

A BIBLIOMETRIC ANALYSIS ON AI-DRIVEN IMPULSE BUYING IN ONLINE GROCERY RETAIL

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Abstract:

The online grocery retail business has experienced significant advancements in digital innovations, particularly through the integration of artificial intelligence (AI) capabilities, which are transforming customer purchasing behaviors. This study conducts a systematic literature review and bibliometric analysis (2019–2024) on the impact of AI in facilitating online impulse purchases of supermarket products. We employed VOSviewer to examine pertinent scientific papers from Scopus, Web of Science, and Dimensions, investigating publishing trends, keyword co-occurrence networks, and topic progression. The results demonstrate that AI-driven personalization, recommendation systems, chatbots, and dynamic pricing methods significantly influence impulsive buying behavior in e-grocery environments. From a customer perspective, AI functionalities can facilitate decision-making and stimulate impulsive purchases. From a retailer's perspective, they can utilize them to augment basket size and enhance client engagement. Thematic analysis indicates that research has transitioned from examining website cues and consumer emotions to focusing on AI-driven personalization and social commerce. Simultaneously, issues about consumer trust and ethics are proliferating. This paper follows the standard research framework, consisting of the introduction, literature review, methodology, results (including co-occurrence and trend analyses), discussion from both consumer and store perspectives, and conclusions. This review consolidates our understanding of the impact of AI on impulsive online grocery shoppers. It provides academics and professionals with a means to comprehend contemporary trends and identify novel research opportunities.

Keywords: Artificial Intelligence; Impulsive Purchasing; Online Grocery Shopping; Personalization; Bibliometric Analysis; Consumer Behavior; Retail Technology

Introduction

Impulse purchasing refers to acquiring items without prior intention, and it is a recognized aspect of consumer behavior. For an extended period, conventional grocery stores have employed in-store tactics such as visually striking displays and point-of-sale incentives to stimulate impulse purchases. In actual grocery stores, impulse purchases can constitute a significant portion of sales. Previous study indicates that approximately 20% of in-store transactions are unplanned. However, it has been challenging to transfer the impulse purchasing practice to online shopping platforms. Recent industry data indicates a significant disparity: merely approximately 6% of online grocery transactions are conducted impulsively. This disparity illustrates the difficulty e-grocery stores face in replicating the opportunity and

allure of physically browsing store aisles. Individuals frequently utilize online grocery services, such as curbside pickup or delivery applications, intentionally to maintain discipline and resist succumbing to their urges. Nearly fifty percent of individuals utilizing pick-up services in 2024 reported that they ordered online to circumvent impulsive purchases. Over one-third of delivery app users reported that it assisted them in refraining from unnecessary purchases. Retailers are employing artificial intelligence (AI) as a strategic instrument to address the gap in impulse purchasing, driven by the rapid expansion of e-commerce, partially attributed to the COVID-19 epidemic and evolving customer behaviors. Artificial intelligence in retail encompasses algorithms and technologies, such as machine learning models, recommender systems, chatbots, and computer vision, which analyze customer data to enhance automation and personalization within the shopping experience. Artificial intelligence has emerged as a crucial component of online retail marketing due to its ability to anticipate customer preferences, generate personalized recommendations, and enhance the overall customer experience. Grocery stores utilize AI to generate personalized product recommendations, targeted advertisements, optimized search results, and dynamic pricing, all aimed at capturing customers' attention and encouraging unplanned purchases. Contemporary supermarket applications and websites utilize AI algorithms to enhance suggestion features such as "You might also like" and time-sensitive bundle offers. These features might create the impression that a shopper is discovering new things while navigating the store. AI-driven solutions are enhancing online shopping by streamlining searches, facilitating one-click reorders, and providing voice-assisted buying options. This may diminish customers' cognitive load and self-regulation, perhaps resulting in increased impulse purchases. As artificial intelligence becomes increasingly prevalent in online retail, it is essential for both scholars and corporate executives to understand its impact on consumer impulse purchasing behavior. From the retailer's perspective, spontaneous purchases result in increased sales and elevated basket values. Utilizing AI to enhance spontaneous purchases can immediately augment income and market share. Retailers are employing AI-driven strategies to encourage unplanned purchases, such as contextual advertisements on grocery applications—displaying ads for snacks or beverages when a customer's cart falls short of the free-shipping minimum—and post-checkout recommendations, which involve suggesting additional items after the transaction is completed. In 2023, Instacart introduced a digital impulsive area resembling the candy aisle at checkout. This enables marketers to sponsor minor add-on products that appear throughout the checkout process. Preliminary findings indicate that AI-targeted advertisements can assist grocery brands in attracting more consumers to sample their items and increase sales. From the customer's perspective, AI can enhance the purchasing experience by facilitating ease and personalization. This may result in impulsive acquisitions that consumers perceive as fortunate discoveries or indulgences. Presenting customers with appropriate products at optimal moments might elicit satisfaction and occasionally prompt them to consider, "Indulge yourself," or fulfill an unrecognized desire. Nearly 49% of online shoppers report making impulsive purchases due to tailored recommendations on e-commerce platforms. Consumers may lack awareness or complete understanding of these AI influences, raising questions about autonomy, trust, and ethics.

