah

et al., 2021, Castro et al., 2021) and to enhance its ethical and societal impacts, including its impact on employment and privacy (Galetsi et al., 2023, Campbell et al., 2022, Chouk and Mani, 2022, Daza and Ilozumba, 2022). There is a strong emphasis on developing more robust, explainable AI models that stakeholders can trust and understand. Other directions point towards the integration of AI with other emerging technologies, like the Internet of Things (IoT), to explore new innovation paths (Buhmann and Fieseler, 2023, Wang et al., 2023, Robertson et al., 2022, Wang and Lee, 2023, Tsolakis et al., 2022, Buster et al., 2021).

In some industries, e.g., pharma, AI is seen as a way to further enhance personalized medicine by integrating genomic, proteomic, and other omics data to tailor treatments to individual patients, or explore the combination of AI and nanotechnology for more efficient drug delivery systems, focusing on targeted therapies and minimal side effects (Abbate et al., 2023, Lou and Wu, 2021). It may be also used for advance materials discovery to unveal new materials with unique properties for applications in energy storage, electronics, and other high-tech industries (Schmid et al., 2022, Lu et al., 2021) or for social innovation, addressing challenges in healthcare, education, and social services (Kumar et al., 2023).

3.3.2 Best Practices and Barriers when Using AI

The role of AI in innovation, R&D, and new product or technology development has become increasingly important, focusing on enhancing creativity, reducing time-to-market, and improving efficiency (Ameen et al., 2022, Abrardi et al., 2022, Agramelal et al., 2023, Oduro et al., 2023).

AI is a recent technology, and both practitioners and scholars are studying it to identify the best way to use it. Several scholars argue that combining AI with traditional research methods may increase the accuracy and efficiency, and be used to support complex decision-making processes and strategic planning in R&D (Abbate et al., 2023, Acquarone et al., 2023, Schmid et al., 2022), or to encourage an organizational culture that embraces innovation (Chatterjee et al., 2022). AI may be also used to interact with consumers, learning and adapting to their changing needs and improving their experience (Pentina et al., 2023, Kumar et al., 2023), to attract and retain talent skilled in AI and innovation management (Malik et al., 2021), yet they should be interpretable and transparent to gain trust and facilitate adoption (Liu et al., 2024, Schmid et al., 2022).

However, there are difficulties in integrating AI solutions with legacy systems (Lee et al., 2022), regulatory challenges and difficulties in ensuring compliance and data privacy (Di Vaio et al., 2020, Whittaker et al., 2023), organizational resistance to adopting new AI technologies and processes (Grashof and Kopka, 2023), while maintaining high-quality, comprehensive datasets for AI training and keeping pace with the rapid advancements in AI technology may be challenging (Lebovitz et al., 2022, Dahlke et al., 2024).

3.3.3 Implications for Innovation Management Practitioners

AI provides data-driven insights and predictive analytics that can significantly enhance decision-making processes. It can streamline operations through automation of routine tasks, thus allowing practitioners to focus on more strategic activities, including process optimization, supply chain management, and customer relationship management. Practitioners may also leverage AI tools to analyze market trends, forecast product success, and optimize resource allocation (Acquarone et al., 2023, Abdulrahman et al., 2023).

By integrating AI into the innovation process, organizations can accelerate the development and commercialization of new products and services. AI-driven R&D can lead to faster discovery of insights and reduction in time-to-market, allowing to personalize customer interactions and improve service delivery. This may lead to higher customer satisfaction and loyalty (Goto, 2023, Pentina et al., 2023).

However, independently of the benefits, special care should be taken to ensure that AI models are free from biases that could affect outcomes, ensure that the AI-driven processes are accurate, transparent and accountable, and that data privacy is ensured and safe from human and cyber threats (Goto, 2023, Acquarone et al., 2023, Kumar et al., 2023, Abdulrahman et al., 2023). Also, collaboration should be promoted in the R&D and innovation departments, along the supply chain and in local or regional innovation ecosystems, as well as alignment with organizational strategic goals (Broekhuizen et al., 2023, Faraj and Leonardi, 2022, Gebhardt et al., 2022, Kolary and Mohanraj, 2023).

5. Conclusions

We set out to systematically analyze the application and impact of AI in R&D and innovation management, addressing questions about AI's usage, benefits, challenges, and best practices. Utilizing a comprehensive systematic literature review methodology, we examined 858 scholarly articles from the ISI Web of Science, filtered by business, economics, and engineering fields. The findings offer several contributions and practical implications for academia and industry.

The key objective of our research was to fill the knowledge gap regarding the role of AI in R&D and innovation management. The results indicate a growing concentration of AI-related publications in top journals, with IEEE Access leading the way, followed by Applied Sciences - Basel and the Journal of Business Research. AI has diverse applications, e.g. in healthcare,

aerospace, or sustainable development. There is an increasing scholarly interest in AI's potential to drive innovation and operational efficiency.

Key contributions of our study include a detailed mapping of AI's role in enhancing research capabilities through data analytics, automation, and predictive modelling. E.g., in healthcare, AI improves diagnostic accuracy and patient outcomes, while in aerospace, it optimizes design and maintenance processes. We also identify the integration of AI with blockchain technology to enhance transparency and security in various industries, further illustrating AI's transformative impact.

From a theoretical perspective, our study enriches the existing body of knowledge by providing a comprehensive overview of AI's applications and implications in R&D and innovation management. It highlights the methodologies employed in AI research, ranging from quantitative analyses using statistical and machine learning techniques to qualitative studies exploring AI adoption within organizations. Additionally, the study outlines future research directions, emphasizing the need for developing robust, explainable AI models that stakeholders can trust and understand.

There are, as well, valuable insights for innovation management practitioners. AI can significantly enhance decision-making processes, streamline operations, and accelerate the development and commercialization of new products and services. However, we also point out several challenges that need to be addressed to fully realize AI's potential. These include e.g., data privacy concerns, the integration of AI solutions with legacy systems, regulatory and compliance issues, and the need to manage organizational resistance to AI adoption.

Future research should focus on addressing these challenges by developing more robust and transparent AI models and exploring the integration of AI with other emerging technologies such as the Internet of Things (IoT). This integration could open new pathways for innovation, particularly in areas like smart manufacturing, healthcare, and environmental sustainability.

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Challenges and Opportunities of Artificial Intelligence Regarding Rapid Technological Change

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Abstract

Artificial Intelligence (AI) attempts to replicate human traits/capabilities through the development of computer systems, capable of performing tasks/functions that would otherwise require human intervention. There has been a tremendous increase in the use of this tool and no sign that this will change, in the near future. The purpose of this study is to analyse the challenges and opportunities of AI regarding rapid technological change. Therefore, a survey was created (143 participants) based on this theme, focusing on different perspectives by gender and nationality. Chi-square tests were performed, and through the results we concluded that there is an apparent association between gender and being informed about AI. Further support exists for the null hypothesis that there is no association between gender and being against AI. Additionally, we concluded that Portuguese, Spanish, and Italian individuals, in general, align with their perception of technological change and development (the Portuguese perhaps being humbler). Finally, more in-depth research is warranted in the AI era on whether the female gender will perhaps continue to be victim of a lack of self-confidence in the work environment and possibly feeling the "impostor syndrome".

Keywords: Artificial Intelligence, dynamic capability theory, ethical boundaries, chi-square test.

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1. Introduction

This study explores the challenges and opportunities presented by Artificial Intelligence (AI) amidst the rapid technological development of today. AI is currently becoming a significant part of people's lives, work, and various sectors in which numerous companies are inserted. Industries, organisations and individuals are increasingly more dependent on AI, as it executes certain tasks progressively quicker and more efficiently than humans. Therefore, it is crucial, as technology advances, to understand the challenges and opportunities of AI, to better comprehend and prepare for a more AI dependent future.

For example, students alert to the [excessive] usage of AI in course assignments by colleagues and encourage teachers to control for this usage. A solution is the implementation of ZeroGPT to check just how much AI was used in the writing of an assignment (a percentage is given by the application). All assignments should provide an audit trail (a best practice) showing how AI was used in a project.

The study is divided into six parts. A literature review where topics such as Dynamic Capability Theory, AI in an organisational environment, and AI as a tool for research are explored. The following section contains the methodology. It articulates how both the study, and a survey were made by the authors, in terms of reasoning and rationale. The succeeding section consists of the results, where the data derived from the conducted survey is presented and rigorously analysed through Cronbach's Alpha Coefficient and Chi-square tests. The subsequent section comprises the discussion, which contains the following subtopics: Are males more aware and informed of AI than females? Or are females more perfectionist concerning what is considered being aware and informed? Is there a cultural alignment between Portuguese, Spanish, and Italian individuals on their perception of technological change and development? Technology as a modern lifestyle facilitator; Artificial Intelligence's future implications in society, the workplace, data security/collection, and politics.

The study, which discusses various topics, has the potential to enrich the reader's understanding of the theme at hand. Given the amount of information and data in the article, it is likely to provide significant insight into knowledge about AI, and the challenges and opportunities of this technology, in both the present and the future.

