

BEYOND THE GROCERY STORE: A BIBLIOMETRIC ANALYSIS OF FOOD SUBSCRIPTION BUSINESS MODELS

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Abstract

The subscription based business model has significantly expanded beyond digital services, deeply penetrating the e-grocery and food delivery sectors. While these ecosystems offer substantial financial predictability and operational efficiency, emerging threats such as subscription fatigue threaten long-term customer retention. This study investigates the tipping point between perceived consumer value and cognitive overload within food subscription ecosystems, emphasizing the distinction between authentic loyalty and artificial retention. Employing a bibliometric approach, the research analyses 977 documents extracted from the Web of Science database up to 2025. Data analysis was performed utilizing the Biblioshiny and RStudio softwares, which revealed a life-cycle saturation of academic interest, largely propelled by the COVID-19 pandemic. The findings indicate a possible shift in the literature, moving from operational logistics toward consumer psychology, sustainability, and public health. Ultimately, the study concludes that sustainable food subscription models must transcend rigid contracts, leveraging indirect benefits and convenience to cultivate voluntary loyalty and minimize the financial burden perceived by consumers.

Keywords: Subscription economy, E-grocery, Consumer behaviour, Bibliometric analysis, Food delivery.

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1. INTRODUCTION

The subscription-based business model has undergone a profound evolution in the recent decades, currently reaching a state of almost complete digitalization (DataArt, 2024). In the contemporary economic sphere, the subscription concept has become inherently associated with the scalability and consolidation

of the global digital infrastructure (Tzuo & Weisert, 2018; Cobzaru & Tugui, 2024). Beyond this technological foundation, the economic sectors that adopt and integrate this monetization model are experiencing an accelerated pace of expansion. Although the media streaming industry continues to maintain dominance in this landscape due to its level of maturity (Chalaby, 2023), a notable upward trajectory is observed in the food sector, particularly in the e-grocery and meal kit segments. Prominent companies such as Sezamo, HelloFresh, and Freshful are rapidly consolidating their market share by implementing intensive customer acquisition and retention strategies, thereby reshaping traditional consumption patterns (Dobiecka et al., 2025).

A quantitative analysis of this phenomenon fully validates the observed dynamics. According to data aggregated in the Subscription Economy Index (SEI), the revenues of corporate entities based on subscription models reported an overall increase of 10.4% during 2023, reflecting a compound annual growth rate (CAGR) of approximately 17% over the past decade (Zuora Subscribed Institute, 2024). Specifically, the food subscription segment demonstrates notable resilience and market penetration capacity, with industry estimates forecasting a sustained annual growth rate of 9.9% (Fact.MR, 2026; Fortune Business Insights, 2026).

It must be emphasized that the implementation of the subscription model in the food sector does not represent a fundamentally novel phenomenon. Historically, catering companies and various business-to-business (B2B) models have utilized recurring contracts for the predictable supply of food (Zentes et al., 2017). However, the current digital landscape demonstrates a significant ramification of this mechanism. At present, not all companies opt for a subscription strictly focused on the recurring delivery of physical products, there is a notable rise in "adjacent" or service-oriented subscriptions. These instruments function as a support ecosystem that stimulates consumption and facilitates core transactions (Krämer & Kalka, 2017). Paid loyalty programs often structured as "Plus" applications (such as Uber One, Glovo Prime, or Wolt+) offer amenities like the elimination of delivery fees, reduction of service costs, or the granting of exclusive discounts (Krämer & Kalka, 2017). These play a dual strategic role, which is that they maximize retention rates and Customer Lifetime Value, while they also generate a "closed" ecosystem that exponentially increases the company's revenues and financial predictability (Somosi et al, 2021).

Inherently, the subscription model presents a vast applicability and generates complex ramifications for consumer behaviour, firm performance, and, not least, the environment. If we isolate the analysis of this phenomenon, without integrating a holistic perspective, we risk minimizing its true scope. Often, the externalities and indirect effects generated by these recurring ecosystems, such as the consolidation and optimization of logistical delivery routes, the alteration of urban mobility patterns, can prove to be equally, or even more significant than the direct commercial outcomes (Seghezzi et al., 2021; Seghezzi et al.,

2022). An in-depth analysis of the literature suggests that a more subtle method of transitioning toward a recurring business model is the implementation of loyalty programs and cards. In its classical sense, a subscription involves acquiring the right to use a good or service for a determined period in exchange for a recurring financial equivalent, thus eliminating the singular nature of traditional commercial interactions (Wirtz & Lovelock, 2021). Based on the studies of Kumar and Reinartz (2018), it can be argued (albeit in a very metaphorical way) that the architecture of loyalty programs assimilates the essence of this model, yet operates through a paradigm inversion: in this ecosystem, the company itself becomes the entity "subscribed" to the consumer.

