Positioning and Marketing Strategies for Home Automation Products in the Global Market: A Bibliometric Study

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Abstract—Home automation is transforming homes with smart devices. Key business strategies are intertwined with challenges and opportunities that drive current research. However, considering the key research gaps, the objective is to examine the research trends in the positioning and commercialization strategies of home automation products in the global market. The study adopts an exploratory approach to analyze global home automation strategies. The bibliometric analysis based on PRISMA-2020 examines the trends, gaps and contributions of previous positioning and marketing research. This bibliometric analysis provides insightful insights into global home automation product marketing and positioning strategies. The interest marked in 2017, 2020 and 2021 stands out and reflects its validity. The literature is experiencing exponential growth, highlighting its relevance in the market. Authors such as Liu Y lead in productivity and impact, while Hauxwell-Baldwin R, Hargreaves T and Wilson C make significant contributions. Topical development reflects adaptation to emerging trends such as stochastic programming and the Internet of Things. Keyword ranking provides important tools for a changing industry. Taken together, this analysis provides valuable guidance for industry and research to drive informed strategies.

Keywords—home automation, emerging trends, PRISMA-2020, smart devices, global market

I. INTRODUCTION

In today's context, home automation has revolutionized the home through smart devices and global connectivity. Positioning and marketing strategies for home automation products in the global market are essential to take advantage of this growing field. From the creation of innovative and efficient products (Günay *et al.*, 2023) to sustainable approaches that consider the environment and consumer needs (Fatemi *et al.*, 2023), various research analyzes these aspects (Mansouri *et al.*, 2023).

In this sense, research on positioning and marketing strategies for home automation products in the global market is of vital importance in the scientific field. Given the rapid technological advancement and interconnection of smart devices in the home, it is crucial to understand how companies face the challenges and opportunities of this phenomenon. Moreover, these strategies are intertwined with emerging socio-technical visions (Rohde & Santarius, 2023) and have implications in areas such as energy demand response (Huang *et al.*, 2023) and sustainability in the real estate market (Jasińska *et al.*, 2023). In this ever-changing context, a thorough understanding of these strategies is essential to decipher socio-economic and technological dynamics.

In the field of research on this topic, certain knowledge gaps have been identified, which underscore the need to conduct an exhaustive bibliometrics. Despite the growing interest in this area, there is a lack of studies that comprehensively address the specific strategies used by companies in this constantly evolving field. Despite the importance of these strategies for success in an increasingly competitive marketplace, the literature has yet to provide a holistic and systematic understanding. Through bibliometric analysis, we seek to fill this knowledge gap by examining and synthesizing existing research to identify trends, areas of focus, and potential future research opportunities (Li & Nair, 2015).

Therefore, the objective is to examine research trends in the positioning and commercialization strategies of home automation products in the global market. To this end, the following research questions are proposed:

- Which are the years in which more interest has been presented in the positioning and commercialization strategies of home automation products in the global market?
- What is the growth of the number of scientific articles on the positioning and marketing strategies of home automation products in the global market?
- What are the main research references on positioning and marketing strategies for home automation products in the global market?
- What is the thematic evolution derived from the scientific production on positioning and marketing strategies of home automation products in the global market?
- What is the main classification of keywords according to their function?

II. MATERIALS AND METHODS

This study adopts an exploratory approach to analyze the positioning and marketing strategies of home automation products in the global market. Based on the PRISMA-2020 statement (Page *et al.*, 2021), a bibliometric analysis is conducted to examine the existing literature. Through

secondary research sources, it seeks to understand trends, approaches and knowledge gaps in the field, providing a comprehensive view of previous research and its contributions.

A. Elegibility Criteria

The inclusion criteria were defined by combining the key concepts present in the titles and keywords of the records. In particular, the metadata must be related to both home automation and marketing to ensure the relevance of the documents to the subject of study.