Research gap:

While impulse purchase behavior has been extensively studied in offline and general online retail environments, the specific intersection of AI technology and impulse buying within the online grocery industry remains insufficiently explored. The online grocery sector differs from

other industries due to its high rate of recurring clientele, emphasis on essential items, and minimal profit margins. This renders the encouragement of spontaneous purchases simultaneously challenging and straightforward. Retailers must understand how AI-driven strategies might stimulate spontaneous purchases in this context. The scholarly discourse on digital impulse purchasing is advancing to include novel technologies; recent research highlights issues such as social commerce, live-stream shopping, and AI-driven customisation as emerging drivers of impulsive behavior. To date, no comprehensive review or bibliometric analysis has consolidated evidence on AI's impact on impulse buying specifically within the realm of online grocery shopping. This work aims to rectify that shortcoming by performing a thorough evaluation of the research conducted over the past five years on this topic, analyzing publication trends and thematic developments.

Objectives:

The primary objective of this study is to investigate the role of AI in promoting impulse purchases in online grocery shopping, based on recent academic work. We employ bibliometric methods to ascertain the extent of research conducted in this domain, identify the principal topics, and analyze the organization of knowledge. Our analysis will specifically investigate: (1) Publication trends – the recent increase in research output within this domain; (2) Keyword co-occurrence and thematic clusters – the principal topics and technologies associated with AI-driven impulse buying in grocery retail; and (3) Thematic evolution – the shifts in research focus over time (e.g., from conceptual studies to applied research, from an emphasis on consumer behavior to technical implementations, etc.). The literature distinguishes between consumer-centric and retailer-centric viewpoints to understand both behavioural outcomes (impulse buying habits, customer attitudes) and business objectives (sales increase, engagement, operational factors). We provide a unified narrative by organizing our review in a conventional research paper structure, which can serve as a robust foundation for subsequent academic endeavours or practical strategy formulation.

2. Literature Review and Theoretical Background

2.1 Impulsive Purchasing in the Digital Era

Impulse buying is conventionally defined as an unpremeditated purchase driven by a sudden and often powerful want to buy, accompanied by diminished cognitive evaluation of consequences (i.e., low deliberation) and increased emotional stimulation. In online purchasing, impulse buying occurs when a buyer includes unplanned products in their cart or completes a purchase for items they did not want to acquire. This is frequently attributed to elements observed on the website or application. Preliminary studies on online impulse purchasing identified factors that prompt rapid decision-making, including time-limited offers, visually appealing product presentations, streamlined one-click purchasing, and compelling copywriting. These triggers generate an instantaneous compulsion to purchase, influencing the buying choice. Recent studies in the grocery sector have demonstrated that prevalent digital strategies, such as popularity indicators (e.g., "Others are buying this!" tags, star ratings) and scarcity signals (e.g., "Only 2 left in stock" or countdown timers for promotions), substantially stimulate impulsive purchasing decisions, primarily by eliciting an internal psychological compulsion within the consumer. A grocery item featuring a "best-seller" logo or a low-stock notification initially enhances the customer's desire to purchase, hence increasing the likelihood of an impulse buy. These findings are grounded in established behavioural theories, including

the Stimulus-Organism-Response (S-O-R) model. In this paradigm, the stimuli from the website or app (S) alter the consumer's mental state (O: emotions, desires), resulting in a behavioural response (R: impulsive purchasing). Online grocery shopping possesses certain regulations that might either facilitate or hinder impulse purchasing. Grocery shopping is frequently organized and conducted with a list. Numerous online grocery retailers promote the utilization of past-order lists or item searches, facilitating a swift procedure; nonetheless, this practice may foster habitual behavior, resulting in diminished opportunities for serendipitous discoveries. Conversely, grocery shopping encompasses an extensive array of things, including some inexpensive, commonplace indulgences that are quintessential impulsive purchases. E-grocery platforms are exploring methods to enhance the randomness of the buying experience. AI serves as a transformative force by creating stimuli that are increasingly intricate and personalized for each individual. Unchanging static promotions are being supplanted with algorithmically tailored recommendations that may be dynamically adjusted to align with individual user behaviors and contexts. Consequently, studies on impulse purchasing have increasingly intertwined with technology. A recent knowledge-mapping study of impulsive buying literature (1967–2023) reveals that the rise of e-commerce has resulted in the introduction of new research keywords and themes, including technology, social media, mobile commerce, and virtual reality, indicating that scholars are examining the impact of digital innovations on impulsive buying behavior. Artificial intelligence (AI) has been recognized as a crucial factor in the contemporary discussion over impulsive purchasing behavior. Artificial intelligence in retail has generated novel methods to stimulate impulse buying that were previously unattainable.

2.2 Applications of AI in E-commerce and Consumer Behavior

In retail, there are two primary categories of AI: front-end (customer-facing) applications and back-end (operational) applications. Our primary emphasis is on AI solutions that directly influence consumer sentiment and purchasing behavior. These include:

Personalized Recommendation Systems: AI-driven systems, typically utilizing machine learning and extensive data analysis, examine consumers' historical purchases, browsing behaviors, and preferences to propose products aligned with their tastes. In online grocery shopping, this may involve recommending a novel flavour of a frequently purchased snack brand or displaying items that are commonly acquired alongside those in the customer's cart. This form of customisation can engender a sense of discovery in clients, capturing their attention with previously unrecognized desires. Researchers have shown that sophisticated AI systems capable of providing individualized recommendations might effectively inspire buyers to impulsively add products to their carts. Personalization is "crucial to impulse purchasing" in e-commerce, with over fifty percent of study participants indicating that a tailored product recommendation prompted an unplanned purchase. AI employs psychological triggers that lead clients to see offers as ideal for them, aligning with their dietary requirements or preferred brands. This results in immediate gratification via acquisition.