2. Literature review

2.1. Dynamic capability theory

While a variety of definitions of the term dynamic capability have been suggested, this study will use the definition first suggested by Teece et al. (1997). The author saw it as a framework to analyse the sources and methods of wealth creation and capture by private enterprise firms operating in environments of rapid technological change. According to Teece, dynamic capability theory is used in an attempt to provide a structure on how or why decision makers decide when there is a deep uncertainty to wager, or speculate, about the future. As aforementioned, it is the ability to manage an organisation and the environment, in addition to structuring the organisation, in the midst of ongoing change. This theory can be distinguished as operational skills that are currently involved in operating procedures in an organisation (Teece et al., 1997). According to Helfat et al. (2007), however, dynamic capability mentions "the capacity of an organisation to purposefully create, extend, or modify its resource base".

Three dynamic capabilities are necessary in order to meet new challenges. Organisations and their employees need the capability to learn quickly and to build strategic assets. New strategic assets such as capability, technology and customer feedback have to be integrated within the company. Existing strategic assets have to be transformed or reconfigured (Teece et al., 2007). For analytical purposes, Teece (2007) indicated that a dynamic capability can be enacted as the aptitude to "(1) sense and shape opportunities and threats, (2) seize opportunities, and (3) sustain competitiveness by improving, combining, protecting, and, when necessary, reconfiguring the business enterprise's resources" (Vu, 2020). To further explain the three capabilities: sensing - means identifying and assessing opportunities outside your company; seizing - refers to mobilising your resources to capture value from those opportunities; and transforming - by constantly renewing those assets (Kleiner, 2013). As previously mentioned, it can also be seen as spotting the capability of an organisation to explore and scan opportunities throughout markets and technologies (Teece et al., 2007). The definitions reflect a means to transform investment in research and development studies into new opportunities.

For a better understanding, Kleiner (2013) provides the strategic example of Nokia and compares it to Apple. Nokia missed the smartphone revolution because the company was not well equipped for sensing, especially compared to Apple, which was embedded in the milieu that was breeding the next generation of smartphones. Steve Jobs sensed what customers wanted, and he also knew what technologists were doing. Step by step, he built the capabilities that Apple needed. For example, to make the iPod work, Apple developed capabilities in digital rights management and handheld device design.

2.2. Rapid technological change in modern society

Rapid technological change involves, particularly, Artificial Intelligence, the Internet, machine learning, robotics, nanotechnology, biotechnology, renewable technology and 3D printing (UNCTAD, 2019). At present, some organisations are finding themselves endangered by this rapid technological development, while other corporations are compelled to embrace the changes of new technologies and business models to join the technological revolution (Hamdani et al., 2018). This is evidence that big tech companies are growing vigorously year after year, jeopardising many other industries in the market.

As pointed out previously, this phenomenon of technological development has been witnessed for the last few decades, derived by the possibility to collect and process a vast amount of data at exceptional speed, incorporating the use of artificial intelligence (AI) for better and smarter decision making (Hamdani et al., 2018). This is especially visible since data knowledge has come to be public domain knowledge. This substantial change is incorporated by big corporations for the reason exemplified in a report by Hamdani et al. (2018).

Modern society as we know it today, is full of big and constant technological changes. Companies, in order to keep up with these changes, have had to adapt and evolve to ensure ongoing growth and success. As a result, due to these rapid changes, certain technologies have assisted organisations to better understand their own consumers, and in some cases, to stand out from their competition (Cascio & Montealegre, 2016).

Decision making is one of the most important aspects of a company, and with the help of AI, the decision-making process has completely changed in many ways (Stone et al., 2020). Ethical considerations of researchers about this topic can vary, but it is difficult to deny the implications of AI when it comes to data analysis (Nassar & Kamal, 2021). Not only is analysing data an important activity to optimise processes and increase the overall efficiency of a business but analysing the different types of data in analytic data platforms is a crucial and essential way of gaining invaluable insights into consumer behaviour (Khade, 2016). This transformation can guarantee a more informed and better decision-making process and allow companies to adapt to the various markets and satisfy the different needs of their existing and future customers.

2.3 Artificial intelligence (AI)

2.3.1 Impact and applications in organisations

Organisations have been increasing their diversity in conversational agents, namely chatbots, as an innovative approach of interaction with customers. The implementation of AI as a connection between companies and consumers is present in websites, social media, and instant messaging apps (Jiang et al., 2022). A chatbot can be defined as a combination of "a program" (Kshetri, 2021) with "artificial intelligence" (Kshetri, 2021), with the purpose of helping automate customer service through interactions with humans. AI technology can be given the means to carry out interactions resorting to natural language, a conversational tone, and social cues (especially if it possesses a voice system as one of its features). The accurate replication of human traits can be achieved by chatbots through machine learning techniques and innovative algorithms (Nguyen et al., 2023).

AI has an extremely wide range of applications, having the power to affect most existing industries, possibly even reshaping several. This spectrum includes how companies' employees are affected by the technology, since an increased use and development of AI will increase the demand for highly skilled workers (Xu et al., 2023). According to Lakhani (2023), "AI won't replace humans - but humans with AI will replace humans without AI". A positive correlation between AI-savvy employees and their income growth can also be verified as AI is progressively implemented in functions and projects (Xu et al., 2023). Furthermore, despite the predictions that advances in this technology will replace many jobs, the growth in labour demand on certain organisational functions, such as accounting, finance, social information, and healthcare consultation is increasing. This phenomenon arises from the stimulating effect of AI on creativity, derived from the relationship between human and machine (Weiguo et al., 2020).

2.3.2 An innovative tool for research purposes

The usage of AI chatbots in research has increased in recent years. They can collaborate, communicate, and automate tasks, such as data tracking, mining and analysis. By processing information in a fast and accurate manner, AI provides researchers in multiple fields with the means to increase informed decision-making and facilitate pattern recognition in data sets. For instance, AI can identify a multitude of treatments and correlations in healthcare, through patient data analysis. Furthermore, by making use of this technology, economists are provided with forecasting models and swifter financial data examination (Cain et al., 2023). Moreover, AI is also integrated in disaster damage assessment, as a means of accelerating "aid responses and reconstruction efforts" (Hanson et al., 2023).

AI deep learning models' applications in academic research have also broadened. Deep learning models can be defined as "language models created to produce responses to textual stimuli that are indistinguishable from those produced by a human". By implementing AI within qualitative research, researchers are able to obtain aid in theme and content analyses, literature review

information filtering, and "conceptualization purposes". Originally costly in both time and resources, the previously mentioned research work can now be efficiently carried out with the help of this technology. AI is able to summarise large amounts of data and generate research questions based on processed information originating from both text and images (Christou, 2023). In addition to qualitative research, quantitative research can also be enhanced by resorting to statistical and simulation-oriented AI-based tools. They are capable of not only writing necessary code for statistical analysis using specific software, but also of conducting simulations and tests on delicate and complicated procedures (Esplugas, 2023).

2.3.3. The need for AI regulations and control

AI systems are evolving so fast that a call for a 6-month long pause appeared in order "to give AI companies and regulators time to formulate safeguards to protect society from potential risks of the technology". While AI is inarguably a tremendously useful tool, it poses many unregulated risks due to its rapid advancement that caught many off-guard. An open letter addressing this issue lists many concerns, among which are privacy issues and data protection, the spread of misinformation, and especially the development of "non-human minds that might eventually outnumber, outsmart, obsolete, and replace us", thus risking losing control of our civilization (Clarke, 2023).

An AI (or a chatbot) must first be trained on data. If this data is not diverse enough, or is rather biased, the results or decisions made by that AI will reflect the biases in the data, and perhaps even the biases of their creators. For instance, a chatbot assisting in the hiring process may be biased against certain groups of people or provide misinformation to a student in need of content. Furthermore, we do not understand how exactly these systems make decisions. Such a lack of transparency makes it difficult for researchers, for example, to trust the results of work done or assisted by AI and reproduce its findings. Lack of process means that they cannot make decisions or judge a situation in the same way a human can – they cannot make decisions independently. As such, AI cannot be held accountable, yet the increasing reliance on chatbots in organisations, academia, and by the general population alike raises concerns about the responsibility for the outcomes of these decisions (Cain et al., 2023). Some hypothesise that we may be re-inventing slavery that allows a clear conscience as we do not (yet) officially consider AI an autonomous being (Letheren et al., 2020). We wonder if an AI system could be a responsible actor of their actions instead of the human using the AI (Chia et al., 2023). Currently, AI is extremely unregulated and has potential for misuse by governments, corporations, and malicious individuals in order to control, manipulate, and restrict access to information (Cain et al., 2023). Even if harm is not intentional, organisations must keep in mind the unintended consequences of poorly programmed or designed AI (Letheren et al., 2020). Privacy, and especially breach of privacy and data, is also an emerging concern. Critics worry that the data used to train AI models might enable the technology to reproduce identifiable information or be tricked into revealing or collecting such information (Clarke, 2023). Moreover, hackers can take advantage of the power of AI to develop more advanced cyberattacks, hence getting around security measures, to exploit weaknesses in systems (Marr, 2023).

2.3.4. Artificial intelligence advertising and education: opportunities and threats

AI assistance has a vast potential in advertising. Artificial Intelligence is capable of analysing, interpreting, and creating vast amounts of data. While that introduces many potential promises, it also plagues us with potential perils. Personalised advertisements, tailored to each customer by collecting and processing their data, allow for more variation than ever before. However, such a number of advertising campaigns would be difficult to monitor and track. Major brands typically hold relatively homogenous associations among the wider public, but that associated brand meaning could now splinter. Consistency would be threatened by dozens or even thousands of different advertisement versions that come with personalisation (Campbell et al., 2022).