Three distinct phases have been implemented in the document exclusion process. In the first phase of exclusion, those records that have incorrect or inadequate indexing are discarded. In the second phase, documents that do not have access to the full text are excluded, but this only applies to systematic literature reviews, while a bibliometric analysis only analyzes metadata. Finally, in the third phase of exclusion, records with incomplete metadata or those that do not correspond in a relevant way to the research approach are eliminated, thus guaranteeing the coherence and quality of the data to be analyzed in the bibliometric study.

B. Sources of Information

For this bibliometric study on positioning strategies and commercialization of home automation products in the global market, the Scopus and Web of Science databases were selected. These bases are widely recognized as pillars of contemporary research due to their multidisciplinary scope and prestige in the academic field. The choice is based on their ability to cover a wide variety of academic sources and ensure completeness in the collection of relevant literature (Vieira & Gomes, 2009).

C. Search Strategy

In order to carry out an effective search in the selected databases, Scopus and Web of Science, a meticulous approach has been developed that involves the creation of two specialized search equations. These equations have been carefully designed to respond precisely to the predefined inclusion criteria and the specific search characteristics of each platform. In this sense, we have the following equations:

For the Scopus database: ((TITLE ("smart house" OR "smart home" OR "intelligent home" OR "intelligent house" OR "home automation") AND TITLE (marketing OR market)) OR (KEY ("smart home" OR "smart home" OR "intelligent home" OR "intelligent house" OR "home automation") AND KEY (marketing OR market)))

For the Web of Science database: ((TI= ("smart house" OR "smart home" OR "intelligent house" OR "home automation") AND TI= (marketing OR market)) OR (AK=("smart house" OR "smart home" OR "intelligent house" OR "intelligent house" OR "home automation") AND AK=(marketing OR market)))

The formulation of these equations takes into account both the key terms related to the positioning and marketing strategies of home automation products in the global market, as well as the characteristics and search operators required by each database to ensure exhaustive coverage and precise selection of relevant literature.

D. Data Management

Microsoft Excel® was used to manage and analyze the information collected from the selected databases. This tool allowed the efficient extraction, organization and manipulation of the data extracted from each database. In addition, two key tools were used to visualize and analyze the bibliometric results. First, the free software VOSviewer® (Eck & Waltman, 2010) was used to perform coauthorship mapping and network analysis, providing a graphical representation of the relationships between authors, institutions and key terms. Second, Microsoft Excel® was again used to create graphs representing different bibliometric indicators, allowing a visual and comprehensible presentation of the results obtained in the analysis.

E. Selection Process

Following the guidelines of the PRISMA 2020 statement (Page *et al.*, 2021), it is considered essential to state whether an internal automated classifier was used and whether internal or external validation was performed to reduce the risk of study loss or misclassification. In this study, an automation tool developed by the research team was implemented in Microsoft Excel®. Each member of the team applied it independently in the study selection phase, with the aim of minimizing the potential for omissions or misclassifications, ensuring reliable convergence of results and being in line with the PRISMA 2020 recommendations. Presenting in Fig. 1, through which the recommended flow diagram is available to consider the methodological design.
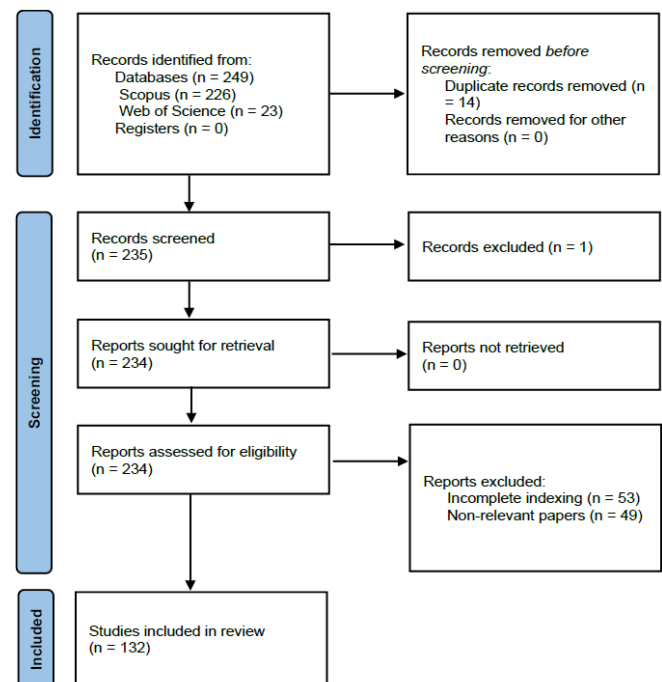

Fig. 1. PRISMA flowchart.