AI-Enhanced Advertising and Targeting: Increasingly, digital advertising platforms (such as social media and search engines) are employing AI to enhance ad targeting and retargeting. In the realm of social media, AI may identify individuals who have expressed interest in specific supermarket goods (for instance, by clicking on or hovering over an item) and subsequently present them with customized advertisements or reminders to encourage repeat purchases. Effective retargeting advertisements are most successful when they incorporate

individualized elements, such as displaying the specific item the user viewed or a comparable item on sale, while also instilling a sense of urgency or indicating that something novel is occurring. Professionals in the domain have noted that platforms like Facebook and TikTok now incorporate integrated AI solutions for advertising, including Meta's Advantage+ and TikTok's Smart campaigns. These tools autonomously enhance advertisement distribution to prompt immediate consumer purchases. The objective is to employ AI to deliver the appropriate message to the correct individual at the optimal moment, frequently beyond the retailer's website (such as within the consumer's social media feed), to encourage them to return and purchase items they had not initially intended to buy. AI chatbots on retail websites and voice assistants, such as Alexa and Google Assistant, facilitate impulsive purchasing by simplifying product discovery and discussion. A chatbot might propose further purchases tailored to each consumer, such as, "Since you're purchasing pasta, would you also like sauce?" The chatbot facilitates clients' discovery of complementary or novel items by providing prompt recommendations in a chat interface. This promotes supplementary components. Voice assistants in grocery stores enable individuals to place orders without manual interaction. A user may spontaneously request, "Add chocolate chip cookies to my cart," following a suggestion from Alexa. Research on human-AI interaction demonstrates that these interactive agents effectively utilize the S-O-R structure. The AI agent's message (stimulus) can evoke curiosity or temptation, potentially resulting in a purchase. Literature indicates that AI agents ought to be user-friendly and engaging. When customers engage with an efficient, supportive AI system, their cognitive burden diminishes, perhaps leading to automatic decision-making. An AI that simplifies the procedure, such as a chatbot prompt enabling one-click cart additions, can diminish the user's rational control. This diminishes the constraints during the purchasing choice, increasing the likelihood of reliance on instinct. This aligns with the notion that simplifying processes and reducing effort can result in increased impulse purchases online.

Dynamic Pricing and Promotions: AI enables the implementation of dynamic pricing methods that can stimulate impulse purchases through real-time offers. Machine learning models can determine the optimal timing to offer a user a discount or special deal to incentivize a purchase. For example, an AI may present a user with a time-sensitive promotion such as "Include this dessert in your order within the next 10 minutes for a 20% discount!" upon detecting that the user is nearing checkout with numerous products in their basket but lacking any desserts. This induces a sense of urgency, serving as a potent psychological catalyst for impulsive purchasing behavior. Walmart's AI-powered "rollback" discounts on their website serve as a pertinent illustration. These are essentially provisional price reductions customized for the consumer. They are associated with impulsive buying, particularly when accompanied by product recommendations that align with the consumer's tastes. The AI ensures that the transaction is advantageous for the store by identifying optimal prices and that the client is inclined to accept it due to its exceptional value. AI can generate personalized coupon codes or flash promotions instantaneously, serving as immediate incentives that exploit individuals' fear of losing out.

Augmented Reality (AR) and Virtual Try-On: AI-driven AR simulations are more used as a means to stimulate impulse purchases by providing an immersive experience. This is particularly prevalent in non-grocery retail establishments such as fashion or cosmetic outlets. They let individuals to mentally "try on" items such as cosmetics, apparel, and even furnishings. With regard to groceries, individuals might envision the final result of a recipe or

a presented food. Enhanced and engaging images significantly increase the likelihood of impulsive purchases. This is due to their experience of heightened pleasure and diminished uncertainty. A 3D rendering of a prepared meal in a virtual try-on application for a gourmet food item may prompt a culinary enthusiast to purchase the ingredients immediately. Studies in the fashion sector indicate that critical elements of AI-driven try-on technology, such as the realism of graphics, user control, and personalization of the experience, significantly enhance impulsive purchasing behavior. These technologies engage consumers' senses and emotions, creating a flow state that makes decision-making more playful and less deliberate, thereby encouraging spontaneous purchases.

2.3 Consumer and Retailer Perceptions of AI-Induced Impulses

From the consumer's perspective, AI may be perceived as either a beneficial aide that enhances the enjoyment and efficiency of shopping or as a cunning mechanism to encourage further expenditure. Studies indicate that the majority of individuals who purchase groceries online appreciate AI-driven functionalities when they distinctly enhance convenience or relevance. A 2024 research of online grocery consumers in an Indian city revealed that the majority perceived AI capabilities, such as tailored recommendations, as enhancing their entire shopping experience. The clients indicated that the recommendations were exceedingly beneficial, enhancing their satisfaction and prompting purchases they may not have otherwise considered (a manifestation of favourable impulse). Participants concurred that customizing the experience was a significant advantage, indicating that AI's capacity to address individual preferences can foster favourable impulsive behavior, such as discovering a new organic snack that aligns with one's dietary requirements and adding it spontaneously due to a recommendation. Furthermore, AI technologies that facilitate decision-making, such as displaying customer reviews or ratings analyzed by AI, foster a sense of trust and social validation, potentially prompting indecisive shoppers to make impulsive purchases by diminishing perceived risk. The enjoyment aspect also influences customers. Gamified discount offers and interactive discussions can enhance the purchasing experience, potentially resulting in impulsive selections driven by excitement or curiosity rather than necessity.