In the face of increasingly competent automation, many jobs would be (and are already) in danger of becoming obsolete (Letheren et al., 2020). In the US, AI contributed to nearly 4,000 job losses in May 2023, according to data from Challenger, Gray & Christmas. This can be explained by the intensification of interest in performing advanced organizational tasks and lightening workloads (Napolitano, 2023). Human workers may be displaced in fields like data analysis and research assistance (Cain et al., 2023). Because of the increased variety of advertisements, being creative may become more challenging. Creative teams might see a shift toward engineering and technical employees, therefore creative roles may become industrialised. Furthermore, the brands may turn toward personal decoders and virtual brand ambassadors instead of macro-celebrities, even going as far as using macro-celebrities' "deepfakes" instead (Campbell et al., 2022). Deepfakes can already cause significant damage, and the potential for harm could increase as technology evolves. For example, fake footage of a company CEO sharing unsavoury political ideologies via social media could seriously damage the company's reputation (Letheren et al., 2020). Regarding costs, while these could be greatly reduced by shrinking the advertising teams, they would soar in sight of new expenses of digital security and monitoring fake content from potential brand attacks or content thieves (which could be more easily engineered with the help of AI), and the need for increased server power in order to track more data for personalised advertising (Campbell et al., 2022).

Consumers experiencing disadvantages stemming from their finances, age, education, gender identity, race etc., may be excluded from fully taking part in an AI future – either because human agents would be unavailable to them, or because they would not be able to afford or use the technology to access AI (Letheren et al., 2020). Furthermore, AI has potential for errors or misinterpretations because they need more context or human help, which could lead to customer dissatisfaction, sense of alienation and disconnection. AI and chatbots are not human and cannot offer the same empathy and personal connection that human interaction can provide. Chatbots can be perceived as impersonal, leading to a lack of customer trust and loyalty (Cain et al., 2023).

Chatbots have a potential to be used in education as a supplement to traditional teaching methods. Unfortunately, they cannot provide the same level of support and guidance as human teachers. Additionally, they could malfunction or provide incorrect information, which could cause confusion and frustration for students. Moreover, it can negatively impact academic learning outcomes and decision-making. AI is often misused in order to complete assignments or take online exams in place of students. Another example of academic misconduct is plagiarism, such as copying text from online sources without proper attribution and using AI-powered writing assistants to rewrite text in an attempt to pass it off as a student's own work. Students no longer need to create original content, which can negatively affect their vocabulary development, among other educational aspects. Unnatural language prompts can negatively impact students' language evolution (Cain et al., 2023).

A set of clear ethical guidelines and standards for AI usage is desperately needed. Researchers, marketers, and others must receive education and/or training on ethical use of Artificial Intelligence and chatbots. Systems that detect and prevent unethical AI usage should be developed (Cain et al. 2023). We must keep in mind that actions have consequences in the world, and that AI reflects those actions (Letheren et al., 2020).

3. Methodology

We began our study by defining its theme. After a thorough literature review based on the methodology proposed by Remenyi (2013), we decided to explore the challenges and opportunities of Artificial Intelligence (AI), in the dynamic capability theory frame (in the current era of rapid technological change). Furthermore, how do people, as individuals and consumers, and organisations, as suppliers of products/services, perceive AI as a tool and a provider of value, or as a threat?

We conducted our research (from November 1, 2023, to November 15, 2023) through the Scopus and EBSCO databases, in order to find relevant documents for our study. The following search words and abbreviations were used in connection with the Boolean operators “AND”; “OR”: “Dynamic capability theory”, “Rapid technological change”, “Artificial Intelligence”, “AI”, “customers”, “consumers”, “dangers”, “threats”, “opportunities”, “research”. After sorting the documents, articles, books and conferences deemed as important for our work, we selected a total of 12 academic articles.

For further exploration of the subject, quantitative research (Saunders et al., 2019) was deemed necessary. Therefore, we created a survey, placed online in late 2023, through which 143 answers were collected. This quantitative data will support or refute the following hypotheses.

H0 (null hypothesis): There is no association between gender and being informed about AI.
H1 (alternate hypothesis): There is an association between gender and being informed about AI.
H2 (null hypothesis): There is no association between gender and being against AI.
H3 (alternate hypothesis): There is an association between gender and being against AI.

In addition, we wish to answer: Do Portuguese, Spanish, and Italian individuals align with their perception of technological change and development?

To reach a wider audience, we shared it through social media (a convenience sample - which is very popular in exploratory studies in business - though they warrant future more in-depth research (Bryman and Bell, 2015). Our survey consisted of twenty-two questions that firstly characterised respondents by demographic variables. Subsequently, they were inquired about their perspective and awareness of Artificial Intelligence, and how it affected them. In addition, they were asked how many electronic devices they use daily, and their level of dependence on them. Furthermore, we inquired the respondents on their stance regarding rapid and frequent technological changes. Lastly, they were asked about their perception on the main drivers behind technological development, in both the recent past and future, from an organisational standpoint. This survey was available for all types of users, in order to obtain a broader perspective.

In the next section we will analyse the answers to the survey, and a chi-square test (test of independence or of association) will also be performed (inferential statistics, where we infer knowledge from a sample - to see if statistically significant relationships exist) (Saunders & Cooper, 1993).

4. Results

4.1. Characterisation of the Sample

Regarding gender distribution, 49.7% of our survey participants identify as female, while 48.2% identify as male, and 2.1% as other. Their age range spans from 18 to 27 or more years old, with a notable concentration in the Generation Z demographic, primarily falling between 18 and 24 years old (Figure 1).

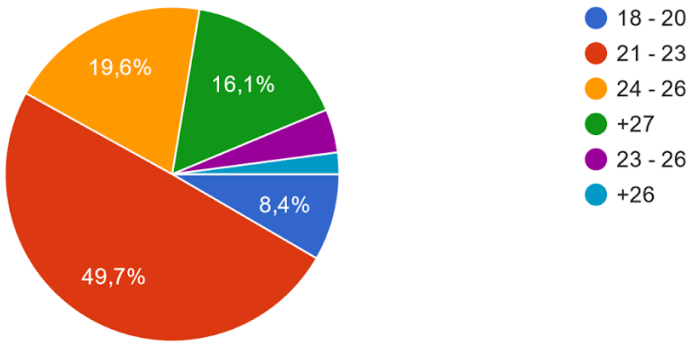

Figure 1 – Respondents by age

Source: Created by the authors

In addition, 30.1% of our respondents are Italian, and 25.9% are Portuguese, with the two nationalities combined accounting for most participants. Nonetheless, there are also respondents from Spain, Timor, Germany, France, Slovenia, Poland, Croatia, Turkey, Brazil, Indonesia, Austria, Hungary, Angola, Canada, the U.S.A, Romania, Panama, Mexico, the Netherlands, Belgium, Sweden and Lithuania. Concerning level of education, our sample ranges from High School to PhD. However, most of our respondents hold bachelor's degrees, as shown in Figure 2.

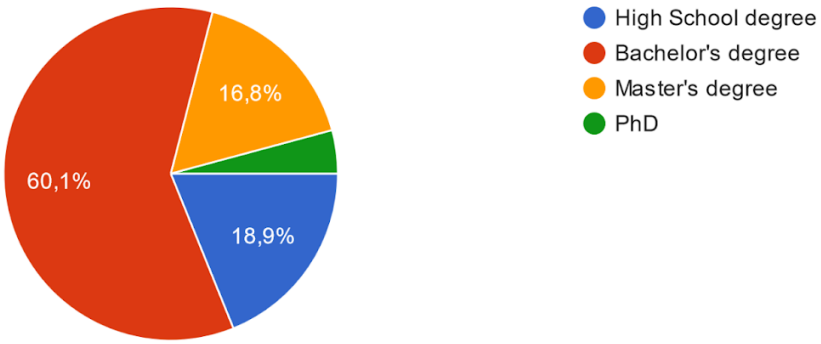

Figure 2 – Respondents by level of education

Source: Created by the authors

Furthermore, the large majority of respondents (84.6%) is currently enrolled in a university (Figure 3).

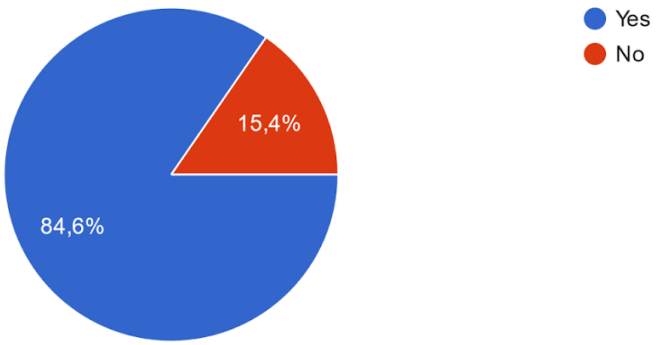

Figure 3 – Respondents by current university enrolment status

Source: Created by the authors

Moreover, 65% of our sample consists of individuals who are currently students as a sole occupation. The remaining 35% stated being a working student, an employee, a manager, a lecturer, a freelancer, a teacher, an administrator, unemployed, or retired, as displayed in Figure 4.