From an operational standpoint, the organization assumes a series of substantial recurring costs, consisting of issuing loyalty instruments, maintaining digital infrastructure, storing and securing databases, as well as remunerating the involved human capital. In this atypical exchange dynamic, the "service" that the company continuously receives is represented by the constant flow of demographic data, transactional patterns, and behavioural actions generated by the cardholder through its mere use (Berman, 2006). Thus, customer data becomes the recurring resource for which the company agrees to pay a technological and operational "subscription" (Zuboff, 2019). Despite its proven efficacy in consolidating loyalty and capital flows, the uninterrupted expansion of this ecosystem generates a systemic vulnerability, defined in recent literature as subscription fatigue. As the market saturates and consumers accumulate a vast portfolio of recurring services, the initial convenience often transforms into cognitive and financial overload. Consumers become hyper-aware of cumulative costs, and the feeling of losing control over their own budget can trigger reactive behaviour, leading to the abrupt cancellation of services perceived as marginal or non-essential (Nguyen, 2025). Thus, the scalability of this model encounters a psychological limit, where the effort to manage subscriptions outweighs the value they provide.

Driven by current industry dynamics and the growing issue of subscription fatigue, this study aims to identify the tipping point where perceived consumer value is eclipsed by cognitive overload within food-delivery and e-grocery subscription ecosystems. To this end, the research explores three core questions. First, it investigates how the subscription business model has expanded into the grocery domain utilizing the amount of scientific productions based on this as data. Second, it assesses which are the most important journals in this field that have promoted the use of this business model. And lastly it will analyse the keywords of this domain to try to identify the driving factors of the market. Consequently, this paper contributes to the literature by extending the theoretical framework of subscription fatigue from the traditional media streaming sector to the high frequency food industry. Furthermore, it offers empirical evidence regarding the data-as-currency paradigm and its limitations in the face of consumer saturation. Practically, the findings equip companies with actionable strategies for building sustainable subscription models that harmonize revenue predictability with long term consumer wellbeing.

2. LITERATURE REVIEW

Looking beyond consumer psychology and digital interfaces, the recurring commitment obtained by companies generates perhaps the most profound impact at the operational level, particularly in the e-grocery and meal kit segments. In traditional food retail, uncertainty and demand fluctuations inevitably lead to overstocking and, implicitly, a high rate of perishable product waste. In contrast, the subscription-based model transforms the supply chain from a reactive one into a predictive and proactive one. Knowing the exact volume and structure of recurring orders weeks in advance enables companies to orchestrate just-in-time inventory management. Thus, the collected data does not solely serve marketing hyper-personalization, it becomes a core element of operational efficiency. On a macro scale, food subscriptions prove to be not merely a marketing tool for increasing retention, but a major logistical creation capable of substantially reducing inventory costs and minimizing the ecological footprint by directly combating food waste (Belavina et al., 2016).

In traditional business models, profitability is often measured at the margin level per singular transaction. In contrast, the architecture of subscriptions and loyalty programs typically entails operating at a loss during the initial stages of the consumer's lifecycle, with net profit being generated exclusively through prolonged retention (Reinartz & Kumar, 2003). From a strategic perspective, substantial investments in marketing, initial discounts, and free deliveries are justified only if the long-term value generated significantly exceeds the initial cost of attraction (Gupta et al., 2004).

However, the financial pressure to maximize this ratio and maintain minimal churn rates (customers/subscribers leaving the business) has generated significant ethical deviations in the design of digital interfaces. Recent academic literature and regulatory authority reports raise an alarm regarding the proliferation of so-called „dark patterns” tactics of architectural manipulation of interfaces designed to intentionally hinder subscription cancellation (McCants, 2023). A classic example, extensively studied within the realm of delivery platforms and recurring services, is the "subscribe with one click, cancel by phone" model. This creates a major asymmetry between the ease of entering the company's financial ecosystem and the procedural effort required to exit (similar to industry entry/exit barriers). These dark patterns directly exploit consumer cognitive biases, such as behavioural inertia or loss aversion, transforming temporary consent into persistent, often involuntary participation. By introducing additional steps, hiding cancellation buttons, or ambiguously phrasing options within the exit architecture, companies manage to keep customers captive, practically distorting retention metrics. What financial dashboards report as loyalty often represents a mere capitulation of the user in the face of a deliberately exhausting cancellation process (McCants, 2023).

Thus, within the context of e-grocery ecosystems and paid loyalty programs, the conceptual distinction between artificial retention and authentic loyalty becomes the critical long-term success factor. "Plus" type programs that rely exclusively on locking in the customer through rigid contracts or procedural barriers succeed, at most, in generating spurious loyalty. This form of retention is highly vulnerable: the moment a competitor enters the market with a more aggressive acquisition offer, the captive customer will immediately migrate (Bansal et al., 2005). In contrast, authentic loyalty is built when the platform utilizes recurring data to exponentially increase the utility of the service. In this ideal scenario, Customer Lifetime Value is organically maximized because the subscriber perceives the loyalty program as an essential instrument for optimizing their consumption routine, transforming retention from an algorithmic constraint into a continuous, voluntary choice.