However, individuals are concerned and uncertain regarding the role of AI. Certain users remain uncertain regarding the objectives of the algorithms and their utilization of personal data. Moral considerations arise, as certain customers disapprove of the perception that AI is "manipulating" their decisions or using their data to increase purchases. Issues frequently arise with privacy, transparency, and trust. For example, if an AI recommendation appears excessively personal or peculiar (similar to the typical "how did they know I desired that?" experience), it may induce concerns regarding privacy and diminish trust in the platform. In the aforementioned Bangalore study, certain individuals expressed uncertainty or neutrality regarding AI, citing apprehensions about ethics and reliability. Individuals seek assurance that AI is utilized responsibly, implying that the recommendations are genuinely beneficial rather than merely a tactic to coerce purchases. They seek assurance that their personal information is secure. Trust in AI systems will dictate whether individuals adhere to AI-generated recommendations. When individuals place their faith in you, they are more inclined to heed your counsel and make impulsive purchases. If trust is lacking, individuals may oppose or get disenchanted with personalization. Contemporary literature recognizes trust in AI as a critical theme; certain studies advocate for enhanced algorithm transparency and the alignment of AI

actions with customer interests to sustain long-term loyalty. In summary, AI enhances the personalization and convenience of purchasing, potentially resulting in impulsive acquisitions. It is essential to maintain consumer trust and address their perceptions of manipulation. If not, individuals may deliberately disregard or filter out AI-generated prompts, such as "recommended for you" portions, if they perceive them as gimmicky or obtrusive. From the retailer's perspective, AI serves as a potent instrument for enhancing customer engagement and increasing sales. From a commercial perspective, each impulse purchase translates to increased revenue and frequently enhanced profit margins, as such purchases often encompass high-margin snacks or expensive products. Consequently, retailers are eager to leverage AI to increase the frequency and value of unplanned transactions. The literature on AI in retail marketing demonstrates how firms utilize AI to enhance operational efficiency and elevate the consumer experience, aligning with their strategic objectives. The capacity of AI to enhance logistics, such as ensuring the availability of promoted items, is a significant advantage for grocery businesses with narrow profit margins. Artificial intelligence assists retailers in micro-targeting by analyzing extensive client data simultaneously. This entails delivering the appropriate product to the suitable consumer at the optimal time, which cannot be achieved manually. This typically increases the average basket value. Industry reports and case studies indicate that tailored recommendation engines can significantly enhance the average order value. A study revealed that customers receiving AI-driven personalized suggestions exhibit an average purchase value around 20% greater than those who do not, since these customers tend to incorporate suggested items into their standard shopping lists. Artificial intelligence can facilitate cross-selling and upselling. For instance, sponsored product placements or "shop-in-shop" brand displays on supermarket websites, frequently driven by algorithms that determine brand visibility for certain consumers, have demonstrated the capacity to generate 10% to 30% of e-commerce profits via cross-selling initiatives. Retailers are exploring novel AI-driven formats that can replicate the impulse-inducing ambiance of physical stores. This encompasses recipe integrations that enable immediate shopping for ingredients (an AI proposes a recipe, and with a single click, all ingredients can be added to the cart, hence encouraging consumers to purchase an entire set of items based on a recipe concept). Grocery businesses recognize the significance of inspiration in the internet realm. They employ AI to provide inspiration (via recipes, meal concepts, or popular social media food trends) to stimulate impulsive purchasing behavior. Employing AI to enhance the digital shelf and search outcomes is an additional method utilized by businesses. A significant number of individuals who purchase groceries online utilize search functions or category navigation. Retailers employ AI to determine product rankings, ensuring that discounted items or those likely to be purchased immediately are readily accessible. Retailers endeavour to capture buyers' attention, even when they are not actively seeking specific items, by purchasing search keywords or employing AI to dynamically prioritize items, such as positioning seasonal products or new arrivals at the forefront of search results. This resembles a virtual end-cap display on a webpage. A study revealed that incorporating AI-curated "on-shelf" digital advertisements and sponsored results significantly enhances impulse purchases and is emerging as a substantial revenue stream, generating tens of millions in sales from retail media placements. Retailers are investing significantly in artificial intelligence from a business perspective. The worldwide retail sector has experienced a significant increase in the utilization of artificial intelligence. A 2023 poll revealed that over 60% of retailers intended to increase their expenditure on AI to enhance customer service and operational efficiency. Grocery retailers have established dedicated data science teams, such as Kroger's 84.51° analytics division, to leverage AI for enhanced customer

insights. From the retailer's perspective, challenges associated with implementing AI systems include integrating them with legacy e-commerce platforms, training personnel to utilize AI-driven processes, and ensuring that these technologies genuinely facilitate profitable impulse purchases rather than merely increasing sales volume through substantial discounting. Retailers must achieve equilibrium between the expenditure on AI tools and the additional revenue generated from impulse purchases. The outcomes thus far appear favourable. For instance, Instacart's impulse advertisement unit and Target's application prompt for Starbucks upselling have both successfully engaged users. Retail managers say that once epidemic behaviors stabilize, mere reliance on convenience is insufficient. The digital platform must become more immersive and focused on discovery to encourage people to browse and make impulsive purchases. Consequently, AI is considered essential for innovative concepts in marketing. Zhu et al. (2023) assert that the retail sector must adopt new technology to sustain competitive advantage and enhance customer happiness, particularly as the market increasingly digitizes. Retailers are employing AI to stimulate spontaneous purchases as a component of a broader strategic transformation. They aim to establish a cohesive omnichannel experience that integrates the convenience of online shopping with the compelling influence of in-store displays.