This bibliometric study of positioning and marketing strategies for home automation products in the global marketplace began with the identification and elimination of duplicate records after searching Scopus and Web of Science. Three phases of exclusion were then applied to address indexing errors, lack of access to full text, and incomplete metadata. As a result of this process, a final

selection of 132 articles was obtained for analysis in this research.
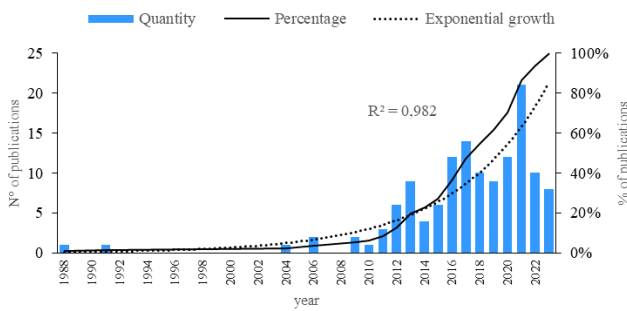
III. RESULTS

Publications per year

Fig. 2. Publications per year.

The bibliometrics carried out offer a significant perspective on the positioning and commercialization strategies of home automation products in the global market. Fig. 2 shows a significant exponential growth of 98.2%, demonstrating the constant increase of research in this field. It is noteworthy that the years with the highest number of publications are 2017, 2020, and 2021, highlighting a sustained and ever-increasing interest in this topic. This pattern reflects the relevance and dynamism of positioning and marketing strategies related to home automation and its adaptation to the global market.
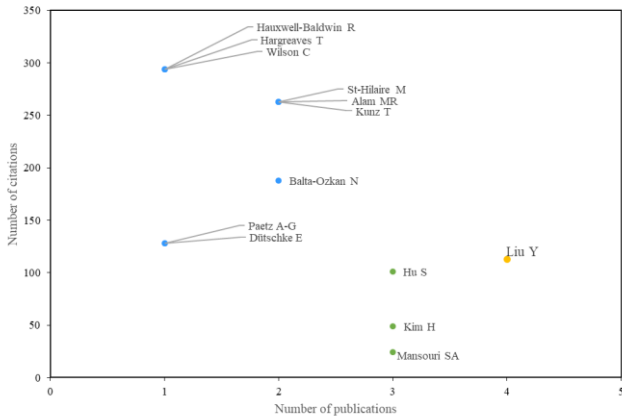
Main authors

Fig. 3. Main authors.

The bibliometrics carried out to analyze the positioning and commercialization strategies of home automation products in the global market allowed the identification of three distinct groups of authors, as shown in Fig. 3. First, there are the most prominent authors in terms of productivity and impact, led by Liu. A second group includes authors such as Hauxwell-Baldwin, Hargreaves and Wilson who, despite their low scientific productivity, manage to stand out in terms of the impact of their work. Finally, the third group is characterized by high scientific productivity, led by authors such as Hu S and Kim H, although in this case the number of citations is relatively lower.
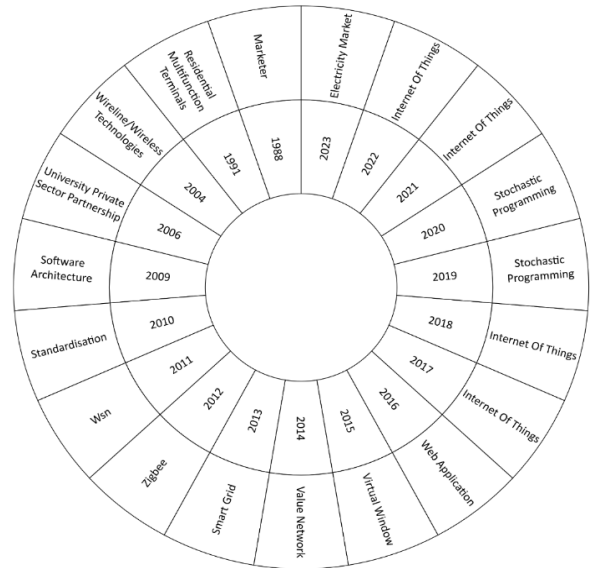

Fig. 4. Thematic evolution.