Although subscription economies are widely researched, notable gaps persist in the current literature. Primarily, while recurring revenue models have been extensively studied in the software and digital media industries, there is a distinct lack of empirical research focusing on the high-frequency e-grocery and food delivery sectors. Furthermore, while the ethics of dark patterns and the financial metrics of Customer Lifetime Value have been analysed in isolation, few studies integrate these concepts to explore the growing issue of subscription fatigue. In particular, it remains unclear how the cognitive burden of managing multiple subscriptions blurs the line between artificial retention and genuine loyalty in "plus" service applications. By bridging these gaps, this study delivers a more holistic view of long term consumer behaviour and evaluates the true sustainability of subscription ecosystems in the digital food industry.

3. METHODOLOGY

Within this paper, a bibliometric analysis was conducted using the Biblioshiny software and RStudio, programs that enabled the analysis of a high number of articles published within a specific database. The chosen database was the one provided by Web of Science, however, a limitation of the employed software must be mentioned, namely the inability to analyse multiple databases (from other platforms) or to extract an extended reference list.

The extracted data includes all publications up to December 31, 2025. Publications from 2026 were excluded due to the year being incomplete. Additionally, the decision was made to analyse results originating strictly from the following fields: business, management, food science technology, nutrition dietetics, public environmental occupational health, economics, environmental sciences, agricultural economics policy, operations research management science, green sustainable science technology, and environmental studies. To select the papers strictly related to our topic of discussion, we queried the Web of Science database using specific search terms: (subscription OR subscription model OR online retail OR

subscription economy OR recurring delivery OR recurring order OR meal kit) AND (food OR HoReCa OR restaurant OR grocery OR e-grocery OR online grocery OR food delivery OR online food OR food industry OR food service). Following the search, we analysed 977 results in R version 4.5.1 (RStudio) and illustrated the sorting process in Figure 1.

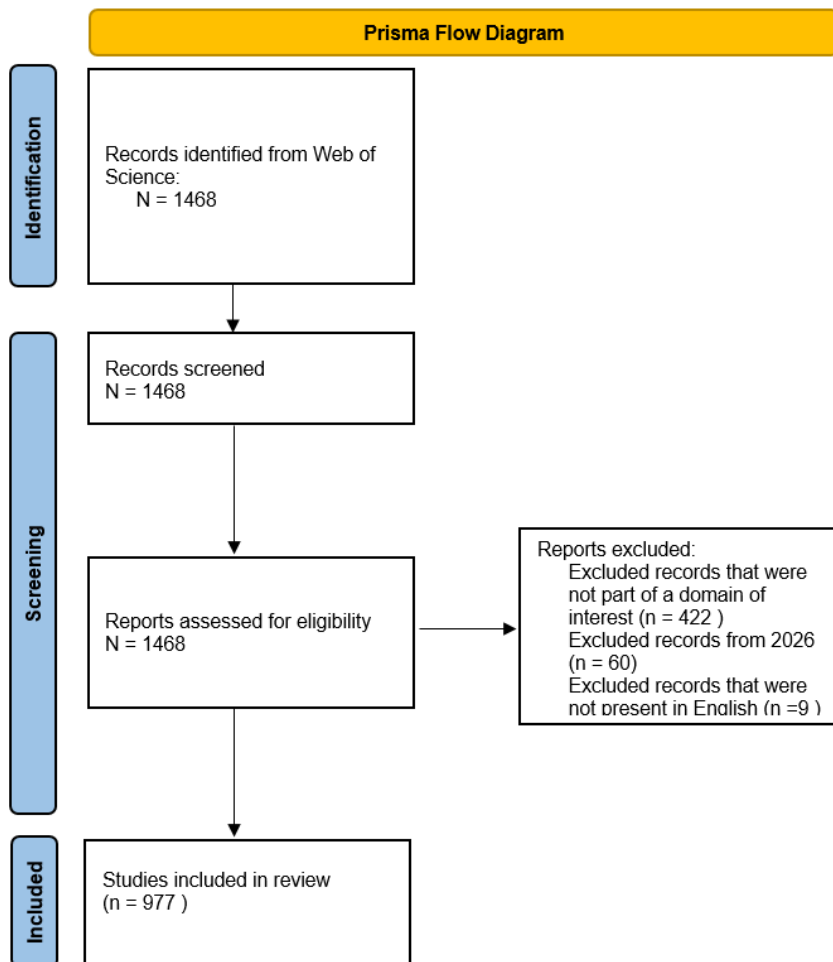


FIGURE 1. PRISMA FLOW DIAGRAM

Source: Page et al., 2021

The main data extracted from the analysis is presented in Figure 2, covering a 30-year period between 1996 and 2026. The annual growth rate was 9.9%, indicating the interest in this field shown by both researchers and private companies, and additionally, this can be correlated with the SEI percentages mentioned earlier in the article. During this interval, 977 documents were published, distributed across 408 distinct sources, such as journals or conference proceedings. This dispersion suggests a field with interdisciplinary dimensions. Moreover, the final data was collected between 18th of April and 20th of April 2026, and it was analysed in the following days after being collected.