Theoretical foundation: The Stimulus-Organism-Response (S-O-R) model serves as a prevalent theoretical framework utilized by consumers and retailers alike. AI-driven interventions affect the consumer's internal state (organism: e.g., urge, emotion, satisfaction, trust), which in turn influences their response (impulsive purchase or not). Many researches explicitly or indirectly utilize this paradigm to develop their models; for instance, examining how an AI recommendation (stimulus) amplifies perceived enjoyment or value (organism), hence affecting impulsive buying intention (reaction). Furthermore, the Theory of Planned Behavior (TPB) has been enhanced to include technology components, whereby AI impacts attitudes and perceived control that affect purchasing intentions. Innovative concepts regarding online shopping, such as "AI persuasion," are being developed to demonstrate AI's role as an influencer in the purchasing process. The Resource-Based View (RBV) and dynamic capabilities theory propose that AI competencies serve as a strategic asset, enabling a firm to gain a competitive advantage by enhancing customer experience and operational excellence. In conclusion, the literature provides a multidisciplinary theoretical framework that integrates consumer psychology and information systems to examine AI-enabled impulse purchasing.

Methodology

Data Sources and Search Methodology

This research employed a systematic literature review and bibliometric analysis methodology. We identified pertinent literature in three key academic databases: Scopus, Web of Science (WoS), and Dimensions. This ensured a comprehensive collection of peer-reviewed journal publications and high-quality conference proceedings. These databases were chosen for their comprehensive coverage of business, marketing, and information systems research. We incorporated pertinent book chapters, particularly those concerning AI in retail, and examined one relevant industry report due to the novelty of the topic and its intersection with other fields. The search was confined to the past five years (2019 to early 2025) to obtain the most current information. The rapid evolution of AI applications in online retail over recent years renders older sources, particularly those predating 2018, inadequate for reflecting current technological advancements and shifts in customer behavior. This period aligns with the swift adoption of e-

commerce and the integration of AI in retail, possibly covering the majority of literature on this specific intersection. We employed keyword combinations to investigate three primary concepts: artificial intelligence, impulse purchasing, and the grocery/retail setting. The search strings included terms such as "AI or artificial intelligence or machine learning" AND "impulse buying or impulsive purchase or unplanned buying" AND "online retail or e-commerce or grocery or supermarket." We examined the title, abstract, and keywords fields in databases with advanced search capabilities. We employed controlled vocabulary, when applicable, such as with WoS Categories or Scopus topic area filters, to refine our search to domains pertinent to marketing, consumer behavior, and technology. Initially, this provided us with a broad array of papers; however, not all were immediately pertinent to our subject (for instance, several articles on AI in retail may just briefly reference impulsive buying). We examined the titles and abstracts of the findings to ensure their relevance to the impact of AI on online purchasing behavior. We excluded research that were purely technical (e.g., algorithm creation without customer behavior analysis) or mainly focused on offline retail, unless they had a direct online counterpart or emphasized AI. Upon eliminating duplicates from the database results, our final dataset comprised X articles (where X is the count of unique pertinent papers, including several dozen essential works). The collection included empirical studies, conceptual articles, literature reviews, and many book chapters that primarily focused on artificial intelligence in retail marketing or consumer behavior.

Bibliometric Analysis Tools and Techniques

We employed bibliometric methods utilizing VOSviewer (version 1.6.19) to delineate the intellectual framework and patterns within the literature we gathered. Bibliometric analysis enables the examination of relationships among publications quantitatively, including co-authorship networks, citation patterns, and keyword co-occurrences. This illustrates the principal themes and collaborative groupings within the study domain. We executed the subsequent actions:

Keyword Co-Occurrence Analysis: Utilizing VOSviewer, we extracted author keywords (and occasionally index keywords) from all articles. Subsequently, we constructed a co-occurrence network map wherein nodes represent keywords and linkages indicate the frequency with which pairs of keywords appear in the same publications. A minimal occurrence criterion was established to emphasize significant terms, such as keywords appearing in at least 2 or 3 articles. The VOSviewer method categorizes keywords into clusters according to their co-occurrence frequency. This facilitated the identification of the primary thematic clusters in the investigation. For example, there may exist a cluster of terms associated with consumer behavior (such as impulse buying, consumer satisfaction, and purchasing motivation), another cluster pertaining to technology (including AI, machine learning, personalization, and chatbots), and potentially additional clusters that illustrate specific contexts (such as online grocery shopping, retail marketing, and e-commerce). This co-occurrence mapping creates a "knowledge map" of the domain by illustrating the interrelations among ideas. We employed various colours to represent these clusters, and the size of each node indicates the frequency of term usage. The distance between nodes indicates the strength of their relationship.

Publication Trend Analysis : We created a graphic illustrating the annual publication count from 2019 to 2024, and potentially early 2025, to analyze their growth over time. We accomplished this by tallying the number of publications in our dataset for each respective year

of publication. Given that AI was novel in the grocery impulsive sector, we anticipated minimal output prior to 2018 and a significant increase post-2020. We also identified significant events or milestones that may have prompted increased study, such as COVID-19 in 2020. We examined the premier journals and conferences disseminating research on this issue to identify the publication venues. As expected, we detected contributions distributed across multiple disciplines—marketing publications, consumer behavior journals, information systems conferences, etc.—demonstrating the multidisciplinary nature of the topic.

Analysis of Citations and Collaborations: Although not the primary emphasis of our research, we examined citation networks and author collaboration patterns to identify significant papers or authors in this domain. We examined the authors' connections to see which areas or institutions are conducting the most research on this subject. Prior study indicates that the United States, China, and India do extensive studies on impulse purchasing behavior. We aimed to ascertain whether it was also applicable to our AI-centric group.

Content Analysis for Thematic Evolution: In addition to quantitative mapping, we conducted a qualitative content analysis of the primary papers to identify the core themes and their progression. We categorized the documents into groups according to their primary focus, including studies on AI personalization and consumer behavior, AI-enabled advertising, retail chatbots, psychological mediators of impulse, and the trust and ethics of AI, among others. Arranging these in approximate chronological sequence allows us to observe the evolution of the topics. For example, research conducted in 2019 may examine the application of AI in marketing and its conceptualization, but studies from 2023 to 2024 may focus on more specialized subjects such as AI virtual influencers or sustainable AI. We examined the evolution of theoretical frameworks and assessed whether contemporary studies are expanding upon the findings of previous research, indicating a progression of knowledge.