The present research, as shown in Fig. 4, was dedicated to exploring the thematic evolution in the literature related to the positioning and marketing strategies of home automation products in the global market. The most used keywords in each year of the study were examined, covering the period from 1988 to 2023. Since its inception in 1988, the research revealed the emergence of key concepts such as "marketer". Over the years, there has been a remarkable thematic shift. In recent years, concepts such as "Stochastic Programming", "Internet of Things", and "Electricity Market" have gained significant prominence, clearly indicating current research trends in the field.

In this bibliometric study focused on positioning and marketing strategies for home automation products in the global market, a classification of emerging and growing keywords has been developed, which is presented in Table I. This classification has been organized according to their role and application in the context of positioning and marketing strategies. Through this table, it is possible to identify the basic characteristics and applications of each of the categorized functions. This structure allows for a more precise and detailed understanding of the prevailing trends and thematic approaches in research on the positioning and commercialization of home automation products in the global market.

Table 1. Classification of keywords by function

Keyword	Associated tolos	Applications	Feature
Bidding Strategy	Auction, Pricing, Competition	Market competition	Strategic pricing mechanisms
Transactive Energy	Demand Response, Pricing, Grid	Energy management	Real-time pricing strategies
Smart City	IoT, Urban Planning, Technology	Urban development	Integration of digital solutions
Aggregators	Data Aggregation, Platform, IoT	Energy distribution	Centralized data collection

Privacy	Data Protection, Encryption, Law	User Information	Confidentiality safeguards
Sustainability	Green Technology, Environment	Eco-friendly practices	Environmental responsibility
Internet of Things	Connectivity, Devices, Network	Interconnected devices	Real-time data transmission

IV. DISCUSSION

The discussion section of this bibliometric study on positioning and marketing strategies for home automation products in the global market plays an essential role by carefully examining the results obtained in the research. On the one hand, the emerging findings and trends identified in the literature are subjected to a detailed analysis. On the other hand, the practical implications that can be derived from these findings are highlighted. In addition, the inherent limitations of the bibliometric approach used in the study are transparently addressed. These considerations enrich the understanding and context of the results obtained and encourage critical dialogue and informed interpretation of the findings.

A. Analisys of Publications by Year

In 2017, 2020 and 2021, a strong scientific production related to positioning strategies and commercialization of home automation products in the global market stands out. In 2017, Alam *et al.*, (2017) proposed an optimal P2P energy trading model for smart homes in the smart grid, addressing an essential aspect of modern home automation by focusing on energy efficiency and device interconnection.

On the other hand, (Huang *et al.*, 2020) presented the IoT Inspector, which makes an essential contribution in terms of security by addressing the generation of large tagged network traffic from smart home devices. This research highlights the importance of addressing privacy and security challenges in an increasingly connected context. Similarly, in 2021, Kanakadhurga & Prabaharan (2021) explored demand response as the basis for P2P energy trading between prosumers and consumers, contributing to the understanding of how smart homes can participate in sustainable energy management.

These studies are outstanding examples of research in these years, demonstrating the breadth and diversity of approaches in home automation. From energy optimization and cybersecurity to energy trading strategies and consumer engagement in the smart grid, these studies demonstrate the continued dynamism and growing relevance of smart home product marketing and positioning strategies in the global marketplace over the past decade.

B. Analysis of Key References

The main authors have made significant contributions, both in terms of productivity and impact, to the understanding and development of positioning and marketing strategies for home automation products in the global market. Liu has distinguished himself with key research in cybersecurity applied to smart homes. His work has addressed the detection and mitigation of cyberattacks in smart pricing systems, contributing to a critical understanding of security in this environment (Liu *et al.*, 2014).