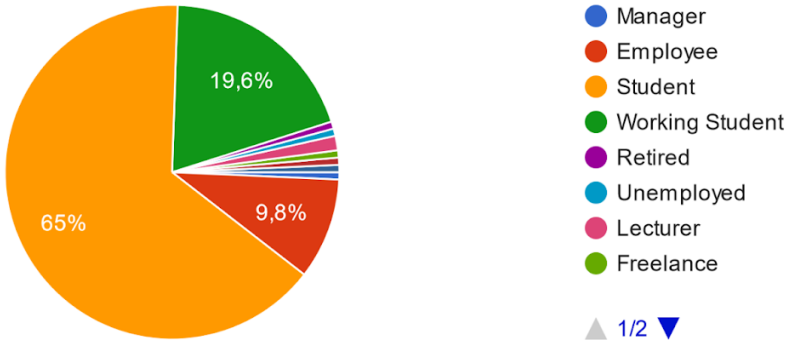

Figure 4 – Respondents by current occupation

Source: Created by the authors

Lastly, concerning both the respondents' current and future work fields, most responses pointed towards engineering (26.6%) and management (24.5%). Education and economics follow, comprising 10.5% and 8.4% of the responses, respectively. Furthermore, the remaining answers are very diverse, as shown in Figure 5.

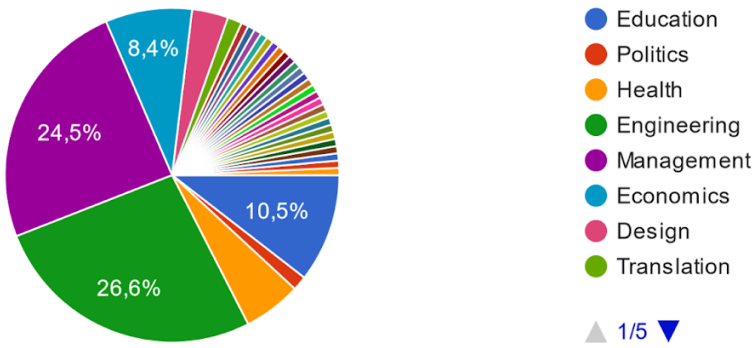

Figure 5 – Respondents by current and future work field

Source: Created by the authors

4.2. Cronbach's Alpha

An internal consistency analysis using Cronbach's Alpha Coefficient was conducted. This method measures the average correlation between questions and has, as an expected result, a value above 0.7 and below 0.9 (Da Hora et al., 2010).

The obtained alpha value considering all the Likert scale questions of the survey (7) was: (0.374). Furthermore, after removing the items with the lowest correlation value, the maximum alpha value achieved was (0.659), as shown in Table 1.

Table 1 – Cronbach's Alpha results

Consistency Statistics	
Cronbach's Alpha	**Number of Items**
0.374	7
0.659	3

Source: Created by the authors

The applicability of this method contemplates several assumptions to be considered valid, e.g. *"the survey must be applied to a significant and heterogeneous sample: When designing a questionnaire for experts, reliability cannot be internally gauged, because it is implied that experts tend to rather have the same opinion on the subject under discussion, decreasing the total variability of the survey and thus decreasing the alpha"* (Da Hora et al., 2010, p. 6).

The sample can be characterised by a predominance of Southern Europeans, who share many cultural aspects and values. In addition, most of the participants are a part of the same age group, Generation Z, which had an early exposure to technological devices. Thus, a very large percentage of our respondents is on a similar wavelength regarding the theme, decreasing the variability of the answers obtained, and consequently the Cronbach Alpha Coefficient.

4.3. Chi-Square test analyses

Only three survey respondents identified their gender as "other". Therefore, it was deemed necessary to exclude these participants when performing the chi-square tests (143-3=140), so as to maintain the data's statistical relevance. The prerequisites for the chi-square test were met albeit for a 2x2 contingency table the continuity correction had to be used. Table 2 summarizes the chi-square test results ("a negative value of Phi indicates that the variables are inversely related, or when one variable increases, the other decreases").

Table 2 – Chi-square results

Problem / Chi-square tests	**Continuity correction**	**Phi (2x2 table)**
Gender and being aware and informed about Artificial Intelligence and its applications.	0.006	-0.249
Gender and being against the use of Artificial Intelligence or similar tools.	0.480	N/A

Source: Created by the authors

The first chi-square test shows that males are apparently more aware and informed about Artificial Intelligence and its applications as compared to females. We concluded that there is an apparent association between an individual's gender and their awareness and knowledge regarding AI (see Tables 3, 4 and 5). Continuity correction p-value 0,006 < 0,05. This statistically significant association between the variables provides support for hypothesis 1 (H1).

*Table 3 – Cross-tabulation – What is your gender? * 3) I am very aware and informed about artificial intelligence and its applications*

			3) I am very aware and informed about artificial intelligence and its applications		
			Agree	Disagree	Total
What is your gender?	Female	Count	36	33	69
		Expected count	44.4	24.6	69
	Male	Count	54	17	71
		Expected count	45.6	25.4	71
Total		Count	90	50	140
		Expected count	90	50	140

Source: Created by the authors

Table 4 - Chi-square test - What is your gender? * 3) I am very aware and informed about artificial intelligence and its applications

	Value	**Degrees of freedom (df)**	**Asymptotic significance (Bilateral)**
Pearson Chi-square	8.693[a]	1	0.003
Continuity Correction[b]	7.684	1	0.006
Nº valid cases	140		

a. 0 cells (0%) expect a count less than 5. The minimum expected count is 24.64.

b. Computed only for a 2x2 table.

Source: Created by the authors

Table 5 - Symmetric measures - What is your gender? * 3) I am very aware and informed about Artificial Intelligence and its applications

	Value	Approximate significance
Phi (2x2 table)	-0.249	0.003
Nº of valid cases	140	

Source: Created by the authors

However, the second chi-square test shows that gender is independent of being for or against the use of Artificial Intelligence or similar tools. Continuity correction p-value 0,480 > 0,05. Therefore, there is apparently no statistically significant association between the variables (see Tables 6 and 7). Most of the survey respondents (73.6% approximately, excluding the three respondents who identified as "other" gender-wise) supports the usage of AI technology. This demonstrates that regardless of being male or female, most respondents support AI usage, providing support for hypothesis 2 (H2).

Table 6 – Cross-tabulation - What is your gender? * 1) I am against the use of Artificial Intelligence or similar tools

			1) I am against the use of artificial intelligence or similar tools		
			Agree	Disagree	Total
What is your gender?	Female	Count	17	52	69
		Expected count	14.8	54.2	69
	Male	Count	13	58	71
		Expected count	15.2	55.8	71
Total		Count	30	110	140
		Expected count	30	110	140

Source: Created by the authors

Table 7 – Chi-square test - What is your gender? * 1) I am against the use of artificial intelligence or similar tools

	Value	Degrees of freedom (df)	Asymptotic significance (Bilateral)
Pearson Chi-square	0.832[a]	1	0.362
Continuity Correction[b]	0.499	1	0.480
Nº valid cases	140		

a. 0 cells (0%) expect a count less than 5. The minimum expected count is 14.79.

b. Computed only for a 2x2 table.

Source: Created by the authors

4.4. Analysis of the survey results regarding the alignment in respect of technological change and development

In addition to the previous hypotheses, we intend to answer the question of whether or not Portuguese, Spanish, and Italian individuals align regarding their perception of technological change and development. Thus, we will analyse the survey questions and respective results that allow for a response to the additional question. This includes Questions "Technology - 1)", "Technology - 2)" and "Technology - 3)". Furthermore, the questions addressing both the sample's nationality and age range, previously shown (see 4.1 Characterisation of the sample), will be used as evidence in the statistics.

Question "Technology - 1)" inquires respondents on whether they are very informed and aware of the rapid technology change trend (see Figure 6). Approximately 83.7% of the Italians, 81.1% of the Portuguese, and 87.5% of the Spanish responded in agreement.

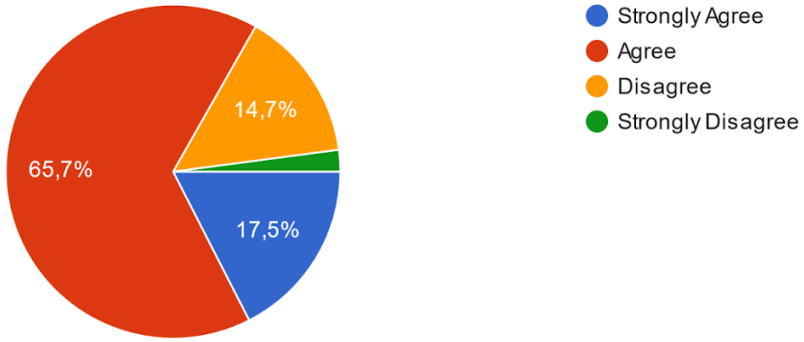

Figure 6 – Respondents on rapid technology change trends - knowledge and awareness

Source: Created by the authors

In the following question, "Technology - 2)", the respondents were asked if they find it easy to keep up with frequent technological change (see Figure 7). Approximately 83.7% of the Italians, 64.9% of the Portuguese, and 81.3% of the Spanish answered affirmatively.