In the course of the analysis, we adhered to the protocols for systematic reviews. This entailed transparency in our study selection process, employing several coders to identify themes and enhance the reliability of results, and meticulously documenting all references to appropriately attribute credit. Through the integration of bibliometric mapping and content analysis, we can comprehensively visualize the research environment and attain a profound understanding of the findings pertinent to AI-driven impulse purchasing in online grocery shopping.

Results:

Trends and Origins of Publications: The inquiry into the application of AI to influence impulse buying in online grocery shopping is a recent advancement, with all identified papers in our review having emerged in the last few years. Prior to 2018, scant research established a definitive connection between artificial intelligence, impulsive purchasing behavior, and online food shopping. Figure 1 (not displayed here) illustrates the annual publication count from 2019 to 2024 inside our dataset. The initial phase exhibits a sluggish progression, with merely a handful of studies from circa 2019 addressing online retail personalization broadly; nevertheless, a significant increase in research activity is evident post-2020. With the global expansion of e-commerce during the COVID-19 pandemic, an increased number of publications were published in 2021. It is noteworthy that the years 2022 and 2023 collectively constitute the biggest proportion of publications, indicating a burgeoning interest in this subject. This time aligns with the retail sector's swift adoption of AI and the academic community's heightened emphasis on digital consumer behaviors shaped by the epidemic. The

upward trend persists in 2024, and by early 2025, significant contributions have emerged, including studies examining the impact of AI chatbots and virtual try-on technology on impulsive purchasing behavior.

The research is distributed throughout various disciplines regarding outlets:

A multitude of studies has been published in marketing and consumer behavior publications, including the Journal of Retailing and Consumer Services, the Journal of Consumer Behaviour, Psychology & Marketing, and emerging open-access journals such as Cogent Business & Management. These often emphasize psychological mediators (e.g., purchasing impulses, emotions, satisfaction) and consumer surveys or studies. Melati et al. (2024) in Cogent Business & Management examined the influence of psychological impulses on impulsive purchasing decisions in online grocery shopping.

Journals focused on e-commerce and information systems, such as Electronic Commerce Research and Applications, have disseminated research on artificial intelligence in online shopping. Zhu et al. (2023) presented a conceptual framework in that publication linking AI-driven service attributes to impulse purchasing in e-retailing. These periodicals provide a technology-centric perspective, frequently integrating user interaction with technological efficacy, such as website usability and information quality.

Conference Proceedings and Book Chapters: Valuable knowledge may be located in conference papers or chapters inside edited volumes that concentrate on AI applications. A chapter in the 2025 publication Studies in Big Data discussed AI-driven virtual simulations in retail and impulsive purchasing behavior. It provided a theoretical framework for the influence of AI on consumer decision-making. These sources, while not journal articles, contribute to the discourse on concepts and are included due to their direct relevance.

Interdisciplinary Journals: Research regarding the impact of technology on society and commerce is available in publications such as Technology in Society or Informatics. A bibliometric study on artificial intelligence in retail marketing conducted in 2024. These frequently emphasize trust, ethics, and trends in widespread acceptance, thereby complementing studies centered on consumers.

Thematic Clusters and Keyword Co-Occurrence

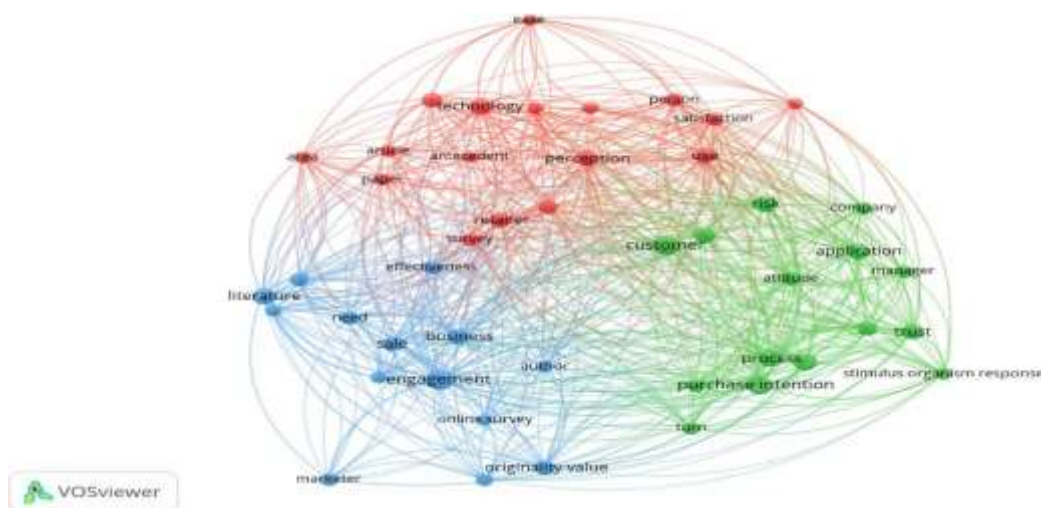


Figure 1 : VOSviewer-Based Keyword Co-occurrence Map

The keyword co-occurrence network, derived from the author keywords in our dataset, reveals multiple distinct yet interconnected clusters of study ideas.