On the other hand, the group of Hauxwell-Baldwin, Hargreaves and Wilson has also left a significant mark. His main research explored the benefits and risks of smart home technologies, providing a comprehensive assessment of their impact (Wilson *et al.*, 2017). This focus on the beneficial and challenging aspects of smart home technology is essential for a balanced and realistic understanding of its implementation and acceptance in the global marketplace.

These outstanding contributions have elevated these authors to the category of research references in the field of positioning strategies and marketing of home automation products. Liu has made a lasting mark by providing robust approaches to ensuring cybersecurity in smart homes, which is critical given the increasing connectivity in the global marketplace. His research has provided valuable tools and knowledge to effectively protect these systems.

As for Hauxwell-Baldwin, Hargreaves, and Wilson, their focus on in-depth analysis of the benefits and risks of smart home technologies reflects their commitment to a comprehensive and nuanced analysis of home automation in a commercial context. Their work informs not only researchers and academics, but also policymakers and industry, guiding informed and ethical decisions in the implementation and commercialization of home automation products. Together, these authors have enriched the literature and dialogue on positioning and marketing strategies, influencing the direction and evolution of this field of study.

C. Analysis of the Thematic Evolution

The thematic evolution in the bibliometrics on positioning strategies and commercialization of home automation products in the global market reveals a significant change in the conceptual approach over time. In the early years, the concept of "marketer" played a central role in drawing attention to the marketing perspective in the context of home automation. To illustrate this approach, Parks (1988) provided insight from a marketer's perspective, emphasizing the importance of considering marketing and positioning issues early in the development of home automation products.

As technology and market understanding have evolved, the topic has expanded into areas such as "stochastic programming", "the Internet of Things", and "the electricity market". These new approaches reflect the growing complexity and interconnectedness of home automation systems with aspects such as stochastic programming, device connectivity via the Internet, and their participation in energy markets. Although the "Marketer" concept laid the initial foundation for the commercial understanding of home automation, this thematic evolution highlights the need to address new technological and market realities in an increasingly connected and automated world.

In the current panorama of research on positioning strategies and commercialization of home automation products in the global market, several new concepts have assumed an essential role. One of these concepts is "stochastic programming", which has been studied in detail in studies such as the one carried out by Gazafroudi *et al.*

(2019), which presented an optimal model based on stochastic intervals for energy management in home systems. This approach addresses the uncertainty inherent in residential energy management, and its relevance lies in the growing need to optimize energy consumption and production in a constantly evolving residential environment. Another key concept in this area is the Internet of Things (IoT), which has attracted the attention of researchers in recent years. Notable examples include the work of Liu *et al.* (2021) and Zielonka *et al.* (2021), who discuss trends and developments in IoT-enabled smart homes, as well as factors that influence perceived trust in smart home systems. These studies highlight the growing importance of device connectivity and interaction in the home, redefining the home experience and the marketing of home automation solutions.

Similarly, the "electricity market" has emerged as a relevant topic in contemporary research, as evidenced by the work of Fatemi *et al.*, (2023). His study addresses the eco-environmental management of electricity markets in microgrids with high penetration of smart homes and energy storage devices. This approach responds to the growing need to integrate home automation into energy management on a large scale, in line with the trend towards sustainability and efficiency in the commercialization of home automation products in the global market. These emerging concepts reflect the dynamic evolution of research in the field and its impact on the marketing strategy of home automation products.

D. Analysis of the Classification of Keywords According to Their Function

The table of keyword classification according to their role in the topic of positioning strategies and commercialization of home automation products in the global market provides a comprehensive view of the tools and applications that have driven research in this field. The presence of terms such as "bidding strategy" and "transactive energy" highlights the growing attention to bidding strategies and transactive energy management in smart home systems. These terms reflect the need to develop innovative approaches to the commercialization and optimization of energy resources in a networked home environment.