A defining aspect of this field is its highly collaborative nature. No fewer than 3,428 authors contributed to the 977 documents, translating to a high average of 4.08 co-authors per paper. Individual work is a rarity, evidenced by the fact that only 75 authors published single-authored papers. Furthermore, the research frequently transcends national borders, with 25.9% of the documents being the result of international collaborations.

In terms of scientific impact, the field showcases excellent reception, with the papers recording an average of 23.29 citations per document; this high value demonstrates that the research is relevant and actively serves as a foundation for new studies. Additionally, the complexity and thematic diversity of the field are reflected by the massive number of keywords used by the authors (3,425) a number nearly equal to that of the involved researchers, suggesting a multitude of niches and a rich fragmentation of the topics addressed.

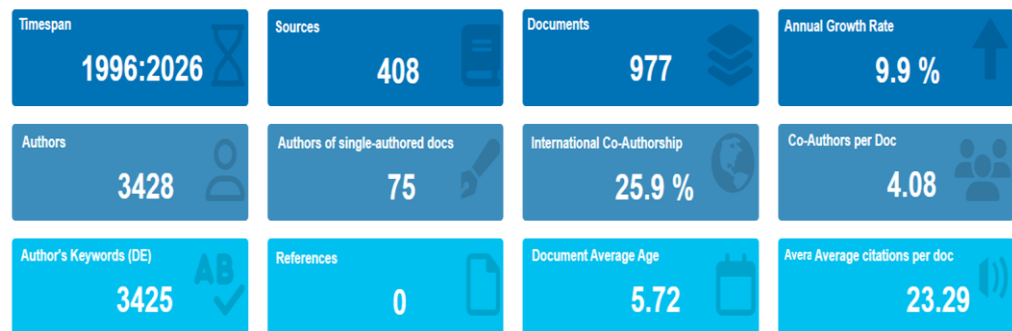


FIGURE 2. DATA OVERVIEW

Source: Author's own conceptualization

The following questions have been formulated based on the bibliometric analysis:

- Q1. What is the life-cycle of scientific production?
- Q2. Which journals are the most utilized and influential in the analysed field?
- Q3. What were the dominant keywords used?

4. RESULTS AND DISCUSSIONS

4.1 The life-cycle of scientific production

The evolution of the number of articles published annually in the analysed research field is represented in Figure 3. Analysing the trajectory of the line, we can distinguish four clear stages in the development and popularity of this topic within the scientific literature. During the first 15 years, the interest in this field was very low and linear. The number of articles published annually remained at a minimum level, a fact that could also be correlated with the ease of technology use by the private sector (smartphone infrastructure was not yet as advanced and accessible).

Starting in 2012, a first clear growth trend emerges. The slope becomes upward at a moderate but constant pace, with the publication volume gradually rising towards 30-40 articles per year. This indicates that the subject began to attract the attention of a larger part of the scientific community, with the trend likely having started as early as 2010. Starting in 2020, the line takes on an almost exponential trajectory, recording a steep increase. The absolute peak of publications is reached in the 2024-2025 period, significantly exceeding the threshold of 100 articles per year. This rapid ascent confirms previous conclusions that the field has gained major economic importance; one of the most relevant factors that helped propel the field was the COVID-19 lockdown, a fact that can be further confirmed later in the relevant keywords. It must be mentioned that even though the articles from 2026 were not included, the software still took the year into account.