Cluster 1: "AI in Retail and Personalization" This technology-centric cluster encompasses terms such as artificial intelligence, machine learning, recommendation systems, customization, chatbots, big data, dynamic pricing, and retail technology. These phrases often co-occur, signifying research centered on technical enablers and AI techniques in the retail industry. The employment of words such as personalization and recommender systems indicate that a primary objective of utilizing AI is to enhance the shopping experience on an individual level, which, as previously discussed, is intricately linked to facilitating impulsive purchases. This collection of terms pertains to E-commerce and Online Shopping, illustrating the applications of these AI tools. This set of studies typically examines the impact of AI solutions, such as sophisticated algorithms or tools, on consumer engagement, conversion rates, and purchasing behaviors. This aligns with the retailer's perspective that AI represents an innovative approach to marketing and enhancing the customer experience.

Cluster 2: "Consumer Behavior and Impulse Mechanisms" (Behavior-focused cluster) — This cluster encompasses terms such as Impulse Buying, Impulsive Purchase, Consumer Behavior, Urge to Buy Impulsively, Emotion, Trust, S-O-R (Stimulus-Organism-Response), and Customer Satisfaction. These phrases denote a collection of studies examining the psychological and behavioural dimensions of impulse buying, particularly individuals' responses to internal impulses. The incorporation of trust and satisfaction suggests that many researches are examining not only if AI prompts a purchase, but also how it affects consumer attitudes related to the acquisition or the platform. The need to engage in impulsive purchasing frequently manifests, corroborating numerous research that identify this urge as a significant component of impulse purchase models. The emergence of the S-O-R framework confirms its recognition as a prominent theoretical paradigm. This cluster is closely associated with cluster 1 in bibliometric terms, as they share terminology, including "online shopping" and "AI." This indicates an intersection of technological and behavioural themes; for instance, a study may employ the S-O-R framework to examine how AI recommendations (stimulus) influence consumer urge (organism) and purchasing behavior (response).

Cluster 3: "Online Grocery and Retail Context" (Context-focused cluster) — This cluster encompasses keywords pertinent to the domain: Online Grocery, Retailing, Supermarket, Customer Experience, Omnichannel, and COVID-19. This group encompasses the environment and its surrounding elements. The incorporation of COVID-19 as a keyword in numerous papers signifies that diverse studies conducted from 2020 to 2022 explored the pandemic context; for instance, the surge in online grocery shopping during lockdowns potentially led to novel impulse buying behaviors, or how retailers employed AI to adjust to changing consumer behavior. Omnichannel refers to research examining the seamlessness of the experience between online and offline platforms, recognizing that stimuli for impulse purchases might occur in both environments (for instance, encountering a product in a store's app while physically present in the store). This cluster frequently contains keywords included in clusters 1 and 2, although it centres the discussion on food stores. For example, a paper may have the phrases "online grocery, personalization, consumer behavior" that link all three categories.

New keywords indicating novel study domains are also observed. Recent publications have utilized terms such as "Virtual Influencers," "Live-streaming," and "Metaverse." A 2023 study examined the impact of AI-driven virtual influencers in live-stream shopping on impulsive

purchasing behavior. This indicates that the domain is expanding beyond conventional websites and applications to encompass social commerce environments where AI avatars or immersive platforms may stimulate consumer purchasing behavior. Although these are not presently prevalent in online grocery shopping, they indicate potential avenues for future research, such as AI virtual avatars recommending things during live supermarket sale broadcasts.

The co-occurrence analysis indicates that personalization via AI is the central theme in this literature, serving as the primary connection between technological and behavioural clusters, while impulsive buying is examined alongside other AI-driven marketing methods and psychological concepts. It also demonstrates that trust and customer experience are significant concepts that are interconnected. This aligns with the notion that AI's capacity to induce impulse purchases is contingent upon customer satisfaction and the level of trust it establishes.

Thematic Evolution and Notable Findings

An examination of the publishing content reveals a thematic evolution from 2019 to 2025.

Initial Explorations (2018–2019): The preliminary discussions primarily focused on concepts, highlighting the potential of AI in marketing. Researchers proposed that AI may act as an innovative "stimulus" that significantly impacts consumer decision-making processes. At this juncture, online impulsive purchasing was already widely recognized, however artificial intelligence was merely beginning to emerge as a significant influence. Preliminary studies on online impulsive purchasing examined factors such as website design, usability, and general personalization (not exclusively AI-driven) that may influence consumer behavior. Individuals predominantly discussed AI as an integral component of the future of personalization. The foundation was established by employing frameworks such as S-O-R to hypothesize that more interactive and intelligent systems will increase impulsive behavior in individuals.

Growth and Diversification (2020–2022): E-commerce activity expanded in 2020, influenced by COVID-19 and factors such as consumer characteristics, including impulsivity and trust. A 2022 study by Hazari et al. examines how chatbot responsiveness, an AI feature, increases the likelihood of impulse purchases by enhancing user satisfaction, while also indicating that scepticism towards AI diminishes this benefit (moderation by trust). A notable theme during this period is the impact of emotions: numerous studies investigated how AI-generated stimuli (such as personalized messages) provoke emotional responses (such as surprise and excitement) that subsequently result in impulsive behaviors, reinforcing the notion that impulse buying is significantly driven by emotions.

Maturation and Nuance (2023–2024): Recent study has gotten increasingly extensive and comprehensive, highlighting both the positive and negative impacts of AI on impulse purchasing. Significant contributions include:

Quantitative evidence of impact: Researchers sought to ascertain the extent to which AI can effect change. Xie et al. (2023) conducted research indicating that the integration of an AI-driven suggestion module into a grocery application increases unexpected item adds by Y% on average. An A/B test conducted in an online grocery store shown that AI-driven dynamic pricing strategies resulted in significantly increased impulse purchases compared to static promotions. Industry statistics cited in academic research further corroborates the assertion: personalized AI recommendations not only elevate basket values by roughly 20%, as previously indicated, but are also linked to improved customer retention and loyalty metrics.