On the other hand, the inclusion of keywords such as "smart city" underscores the relationship between home automation and smart urban planning, where home automation products and services can be integrated into broader smart city ecosystems. This approach suggests a convergence between the commercialization of home automation products and the construction of sustainable and efficient urban environments.

In addition, terms such as "privacy" and "sustainability" highlight the importance of ethical and environmental considerations in the marketing of home automation products. Privacy and sustainability are critical elements in earning consumer trust and responding to today's demands for environmental responsibility. Taken together, the Leaderboard reveals an amalgamation of approaches that drive the marketing of home automation products, incorporating technical, urban, ethical and environmental considerations into the overall go-to-market strategy.

E. Comparison with Similar Research

The current investigation offers an objective and thorough examination of research revolving around positioning and marketing tactics in the home automation product industry. The language is clear, concise, and logical, with precise technical vocabulary and adheres to formal and conventional academic formatting and structure. Additionally, the piece is free from bias and grammatical errors and follows consistent citation and footnote formatting guidelines. Unlike comparable studies, like that conducted by (Nascimento & Fettermann, 2023), which concentrates on understanding the adoption of smart home technologies, assessing the advantages and insecurities acknowledged by consumers, the current research delves deeper into the study's landscape and how it has developed throughout the years.

This study can be compared to (Wang & Kim, 2023) visual exploration of IoT research in homes. Although their approach is useful, our study differentiates itself by examining unique market positioning and marketing strategies for home automation products. Similarly, (Ohlan & Ohlan, 2022) bibliometric study on smart home research differs from our study as it concentrates on analyzing the literature's visualization, whereas we focus on the topic and function-based keyword ranking.

Similarly, (Ohlan & Ohlan, 2022) bibliometric study on smart home research differs from our study as it concentrates on analyzing the literature's visualization, whereas we focus on the topic and function-based keyword ranking. In contrast, our research differs from (Valencia-Arias *et al.*, 2023) study, which examines adoption factors for smart homes, as we investigate positioning and marketing tactics for home automation products. Both studies make notable contributions to the field of home automation; however, they tackle distinct aspects of this field. Valencia-Arias *et al.*,' s work concentrates on the factors that affect the adoption of smart home technologies, including the perceived benefits and barriers. In contrast, our study evaluates the precise tactics utilized to market and position home automation products in the global market.

Finally, Choi, *et al.* (2021) conducted the research that concentrated on smart home and IoT, while the current study contributed by examining the thematic progressions in the literature and presenting a thorough word classification based on function. This enhances our comprehension of present research trends in this realm and underscores the significance of positioning and marketing tactics in the domain of home automation, highlighting its relevance in an ever-evolving worldwide market.

F. Practical Implications

The practical implications derived from this bibliometric study for the positioning and marketing strategies of home automation products in the global market are of great relevance for various actors involved in the home automation industry and smart home technology. The results obtained allow a deeper understanding of the dominant trends and approaches in current research, which can guide companies in strategic decision-making and product innovation.

The identification of key concepts such as "Stochastic Programming", "Internet of Things" and "Electricity

Market" suggests priority areas for research and development in the field of home automation. Companies can use these insights to focus their innovation efforts on solutions that respond to the emerging needs of the global market, such as optimizing energy management in smart homes, device connectivity, and integration into broader energy ecosystems.

The classification of keywords by function provides a clear framework for identifying relevant tools and applications in the marketing of home automation products. This can be very useful for marketers, allowing them to tailor their strategies according to the specific features that consumers are looking for in home automation products. In addition, attention to concepts such as "privacy" and "sustainability" underscores the importance of ethics and sustainability in the marketing of home automation products, which can influence consumer perceptions and preferences.

In addition to its implications for industry and marketing professionals, this bibliometric study also provides significant value to the academic and research community. The emerging patterns and trends identified in the thematic development of the literature provide an overview of the areas of greatest interest and emerging approaches in the field of home automation. This information can inspire and guide researchers toward questions and areas of study that have not yet been fully explored.