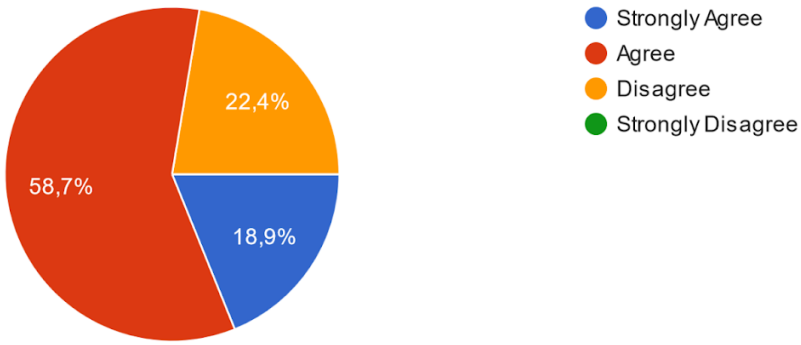

Figure 7 – Respondents on ease to keep up with frequent technological change

Source: Created by the authors

Last of all, in the question "Technology - 3)", respondents were inquired on whether or not technology development has made their lives easier (see Figure 8). Approximately 90.7% of the Italians, 97.3% of the Portuguese and 100% of the Spanish answered in agreement.

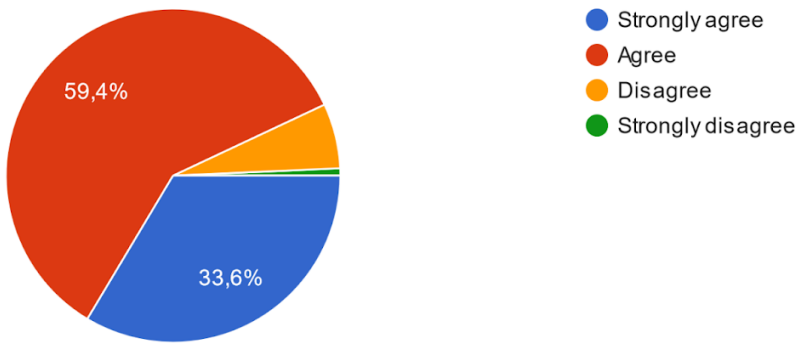

Figure 8 – Respondents on technology development facilitating their lives

Source: Created by the authors

5. Discussion

5.1 Are males more aware and informed of AI than females? Or are females more perfectionist concerning what is considered being aware and informed?

These are generalizations and perceptions that may not hold true universally, which causes different opinions. However, we perceive that most of the society has the same mindset. The perception that males are more informed or have more confidence in their knowledge may originate from societal norms/standards.

Males are told they can achieve great academic accomplishments, even if they, for instance, struggle in class. This motivating speech is also present in interpersonal relationships, when they struggle to make connections with other people. On the other hand, females are told differently, causing perhaps a lack of confidence. The attempt to meet very demanding societal standards and expectations may be the reason behind the female struggle with perfectionism.

Male individuals tend to not attribute as much importance to what others say and tend to not feel the need to be perfect - they are who they are. This is noticeable in our chi-square test. In the question "I am very aware and informed regarding Artificial Intelligence and its applications", each gender holds a very different perspective. In 71 males, 54 consider themselves to be aware of AI in general, which accounts for 76% of their answers. However, this belief is not as strong among the females. Only 52% are aware and informed of AI, meaning almost half of the female respondents do not consider themselves knowledgeable on this topic.

5.2 Cultural alignment between Portuguese, Spanish, and Italian individuals on their perception of technological change and development

Southern European nations share many cultural traits and lifestyles, which could be linked to similar geographical attributes and a common background. This can be confirmed by the survey responses, which made it evident that Portuguese, Italians, and Spaniards generally align on the questions we provided regarding technology. The only slight difference between the Portuguese opinions and the others' (Italians and Spanish ones) is visible in the different agreement rate on the second answer: "Technology - 2)". The respondents were asked if they find it easy to keep up with frequent technological change. Comparing the results, these show that approximately 83.7% of Italians, 64.9% of Portuguese, and 81.3% of Spanish answered affirmatively. That means a difference of 18.8% between Italians and Portuguese and a difference of 16.4% between Spaniards and Portuguese.

This could suggest that generally, Portuguese people adapt slower or with more effort to changes in technology, or that the Portuguese are less optimistic about their ability to adapt to new technologies. These findings presuppose keeping up with technological change throughout the ongoing development of technology in this century, confirming that they follow the growth and evolution of this ever-changing trend. This brought us back to Teece's Dynamic Capability theory, described as the ability to manage an organisation and the environment, in addition to structuring the organisation in an ongoing change (Teece et al., 1997). When the tendency is moving forward, people tend to float with the stream, to remain updated on the world surrounding them.

5.3 Technology as a modern lifestyle facilitator

It is observable in the survey's findings that a significant number of respondents agreed that technological development has greatly facilitated their day-to-day lives. In fact, approximately 93% of the individuals answered in agreement (see Figure 8). This can be explained by the constant introduction of newer technology, indicating and reflecting the public's wants and needs. As society's demands and requests increase globally, technological change initiatives from big tech companies constantly move forward. In doing so, organisations around the world change the quality of people's lives through modifications in several fields/sectors, such as communication, transportation, and healthcare. These innovative technological advances are therefore mostly perceived as substantial lifestyle facilitators.

5.4 Artificial Intelligence's future implications in society, the workplace, data security/collection, and politics

In this section some of the most quoted fears and concerns received via the survey's open-ended questions will be discussed. The reasons why the insights on the previously mentioned topics are generally aligned in a negative way could be explained by different factors, and it is important to further investigate the main reasons that shape a negative opinion towards AI, in future research. However, we perceive some of them to be: culture, the spreading of media sensationalism, and uncertainty towards the future due to rapid technological change and a lack of faith in the regulating organs.

The provided open questions were: "You agreed to the previous statement: I believe Artificial Intelligence will replace my work in the future. Can you specify why in a short sentence?" (28 answers); "Do you have any further information/comments or suggestions you would like to share?" (30 answers)

The first concern about AI that stood out was the fear of being replaced by AI machinery and software, with the most quoted jobs being in the fields of design/marketing (cited 6 times), programming (cited 4 times), translation (cited 2 times), and repetitive labour (cited twice). The main reasons, when specified, were because AI tools are faster (cited 4 times) and cheaper (cited 3 times).

The fear and unacceptance of a new, disrupting technology could be the leitmotif, since these respondents' opinion was focused on substitution in today's working activities by computers and robots. A new set of skills will probably be required by the next generation of workers, as many jobs will be out of fashion, and new ones will require collaboration between humans and AI. This calls for reconsideration, since some jobs will continue being supervised by humans, or will need to be performed by humans. Professions like lawyers, doctors, teachers and politicians require a level of ethical nuances that Artificial Intelligence could not achieve in the near future. There are also functions that will be difficult to substitute, given their completely personalised and complex nature, such as nurses, caregivers and hairdressers.

Perhaps being replaced by machines and computers in repetitive tasks could be a freedom act, in a way. As the industrial revolution freed horses, AI technology could free humans from several demanding types of work. There are multiple social implications that are involved in this scenario, which would manifest in the form of complex social and lifestyle adaptations. There is a big opportunity for AI technology to help society. However, it is likely that the global elites will benefit the most from it, and not the masses, who do not possess the resources to explore these new technologies to the fullest. Therefore, there is a considerable risk that AI implementation will augment the social differences between upper and lower classes.

6. Conclusions

There is an apparent association between an individual's gender and their level of knowledge and awareness of AI. As per our sample, males – also called the gender of "lost opportunity" by researchers in Portugal (less ambitious in academic terms, preferring to go to work sooner and being less perfectionist than their female counterparts; more content with the status quo... which favours them) – self-report higher AI knowledge and awareness than their female counterparts, which can perhaps be explained by a difference in self-confidence between genders, as well as meticulousness/perfectionism when approaching a subject. According to Pierre-Bravo (2018): "Madeleine Albright made history as America´s first female Secretary of State. But like many women, she has at times struggled to speak out confidently, especially in meetings where she's been surrounded entirely by men". Indeed, according to Albright: "It was intimidating... You listen carefully, think you are going to say something, and you think, 'No, it'll sound stupid.' And then you don't say it. And then some man says it and everybody thinks it's brilliant. And then you're mad at yourself for not saying anything." (cited in Pierre-Bravo, 2018). Albright has been credited for saying that there is no room in the job market for mediocre women (Pierre-Bravo, 2018). On the other hand, we have met many mediocre men in different roles in the work environment.

However, there is not an association between gender and one's stance regarding AI. Concerning being for/against AI, by analysing our sample's results, it is visible that most respondents, regardless of their gender, support the usage of AI or similar tools. This can be linked to how much technology facilitates modern lifestyles, in which most of our sample, from both genders, responded in agreement.

Finally, regarding the additional question, by cross-examining the data from our survey's "Questionnaire - Technology" section

with the three biggest sample groups nationality-wise, it was concluded that the perceptions of Portuguese, Italian, and Spanish respondents on technological change and development strongly align. The explanation for this may reside in the large number of similar cultural aspects and traits shared by these Southern European respondents, which could lead to a similar perspective on the theme. Albeit Portuguese respondents still self-reported greater difficulty (16.4% less able than the Spanish and 18.8% less able than the Italians) in keeping up with frequent technological change. This may be indicative of the Portuguese being humbler (please see Hofstede, 2001, for a discussion on masculinity versus femininity), more realistic, and not necessarily being less able or competent.