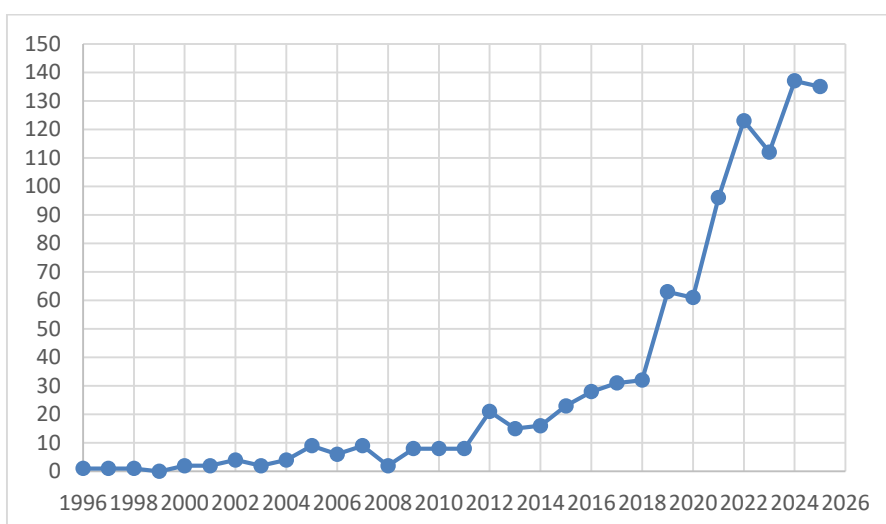


FIGURE 3. ANNUAL SCIENTIFIC PRODUCTION

Source: Author's own conceptualization

To evaluate the life cycle production of the field, a dashboard based on a mathematical model was used (Figure 4); the quality of the model is evaluated in the system as "good," with a coefficient of determination R^2 of 0.873. This means that the algorithm manages to explain over 87% of the variation in the historical data, providing us with a high degree of confidence in the accuracy of the diagnosis and the generated forecasts. It can be stated that the research field has already clearly passed its point of maximum academic interest; according to the model, the absolute peak of publications was reached in 2023, a period during which a maximum rate of 127 articles per year was recorded. The warning displayed in the key stages section explicitly highlights that the theme has entered the saturation phase, and the annual number of publications is decreasing. Thus, the visible decline after 2024 is not just the result of an incomplete dataset for the current year, but reflects a real and accelerated restriction of scientific activity on this subject. However, it must be mentioned that the subscription business model and its academic

interests might not be on the same trajectory as its niche fields, such as subscriptions in the agriculture/food industries, perhaps one of the most relevant themes regarding the evolution of subscriptions is how many niche fields have formed recently and how many have disappeared so far. It is also worth noting that the publications of 2026 were excluded due to unfinished or incomplete works, since at the time of writing the yearly journals are not yet out.



FIGURE 4. LIFE CYCLE OF SCIENTIFIC PRODUCTION I

Source: Author's own conceptualization

To visualize the life cycle, two complementary graphs were created (Figure 5 and Figure 6), the Gaussian bell curve of annual publications and the curve of cumulative growth, which confirm both visually and mathematically the previous statements, namely that we are dealing with a research niche that has already passed its maturity phase and has entered an accelerated decline.

The graph in Figure 5 (Life Cycle - Annual Publications) visually transposes the derivative of the logistic function, indicating the intensity of academic activity over time.

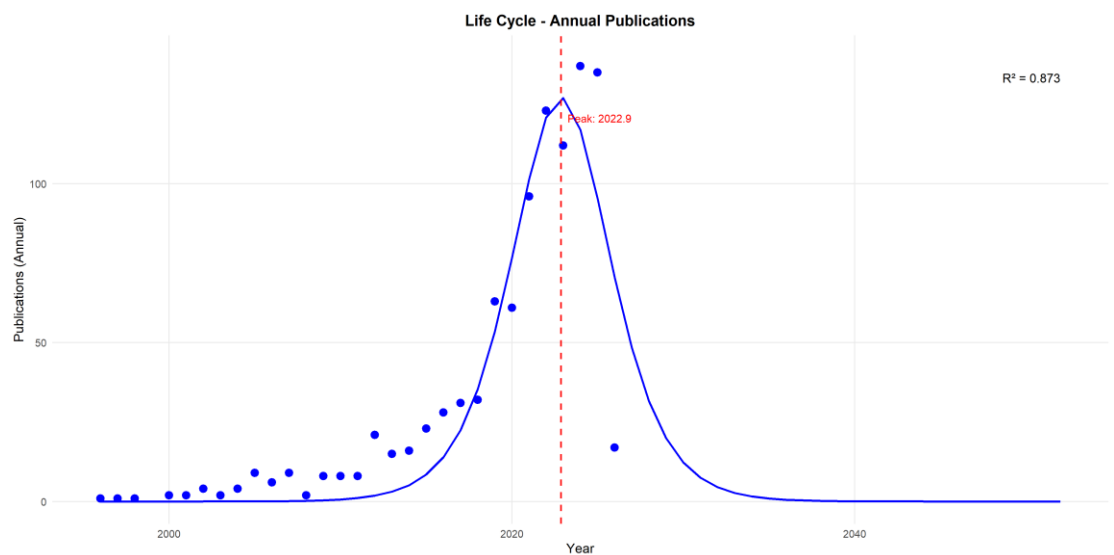


FIGURE 5. LIFE CYCLE OF SCIENTIFIC PRODUCTION II

Source: Author's own conceptualization

The blue line represents the model's fit to the observed historical data, while the vertical red dotted line marks the inflection point, meaning the peak year. The absolute peak of interest was reached at the end of 2022 (marked on the graph as 2022.9), with a maximum intensity of 127 annual publications. According to the model's interpretation principles, the fact that this peak point is in the past confirms that the subject has lost traction, a phenomenon clearly illustrated by the downward forecast that rapidly tends toward zero. In conformity to the best practices described in the documentation provided for the mathematical model, the current approach to this subject by new researchers is contraindicated, because obtaining results with a high degree of novelty is extremely difficult in an already saturated environment.