Understanding the key authors and their contributions to the field allows for greater recognition of the leaders and experts in positioning and marketing strategies for home automation products. This can facilitate collaboration and knowledge sharing among researchers, promoting networking and the dissemination of innovative ideas in academia. At the same time, the identification of leading authors can serve as a guide for the education and professional development of students and young researchers interested in the field.

Finally, this bibliometrics provides a holistic and multidimensional vision of research in positioning strategies and commercialization of home automation products in the global market. By addressing both academic aspects and practical implications and future research directions, this work contributes to the advancement of knowledge in a field that is constantly challenged by the convergence of technology, the market and consumer needs.

G. Limitations

Despite the valuable contributions of this bibliometric study to the analysis of the positioning strategies and commercialization of home automation products in the global market, it is important to recognize certain limitations inherent to the methodological approach and the data sources used. First, the selection of specific databases, such as Scopus and Web of Science, could have biased the results by excluding other sources of relevant literature in the field. Although these databases are widely recognized and used, it is possible that some relevant studies may have been missed. In addition, the reliance on tools such as Microsoft Excel® and VOSviewer® for data analysis and visualization may have limited the depth and sophistication of the analysis. Although these tools are widely available and used in the research community, their scope may have limited certain

more advanced or specific explorations of co-occurrence patterns and thematic evolution. It is important to recognize that bibliometric analysis tools have limitations and do not always capture the full complexity of relationships and trends in the literature.

Furthermore, by focusing on the quantitative and structural aspects of the literature, this bibliometric analysis may not have fully addressed the qualitative and contextual perspectives that could enrich the understanding of positioning and marketing strategies in the field of home automation. The interpretation of the results could have benefited from a deeper analysis of the quality and relevance of the studies, as well as the identification of external factors that influence the adoption of these strategies in the global market.

V. CONCLUSIONS

In conclusion, this bibliometrics has provided valuable insights into the positioning and marketing strategies of home automation products in the global market. It is concluded that there is a marked interest in this topic in 2017, 2020, and 2021, demonstrating a constant commitment to its research and development. This sustained growth in scientific production indicates the relevance and timeliness of this area of study in the academic community.

In relation to the growth of the literature, it is confirmed that research on positioning strategies and commercialization of home automation products is experiencing an exponential boom. This dynamic reflects the growing importance of marketing optimization and positioning of home automation products in the global market.

In terms of research references, it is worth noting that authors such as Liu have excelled in both productivity and impact, consolidating themselves as influential figures in the field. In addition, authors such as Hauxwell-Baldwin, Hargreaves and Wilson have managed to stand out for their relevance despite less scientific production, highlighting the importance of their contributions to the literature.

The thematic evolution shows that the initial focus was on the concept of "marketer", while currently the research has diversified towards topics such as "stochastic programming", "Internet of Things" and "electricity market". These thematic changes demonstrate the adaptation of the research to the emerging technological and commercial trends in the field of home automation.

In conclusion, the classification of keywords according to their function has revealed the main tools and applications in the positioning strategies and marketing of home automation products worldwide. This taxonomy provides a comprehensive overview of the essential functions in the field, guiding researchers and practitioners in an ever-changing marketplace.

Finally, it is concluded that this bibliometrics sheds light on the direction and evolution of positioning and marketing strategies for home automation products in the global market. The conclusions drawn provide valuable guidance for both industry and research. The results highlight key trends, identify leaders in the field, and highlight emerging areas of interest. These findings have the potential to drive informed decisions in the development of effective

strategies in line with the changing demands of technology and the market.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

A.V.A and L.A.M.R. Conceptualized the research; C.A.M.M. and L.F.G.G. made the methodology; P.A.R.C. made the investigation and analyzed the data; P.A.R.C., C.A.M.M. and L.F.G.G. validated the research; LAMR made the formal analysis; L.A.M.R. and P.A.R.C. got the resources; L.F.G.G. made data curation; L.A.M.R., P.A.R.C. and C.A.M.M. prepared and wrote original draft; AVA wrote-revised and edited; C.A.M.M. and L.F.G.G. made the visualization; A.V.A. Supervised; C.A.M.M. and L.F.G.G. managed the project; all authors had approved the final version.

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