Limitations of this exploratory study include its rather small sample (143 answers) and its convenience nature. In future, more in-depth studies are warranted, to ascertain whether our study indeed points in the right direction. There is perhaps a link between what we found, regarding the lack of confidence by women in their own knowledge of AI, and impostor syndrome: "the persistent inability to believe that one's success is deserved or has been legitimately achieved as a result of one's own efforts or skills." (Oxford Languages).

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Understanding Internal Marketing Orientation in Higher Education

Evidence from a Portuguese Public University

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Abstract

This paper studies the internal marketing orientation (IMO) within a Portuguese public university, applying a validated multidimensional model comprising informal information creation, formal information creation, information dissemination, and responsiveness. Using a questionnaire-based survey which was distributed to the entire population of teaching staff, non-teaching staff and researchers at a Portuguese university, and based on a sample of 67 respondents, the study combines descriptive analysis, regression modelling, and cluster analysis to identify patterns in internal communication. The findings confirm the internal consistency of IMO dimensions and show that formal information creation significantly predicts information dissemination, while both dissemination and informal information creation positively influence perceptions of responsiveness. Using cluster analysis, we identify three distinct staff profiles (Disconnected, Ambivalent, and Engaged) with different perceptions of internal marketing. The positive effects of formal communication on dissemination are only observed among the Engaged group, suggesting that alignment with the institution moderates the impact of internal marketing efforts. These results suggest that the university should move beyond one-size-fits-all communication models and adopt differentiated, group-specific strategies. By combining psychometric measurement with staff segmentation, the study provides methodological and strategic contributions to internal marketing research and practice in university settings.

Keywords: Internal marketing orientation; Higher education institutions; Organizational communication; Employee engagement; Information dissemination; Organizational responsiveness; Cluster analysis; Regression modelling.

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1. Introduction

In recent decades, internal marketing has gained growing attention in organizational research, particularly in service-oriented institutions where employee satisfaction and engagement are essential prerequisites for high-quality service delivery (Berry & Parasuraman, 1991; Lings & Greenley, 2005). Rooted in the premise that employees constitute an internal market, internal marketing orientation (IMO) proposes that organizations must generate, disseminate and respond to intelligence about employees' needs and expectations, mirroring the principles of external market orientation (Grönroos, 1990; Lings & Greenley, 2009). In higher education institutions (HEIs), this alignment has become increasingly relevant in the face of institutional growth, structural complexity, and the pressures of competitive repositioning.

Despite its acknowledged importance, empirical evidence on internal marketing in HEIs remains scarce, particularly in non-Anglophone contexts and often lacks quantitative validation. Addressing this gap, the present study examines the internal marketing orientation of a Portuguese public university, focusing on how different staff members perceive the organization's efforts in four core dimensions: Informal Information Creation, Formal Face-to-Face Information Creation, Information Dissemination, and Responsiveness (Lings & Greenley, 2005; Santos & Gonçalves, 2010). The research question guiding this study is: *To what extent do staff members perceive the internal marketing orientation of their university, and how do these perceptions vary across organizational groups and influence responsiveness?*

To answer this question, a structured questionnaire based on the IMO model was administered to all teaching, non-teaching and research staff of the university. From the 67 valid responses obtained, quantitative analysis was conducted to explore central tendencies, test relationships between IMO dimensions, and identify staff clusters based on shared perceptions of internal marketing practices.

The paper is structured as follows. Section 2 reviews the theoretical foundations of internal marketing orientation and its application in higher education. Section 3 presents the methodology, including the conceptual framework, measurement instruments, and data collection procedures. Section 4 outlines the empirical findings, while Section 5 discusses the implications of these results. The paper concludes in Section 6 with practical recommendations and directions for future research.

2. Internal Marketing Orientation (IMO)

IMO is a multidimensional construct grounded in the idea that employees are the organization's internal customers, and that jobs should be managed as internal products (Grönroos, 1990; Berry, 1981). It aligns managerial practices with the goal of fostering employee satisfaction, engagement, and alignment with strategic objectives, thereby creating conditions for improved external service quality (Kotler, 2000; Lings & Greenley, 2005). The construct evolved from early notions of internal marketing as primarily related to training and motivation (Sasser & Arbeit, 1976), toward a more comprehensive model of market-sensing and responsiveness within the internal environment (Lings & Greenley, 2009; Gounaris, 2008).

The model proposed by Lings and Greenley (2005) identifies five behavioural dimensions of IMO: informal information creation, formal face-to-face information creation, formal written information creation, information dissemination, and responsiveness. These dimensions are operationalized based on the principles of external market orientation (Kohli & Jaworski, 1990), emphasizing the need to systematically gather intelligence on employee needs, disseminate it across the organization, and implement appropriate responses.

Empirical studies have validated the positive effects of IMO on various organizational outcomes, including employee satisfaction, commitment, compliance, and customer satisfaction (Ahmed & Rafiq, 2003; Bansal et al., 2001; Piercy & Morgan, 1990). In particular, responsiveness to employees' feedback and concerns has been associated with stronger perceptions of organizational support and a greater likelihood of staff acting in line with institutional goals (Eisenberger et al., 2001; Vieira-dos Santos & Gonçalves, 2018).

In higher education, however, the application of internal marketing remains underexplored. Recent work by Vieira-dos Santos and Gonçalves (2018) demonstrates that a supportive organizational culture and internal communication mechanisms contribute positively to perceived organizational support among HEI staff. Nevertheless, most studies in this context are qualitative or descriptive, and few apply validated IMO models to analyse the perceptions of diverse university stakeholders.

The present study builds on this foundation by applying the Lings and Greenley (2005) framework to assess how teaching, research and technical-administrative staff in a Portuguese university perceive the institution's internal marketing orientation. By exploring both the mean evaluations and the interrelationships between IMO dimensions, the study seeks to contribute to the empirical grounding of internal marketing in the higher education sector.

3. Methodology

3.1. Research Design and Objectives

This study adopts a quantitative research design to assess the IMO of a Portuguese public university. Drawing on the model developed by Lings and Greenley (2005) and adapted for the Portuguese context by Santos and Gonçalves (2010), the research aims to evaluate how different groups of staff - academic, research, and administrative - perceive the university's performance in terms of internal information generation, dissemination, and responsiveness.

The main research objectives are: to measure the perceived levels of IMO dimensions across the university staff; to examine differences in perceptions across professional categories and organizational contexts; to analyse the interrelationships between IMO dimensions; and to identify staff clusters based on their evaluation of internal marketing practices, and derive implications for targeted internal communication strategies.

3.2 Conceptual Framework

The conceptual model guiding this study comprises four dimensions of internal marketing orientation (see Figure 1).

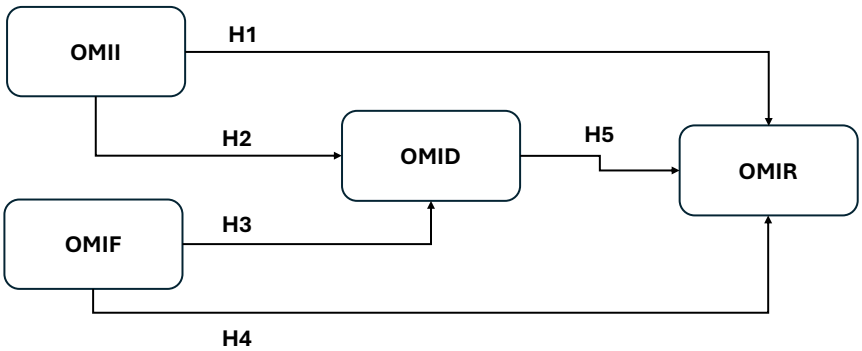

Figure 1 – Conceptual Model

The four dimensions depicted are:

- IMO - Informal information creation (OMII): the extent to which the organization gathers intelligence through informal interactions (e.g., spontaneous conversations, informal feedback);
- IMO - Formal Face-to-Face information creation (OMIF): the use of structured interactions, such as meetings or formal interviews, to collect input from staff;
- IMO - Information dissemination (OMID): the degree to which relevant information is shared across hierarchical and functional levels;
- IMO - Responsiveness (OMIR): the organization's capacity to act upon the information received and implement changes aligned with staff expectations.

While the original model includes a fifth dimension (IMO - Formal written information creation), it was excluded from the questionnaire in this study, following a pilot phase which indicated limited relevance in the institutional context under analysis.

3.3 Data Collection

Data were collected through an online questionnaire distributed between February 2 and March 10, 2025, to the entire population of staff at the university, including faculty members, researchers, and administrative personnel. The instrument used a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree) to assess agreement with a set of statements representing the four IMO dimensions.

Prior to distribution, five pilot tests were conducted to ensure clarity and face validity. Based on feedback, minor adjustments were made to the structure and wording of the items. The final version of the questionnaire included 13 items: 7 items assessing Informal and Formal information creation, and 6 items assessing Information dissemination and Responsiveness.

3.4 Sample

A total of 67 valid responses were obtained. Respondents represented various organizational units within the university, including departments, laboratories, and administrative services. The sample included individuals with different academic backgrounds and hierarchical positions, allowing for exploratory analysis of subgroup differences.

3.5 Data Analysis

Descriptive statistics were used to examine the central tendencies of each IMO dimension. Group comparisons were performed using non-parametric tests to detect statistically significant differences in perceptions based on academic qualifications, work context, and functional area.

To investigate the relationships between dimensions, multiple linear regression analyses were conducted. The first model tested whether informal and formal information creation predicted information dissemination. The second model examined the effects of both information dissemination and informal information creation on organizational responsiveness.