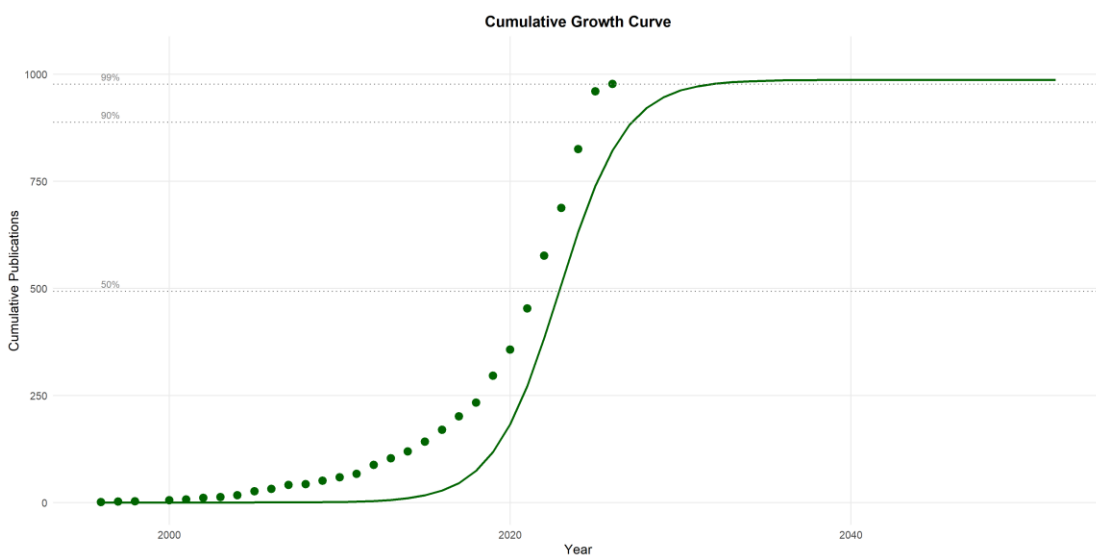


FIGURE 6. LIFE CYCLE OF SCIENTIFIC PRODUCTION III

Source: Author's own conceptualization

According to the methodology described by Aria and Cuccurullo (2017), the life-cycle analysis of scientific material publication uses a logistic growth model to track the dynamics of research themes over time. This approach allows for determining the current stage of a field, whether it is the emergence phase, rapid growth, maturity, or decline, and helps in predicting future trends.

To calculate publication dynamics and the saturation level, the equation $P(t) = K / (1 + \exp(-b(t - t_0)))$ is used. In this formula, $P(t)$ represents the cumulative number of publications at a given time t . The variable K indicates the saturation level, more precisely the maximum total number of publications that the subject will ever produce. The parameter b defines the growth rate, determining how steep the curve is, while t_0 represents the inflection point, meaning the moment when the growth rate is at its maximum level. By differentiating this function, the annual publication rate is obtained in the form of a bell-shaped curve, which reaches its maximum point at the time of inflection and gradually decreases as the field approaches the saturation level.

Based on this model, four fundamental indicators are extracted to interpret the data. The first is saturation K, which estimates the final volume of research; a value greater than 5,000 indicates a field of vast impact with long-term interest, whereas a value below 1,000 reflects a highly specialized niche theme. The second indicator is the peak year, representing the year in which annual production reaches its maximum capacity. If this year is in the future, the theme is still expanding and attracting the attention of the scientific community, and if it belongs to the past, the subject has reached maturity or has already entered a decline. The third indicator is the annual peak, which represents the maximum number of publications expected for that peak year, thus illustrating the intensity of academic activity and the concentration of resources. Finally, the fourth indicator is the growth duration. This estimates the time, expressed in years, elapsed from the emergence of the theme until the moment it reaches a level of near saturation.

4.2 Prolific and influential journals in the field

The most relevant publication sources for the field of food subscriptions are presented in Figure 7, ranking scientific journals according to the total number of published documents.