Finally, a cluster analysis was performed to identify staff profiles based on their responses to the IMO items. These clusters were interpreted as representing distinct perceptions of the university's internal marketing practices and subsequently used to develop targeted strategic recommendations.

4. Results

4.1 Sample Characterization

The final sample comprised 67 valid responses from staff members of a Portuguese public university. Participants were diverse in their roles, organizational affiliation, and academic background. In terms of professional function, the sample included teaching staff (faculty), non-teaching technical and administrative staff (TAG), and researchers. Most respondents were affiliated with academic departments, while others worked in research laboratories or support services.

Regarding gender distribution, the sample was predominantly female, and most participants were aged between 35 and 54 years. Academic qualifications varied, with a significant proportion holding doctoral degrees, followed by master's degrees and bachelor's or equivalent. Tenure at the university also ranged broadly, with most participants having between 10 and 29 years of service.

This heterogeneity provides a comprehensive perspective on the internal marketing orientation perceived across different staff profiles and organizational contexts within the university.

4.2 Reliability Analysis

To assess the internal consistency of the instrument used to measure internal marketing orientation, Cronbach's alpha coefficients were calculated for each of the four dimensions included in the model. The results indicate a high level of reliability across all dimensions, exceeding the conventional threshold of $\alpha = 0.70$ (Nunnally, 1978), and thereby confirming the robustness of the measurement scales.

- OMII - Informal Information Creation (7 items): $\alpha = 0.85$
- OMIF - Formal Face-to-Face Information Creation (3 items): $\alpha = 0.89$
- OMID - Information Dissemination (3 items): $\alpha = 0.94$
- OMIR - Responsiveness (3 items): $\alpha = 0.97$

4.3 Linear Regression Analysis

To examine the interrelationships between the core dimensions of internal marketing orientation, two multiple linear regression models were estimated. The first model explored the joint effects of informal and formal information creation on information dissemination. The second examined how dissemination and informal creation influence responsiveness.

A multiple regression model (see Table 1) was tested to evaluate the contribution of both informal (OMII) and formal face-to-face (OMIF) information creation to information dissemination (OMID). The model explained 54,8% of the variance in dissemination ($R^2 = 0.548$).

However, only **formal face-to-face information creation** emerges as a statistically significant predictor, with a strong positive effect. In contrast, informal information creation did not contribute significantly to the model when both predictors were included. The Durbin-Watson statistic was 1.507, indicating no concerning level of residual autocorrelation.

Table 1 – Regression Model Summary, ANOVA and Coefficients: Dependent Variable OMID

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.740[a]	.548	.534	1.04321	.548	38.768	2	64	<.001	1.507

a. Predictors: (Constant), OMIF, OMII

b. Dependent Variable: OMID

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	84.382	2	42.191	38.768	<.001[b]
	Residual	69.651	64	1.088		
	Total	154.033	66			

a. Dependent Variable: OMID

b. Predictors: (Constant), OMIF, OMII

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.186	.331		3.587	<.001
	OMII	.136	.140	.119	.975	.333
	OMIF	.625	.118	.649	5.298	<.001

a. Dependent Variable: OMID

Source: Own elaboration

A second model (see Table 2) assessed whether both information dissemination (OMID), formal information creation (OMIR) and informal information creation (OMII) predicted responsiveness (OMIR). The model accounted for 69% of the variance ($R^2 = 0.69$)

Table 2 – Regression Model Summary, ANOVA and Coefficients: Dependent Variable OMIR

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.831[a]	.690	.676	.81082	.690	46.824	3	63	<.001	1.524

a. Predictors: (Constant), OMID, OMII, OMIF

b. Dependent Variable: OMIR

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	92.350	3	30.783	46.824	<.001[b]
	Residual	41.418	63	.657		
	Total	133.768	66			

a. Dependent Variable: OMIR

b. Predictors: (Constant), OMID, OMII, OMIF

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.037	.282		.131	.896
	OMII	.376	.109	.354	3.443	.001
	OMIF	.182	.110	.203	1.658	.102
	OMID	.355	.097	.381	3.657	<.001

a. Dependent Variable: OMIR

Source: Own elaboration

Two predictors were statistically significant, **informal information creation** and **information dissemination**, with a positive effect, with a Durbin-Watson value of 1.524, indicating no concerning level of residual autocorrelation.

These results reinforce the role of **formal communication mechanisms** in enhancing internal information flow. They also highlight that both **informal information exchange and effective dissemination** play a central role in shaping employees' perceptions of organizational responsiveness.

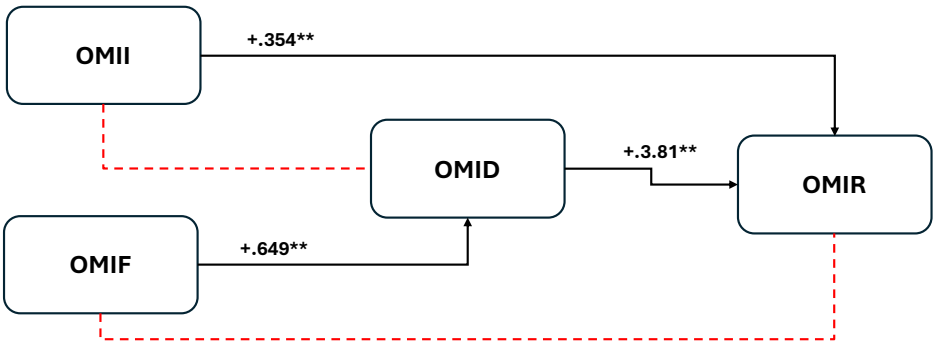

Figure 2 – Empirical Model

Source: Own elaboration

4.4 Cluster Analysis

To identify distinct perception profiles within the organization, a cluster analysis was conducted based on the four core dimensions of internal marketing orientation: informal information creation (OMII), formal face-to-face information creation (OMIF), information dissemination (OMID), and responsiveness (OMIR). A three-cluster solution was identified as the most interpretable and theoretically meaningful configuration. These groups were labelled Disconnected, Ambivalent, and Engaged, reflecting their overall evaluation profiles.

The **Disconnected** group (n = 24) displayed the lowest average scores across all dimensions, particularly in responsiveness (M = 1.58, SD = 0.56) and informal information creation (M = 1.61, SD = 0.57). Most respondents in this group were non-teaching technical and administrative staff (TAG), mainly female, aged 45 and above, and holding master's or doctoral degrees. They were predominantly affiliated with support services and had longer tenures (10 to 29 years) at the university. This cluster reflects a segment of staff who perceive limited access to internal communication and organizational responsiveness, and may feel structurally marginalized or organizationally distant, suggesting a need for more inclusive and informal engagement mechanisms.

The **Ambivalent** group (n = 19) reported moderate scores on all dimensions, especially information dissemination (M = 3.72, SD = 0.95) and responsiveness (M = 3.47, SD = 0.92), suggesting inconsistency in communication practices or mixed personal experiences. The group is mostly composed of TAG staff, with diverse educational backgrounds and mainly female. Members were distributed across support services and academic departments, with a significant proportion having over 30 years of institutional experience. This group appears to reflect uncertainty or inconsistency in communication experiences, with some access to information but a lack of alignment or strategic coherence in internal messaging.

The **Engaged** group (n = 24) showed the highest scores across all dimensions: information dissemination (M = 5.21, SD = 0.83), formal communication (M = 5.18, SD = 0.87), responsiveness (M = 4.40, SD = 0.75), and informal creation (M = 4.26, SD = 0.65). This group is mostly composed of TAG staff, aged mostly between 35 and 54, was predominantly affiliated with academic departments, and had a stronger presence of individuals with doctoral degrees. The results could be explained by integration in units where internal communication is strategically managed and valued. Their positive evaluations position them as potential internal ambassadors for good practices in communication and engagement.

These clusters provide a differentiated view of internal marketing orientation within the university and reinforce the idea that perceptions of internal communication vary significantly depending on professional function, tenure, and organizational context.

4.5 Nonparametric Tests

To assess whether the differences observed between the three staff clusters were statistically significant across the four dimensions of internal marketing orientation, nonparametric tests were conducted using the Kruskal-Wallis H test (see Figure 2). This approach was selected due to the non-normal distribution of the variables and the relatively small sample size within each cluster. The results revealed statistically significant differences among the groups in all four dimensions.