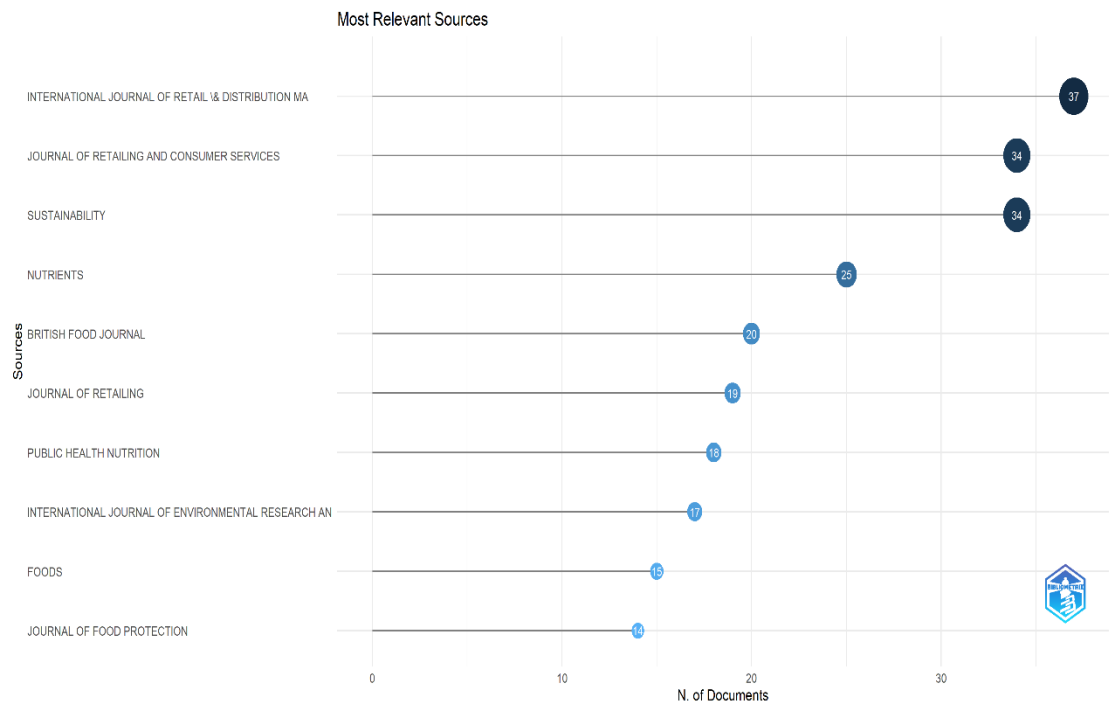


FIGURE 7. MOST RELEVANT SOURCES
Source: Author's own conceptualization

In first place in researchers' preferences is the "International Journal of Retail & Distribution Management," with the highest number of articles, specifically 37. This journal is closely followed by a group of two journals, the "Journal of Retailing and Consumer Services" and the multidisciplinary publication "Sustainability", both recording an equal volume of 34 scientific papers each. The concentration at the top

global crises. We can observe here the "covid-19" node positioned as a bridge, linking to terms that address the consequences of this type of commerce, such as "sustainability", "food waste", "health", "nutrition", and "obesity". This confirms that the impact of the transition to online grocery shopping is also being intensely studied from the perspective of public policy and its long-term effects on the population's health, including that of children.

The green group, positioned in the upper-left section, is dedicated to consumer psychology and the barriers to adopting new technologies. The key terms in this area, such as "satisfaction," "consumers," "trust", "acceptance", and "loyalty", gravitate around the concepts of technology and everyday shopping. This section of the literature attempts to decipher the attitudes and factors that drive people to trust digital platforms for the purchase of consumer goods and to remain loyal to them.

This thematic map, presented in Figure 10, divides the concepts of the research field into four distinct quadrants based on two dimensions: centrality (the horizontal axis) and density (the vertical axis). Centrality measures a theme's degree of relevance and its links to the rest of the field, while density indicates its degree of internal development. This visual representation helps us understand the specific role that each group of keywords plays in the overall architecture of the analysed scientific literature.