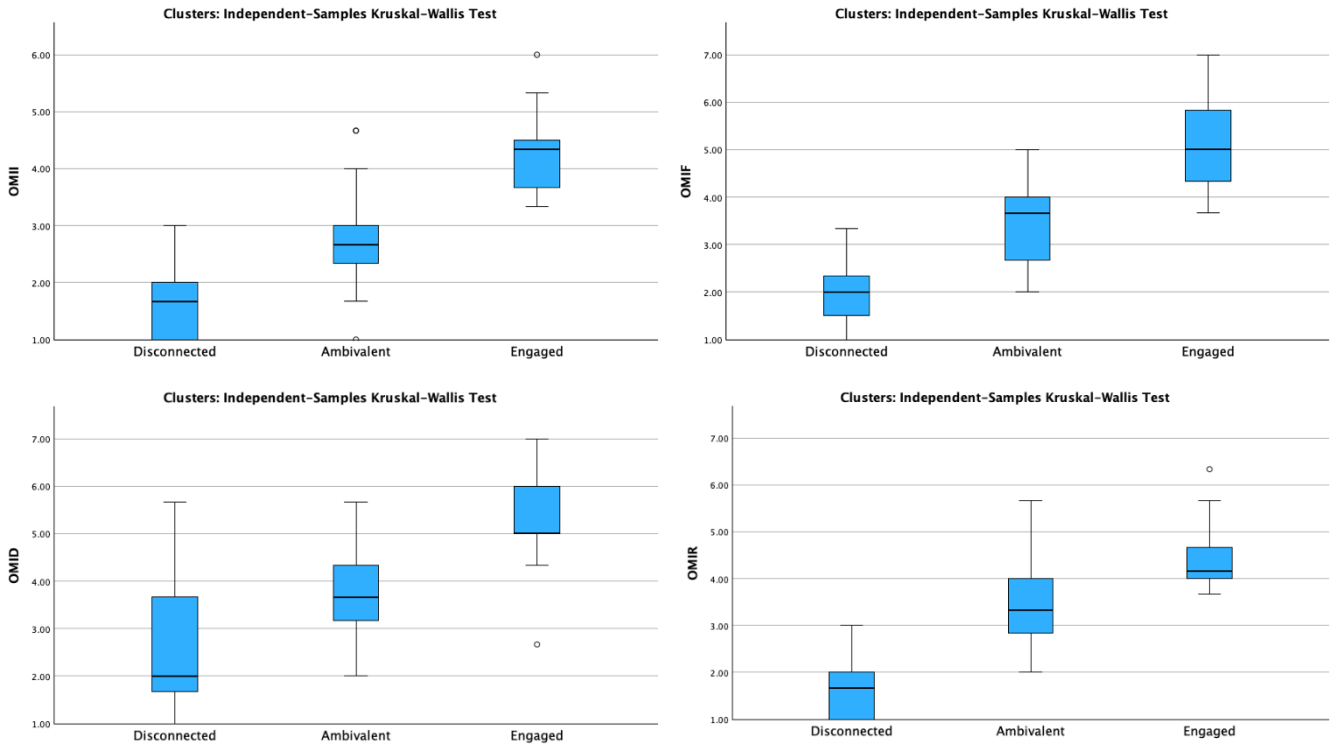

Figure 2 – Non-parametric Tests for the Cluster Groups: OMII, OMIF, OMID and OMIR

These findings confirm that the three clusters (Disconnected, Ambivalent, and Engaged) differ significantly in their perceptions of the university's internal marketing efforts. The consistently high significance across all dimensions reinforces the robustness of the cluster solution and highlights the relevance of adopting differentiated internal communication strategies based on staff segmentation.

4.6 Implications of Cluster-Specific Dynamics

The identification of distinct clusters based on perceptions of internal marketing orientation raised the question of whether the predictive relationships observed in the overall regression models are consistent across all staff segments. To explore this, the regression equations were re-estimated separately for each of the three clusters: Disconnected, Ambivalent, and Engaged.

The results reveal substantial variation in the strength and significance of the relationship across the three groups. In the Engaged group, the relationship between OMIF and OMID remained statistically significant ($\beta = 0.537$, $p = .014$), with a moderate explanatory power ($R^2 = 0.258$). This suggests that in organizational contexts perceived as communicatively mature, staff members recognize a clear link between structured communication and effective dissemination.

For the Disconnected group, the relationship between OMIF and OMID was not statistically significant. Similarly, in the Ambivalent group, the effect was negligible and non-significant. These findings suggest that for staff who are less aligned with the organization, formal communication efforts may not be sufficient (or even noticed) to improve perceived information flow. The relationships between OMIF, OMII, OMID and OMIR were not statistically significant in any of the three groups.

These discrepancies have both theoretical and practical implications. Theoretically, they point to non-invariance of the internal marketing model across organizational subcultures. Practically, they suggest that a one-size-fits-all communication strategy may be ineffective: while structured communication is impactful for some, it may be irrelevant or insufficient for others.

Therefore, future internal marketing strategies should incorporate segmentation and tailoring, recognizing that different groups of employees interpret and respond to communication practices in different ways. The integration of cluster analysis with regression modeling proves to be a valuable approach for identifying differentiated dynamics in internal marketing. It provides

evidence that staff respond to communication strategies in distinct ways, and that segmentation should inform both the design and delivery of internal communication initiatives.

The preceding analyses provide robust evidence of both general patterns and group-specific differences in how staff perceive and respond to internal marketing practices within the university. In the following section, we interpret these findings in light of the theoretical framework and relevant literature, highlighting key implications for organizational communication strategy and employee engagement in higher education institutions.

5. Discussion

This study set out to examine IMO in a Portuguese higher education institution, drawing on the model of Lings and Greenley (2005) and its validated Portuguese adaptation (Santos & Gonçalves, 2010). By combining a survey-based measurement of four core dimensions - informal information creation, formal face-to-face information creation, information dissemination, and responsiveness -with a cluster-based segmentation of the staff population, the study offers both detailed empirical insight and strategic implications regarding how different groups of staff perceive and respond to internal marketing efforts.

The results confirm the reliability and internal consistency of the IMO dimensions, and linear regression models demonstrate that formal information creation plays a key role in predicting the dissemination of information across the university. Additionally, both information dissemination and informal interaction significantly predict responsiveness, emphasizing that effective internal communication requires not only structured channels but also trust-based, spontaneous exchanges.

However, the identification of three distinct staff profiles challenges the assumption of uniformity in how communication practices are experienced. Staff alignment with the institution appears to moderate the effectiveness of formal communication: while the Engaged group clearly perceives its impact on dissemination, this relationship does not hold for the Ambivalent and Disconnected groups. This observation supports prior research suggesting that internal marketing practices are more effective when embedded in a broader organizational culture of support and mutual trust (Gounaris, 2008; Vieira-dos Santos & Gonçalves, 2018). They also support the view that internal communication is not merely transactional, but depends on relational dynamics and employee identification with the institution.

From a strategic management perspective, these findings have significant practical implications. Structured communication mechanisms may be effective in units where alignment and engagement already exist. However, for less connected groups, communication strategies should go beyond information provision and actively invest in building trust, informal dialogue, and opportunities for authentic feedback. The importance of adapting communication strategies to different internal audiences is also consistent with broader calls for human-centered and adaptive approaches to organizational change in higher education (Zhu & Engels, 2014).

Finally, the integration of cluster analysis with regression modeling contributes methodologically to the field by demonstrating how segmentation can enhance the strategic relevance of internal marketing diagnostics. Rather than relying on aggregate metrics, organizations can gain a more precise understanding of where interventions are most needed and what type of engagement strategy is likely to be effective.

6. Conclusions

This study contributes to a more nuanced understanding of IMO in higher education by combining validated psychometric assessment with cluster-based segmentation. Focusing on a Portuguese public university, we investigated how employees perceive key dimensions of internal marketing: informal and formal information creation, information dissemination, and organizational responsiveness. While formal information creation was shown to be a significant predictor of dissemination, and both dissemination and informal communication predicted responsiveness, these relationships proved not to be homogeneous across the organization.

The identification of three distinct groups (Disconnected, Ambivalent, and Engaged) revealed substantial variation in how staff experience internal marketing practices. These profiles provide a strong case for the design of differentiated and targeted internal communication strategies.

For the Disconnected group, where formal efforts appear to have little impact and overall scores are low, it is essential to invest in trust-building and informal engagement mechanisms. This may include open listening sessions, informal feedback loops, and visible responsiveness to concerns raised by staff, particularly those in long-standing support roles. Enhancing informal communication opportunities may be particularly valuable in reducing perceptions of marginalization and increasing connection with the institution.

In contrast, the Ambivalent group demonstrates moderate but inconsistent perceptions. For these staff members, communication strategies should aim at stabilizing and clarifying internal messaging, through more transparent decision-making, regular structured updates from leadership, and the reinforcement of communication routines that build predictability and reduce

ambiguity. Encouraging feedback and closing the communication loop will also help strengthen the perceived credibility of the institution's internal messaging.

The Engaged group, who already experience communication positively, represents a strategic opportunity. These staff members could be mobilized as internal ambassadors, sharing good practices, mentoring colleagues in less engaged groups, and contributing to collaborative internal initiatives. Maintaining high communication quality in these units is equally crucial to sustaining engagement levels over time.

From a strategic perspective, this study highlights the value of combining cluster analysis with regression modelling to allow identification of areas for improvement in internal marketing orientation. The results provide institutional leaders with a stronger empirical foundation for designing segmented and context-sensitive internal communication strategies, allowing to evolve from a one-size-fits-all model and aligning with the diverse realities and experiences of its internal audiences.

This study is not without limitations. The analysis was conducted in a single institution and based on a relatively small sample, which limits the generalizability of the findings. Moreover, the use of self-report data introduces the risk of response biases, and the cross-sectional nature of the design precludes causal interpretations.

Future research could address these limitations by adopting longitudinal designs to track changes in perceptions over time and assess the impact of targeted interventions. Comparative studies across universities or national contexts would also deepen our understanding of how organizational culture mediates internal marketing practices. In addition, mixed-methods approaches, e.g., combining surveys with interviews or focus groups, could offer richer insight into the mechanisms behind communication perceptions. Finally, multigroup structural equation modeling could formally test the invariance of the internal marketing model across organizational subgroups, providing a more rigorous statistical basis for segmented communication strategies.

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