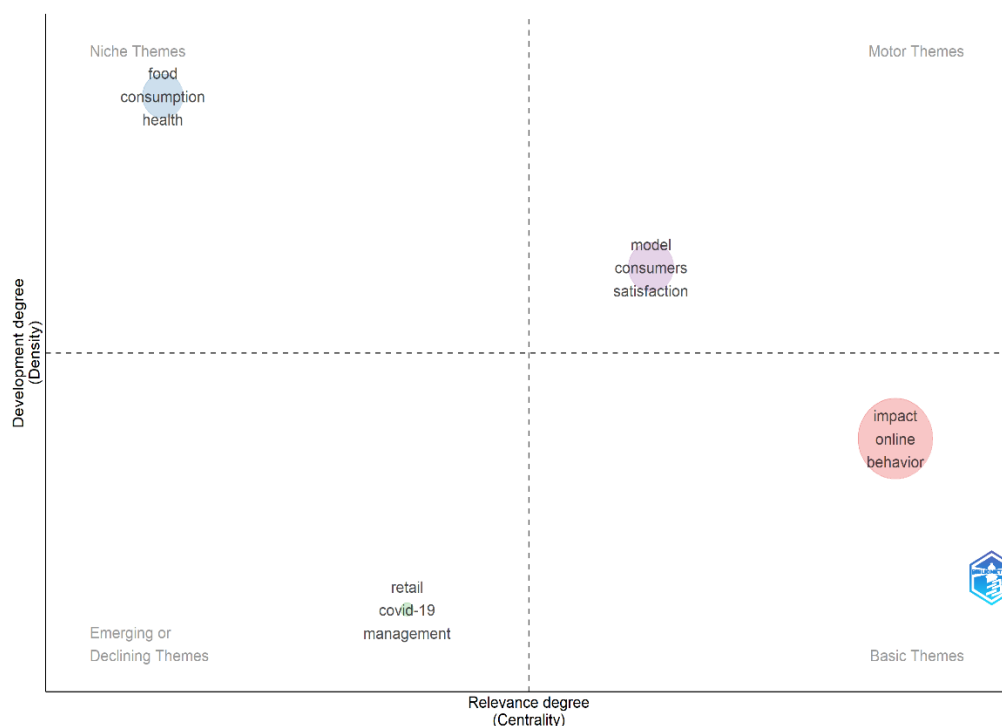


FIGURE 10. THEMATIC MAP

Source: Author's own conceptualization

In the upper-right quadrant, we find the motor themes, characterized by high relevance and high development. Here, we identify the cluster formed by the terms "model", "consumers", and "satisfaction".

This indicates that the study of consumer satisfaction and the creation of theoretical models to explain it represent a research direction that propels the field, being well-structured internally and absolutely essential to the academic community. Below this, in the lower-right quadrant, we observe the basic themes, where the largest bubble on the graph stands out, defined by the words "impact", "online", and "behaviour". These concepts have maximum centrality, being cross-cutting and fundamental to the entire field, but a lower density, which suggests they function as a general theoretical umbrella under which most research takes place, influencing all other branches without necessarily being a highly specialized niche.

Shifting our attention to the left side of the graph, we discover the niche themes in the upper-left quadrant, represented by the group "food", "consumption", and "health." These topics have high density, being very well developed and studied in depth internally, but they have low centrality, meaning they remain somewhat isolated from the mainstream. Essentially, they represent a highly specialized branch of the field, focused on medical and nutritional implications, which does not intersect as frequently with the rest of pure commerce studies.

Finally, in the lower-left quadrant are the emerging or declining themes, where we find the cluster consisting of "retail", "covid-19", and "management". Corroborating this marginal positioning (with both low development and low relevance) with the life-cycle analysis observed in the previous graphs, we can deduce that this cluster clearly represents a declining theme. The direct impact of the pandemic on retail management generated a massive explosion of publications during the crisis period, but now, with the return to normalcy and the exhaustion of innovation on this front, the topic has lost its momentum and has become peripheral in current and future scientific literature.

It must be mentioned that there is a major consistency surrounding the key words that appeared in most figures, words that managed to transcend different fields, from economics and management to health and social studies. Thematic mapping reveals significant interdisciplinary transcendence, linking retail management with public health, nutrition, and sustainability, food subscriptions are recognized not merely as commercial monetization tools, but as structural mechanisms altering urban logistics and dietary habits. Furthermore, the strong correlation between consumer psychology and digital architecture underscores the necessity for ethical interface design. The analysed literature explicitly warns against digital "dark patterns" which exploit cognitive biases to artificially inflate retention, resulting in spurious loyalty that remains highly vulnerable to market competition.

The bibliometric analysis confirms that the research field of food subscriptions has surpassed its maturity phase, with scientific interest peaking during the COVID-19 pandemic. As foundational operational logistics are now exhaustively documented, current academic discourse is decisively shifting toward post-adoption behaviours, particularly the psychological and financial impacts of subscription fatigue and cognitive overload.

Managerially, these findings require practitioners navigating a saturated market to fundamentally reassess their value propositions. To mitigate subscription fatigue, platforms must shift from aggressive acquisition toward optimizing Customer Lifetime Value through authentic loyalty. Integrating indirect benefits and exclusive ecosystem perks reduces the perceived financial burden and enhances consumer utility.

5. CONCLUSIONS

The current research brings essential theoretical contributions by contextualizing recurring revenue models within the high-frequency e-grocery sector. Through life-cycle bibliometric analysis, the study identifies a saturation point in academic interest, marking a distinct shift in focus from the immediate logistical impacts of the COVID-19 pandemic to complex consumer psychology issues, such as subscription fatigue.

From a managerial perspective, the findings provide actionable insights for food delivery platforms navigating a mature, highly competitive market. The study highlights the strategic risk of utilizing digital dark patterns to create artificial exit barriers, a practice that generates merely spurious loyalty. Consequently, practitioners must transition toward sustainable retention strategies that leverage convenience and exclusive ecosystem perks to mitigate consumer cognitive overload and foster authentic, voluntary loyalty.

Despite its rigorous approach, this study presents certain methodological limitations. Data extraction was restricted exclusively to the Web of Science database up to December 31, 2025, potentially omitting relevant literature indexed on alternative platforms. Furthermore, technical constraints within the Biblioshiny and RStudio software prevented the extraction of an extended, multi-platform reference list. Future research should adopt a multi-database methodology to explore emerging post-saturation niches within the broader food subscription economy.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work the authors used Grammarly and Google Gemini in order to correct the text and improve upon the coherence of the language used. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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