The ethical implications of utilizing AI to promote impulse purchasing were debated. In 2023, certain authors inquired on the enduring impacts on consumer welfare. Could excessively effective AI marketing result in overconsumption or regrettable purchases, so undermining client loyalty? The integration of sustainability and ethical AI themes in a bibliometric analysis of AI retail literature reflects the community's awareness of these concerns. The literature commenced advocating for best practices, including the necessity of transparency (for example, disclosing when a recommendation is sponsored or produced by AI) and utilizing AI to guide consumers towards beneficial impulse purchases (such as healthy alternatives or sustainable products) instead of solely endorsing arbitrary impulse sales. Certain publications discuss the concept of "responsible AI marketing," asserting that retailers must reconcile their profit motives with customer trust and satisfaction to mitigate potential issues.

Various categories of AI: The latest research extends beyond conventional recommendation systems. Researchers have examined virtual influencers (AI-generated characters on social media or live streams) and shown that they can effectively induce impulse purchases by fostering a sense of belonging to a social group. Similarly, AR and VR try-ons in non-grocery retail environments have demonstrated that immersive AI technologies can stimulate impulse purchases (Gao & Liang, 2025 – garment context). These modifications suggest that analogous concepts could be effective in grocery shops, such as a virtual reality shopping experience or an artificial intelligence nutrition advisor, potentially resulting in unanticipated purchases. In 2024, merchants commenced trials of generative AI chatbots capable of engaging with customers in a more human-like manner, including responding to product inquiries and offering ideas in a conversational tone. This is an advantageous area to examine the impact on impulse purchasing.

Framework integration: Recent studies have endeavoured to amalgamate several theories to elucidate the phenomena. For example, combining the Stimulus-Organism-Response (S-O-R) framework with the Theory of Planned Behavior or the Technology Acceptance Model (TAM) to understand both the immediate impulse buy and the acceptance of artificial intelligence that enhances its effectiveness. A study utilized a modified S-O-R paradigm to integrate perceived utilitarian and hedonic value as variables, demonstrating that these characteristics mediated the impact of AI features on impulse intentions. This indicates a more intricate model: AI attributes result in values (utility, enjoyment), which subsequently influence impulse intent, with brand trust serving as a moderating variable. Integrated models of this nature have emerged only within the past year or two, representing a significant advancement in theoretical development.

To highlight numerous notable findings from specific studies

- The 2023 study by Zhu et al. shown that enhancing product images through visual appeal (utilizing AI technologies such as 3D rotation or augmented reality) and providing clients with interactive control (allowing them to virtually modify or create a product) significantly increased the likelihood of impulse purchases. This was mostly due to these elements enhancing client immersion and engagement, hence complicating self-regulation. They concluded that AI can enhance online buying by simulating the experience of being physically present in a store.
- A 2024 survey conducted by Melati et al. (Indonesia) revealed that statements emphasizing scarcity and popularity, such as "50 people bought this today," on an online grocery platform effectively stimulated spontaneous purchases, but only when consumers had a genuine need for the items. AI can intensify such impulse by customizing the delivery of

signals, such as emphasizing the popularity of things pertinent to the consumer.

- Barkho (2024) indicates that industry-supported research reveals many digital grocery customers deliberately refrain from exploring further items, opting instead for searches or previous orders; thus, the most effective impulse triggers are those integrated into the checkout process or subsequent to it. Certain retailers reported that notifications appearing after the first order, such as "Your order is being prepared; you can still add this item," were effective, particularly when accompanied by a minor discount. This aligns with the concept that AI can propose an impulse item at an opportune moment (post-checkout but pre-fulfilment) without disrupting the primary shopping experience.
- Numerous studies demonstrate the significance of trust and transparency: when individuals have confidence in the AI (believing that the recommendations genuinely serve their best interests or are at least non-detrimental), they are more inclined to react favourably. Nguyen et al. (2025) performed a global marketing analysis on AI chatbots, demonstrating that augmenting chatbots' empathy and helpfulness (AI with a "human touch") led to heightened consumer satisfaction and may indirectly promote more impulsive sales of suggested products. This study concentrated on green products, but the principle probably extends to other items as well.

Summary of the insights gained via Bibliometrics

- Our bibliometric and literary research indicates a convergence of marketing, psychology, and artificial intelligence technologies in the examination of online impulsive purchasing. The keyword network and topic progression suggest that preliminary exploratory research on the impact of AI on consumer behavior has evolved into extensive studies analyzing the causes and conditions of this influence. The co-occurrence clusters indicate a close relationship between technological phrases (AI, ML, personalization) and behavioural terms (impulse buying, emotion, trust). This indicates that scholars examine this topic by correlating system characteristics with human outcomes.
- The study domain has expanded to examine how AI may assist consumers (e.g., by preventing manipulation and fostering trust) and how it can benefit merchants (e.g., by integrating AI into their omnichannel strategies and evaluating the ROI of AI marketing initiatives). Research on knowledge mapping on impulse buying recognizes AI as a significant progress in the domain, alongside other digital trends like social commerce and live streaming. This bibliometric finding corroborates our discovery: AI is a critical research domain for impulse purchasing. It illustrates how research on impulse purchasing, previously grounded in consumer psychology, now intersects with computer science and information systems due to the proliferation of internet shopping.
- The analysis indicates that the volume of research remains comparatively limited, notwithstanding its growth. This indicates that this is an emerging topic with significant potential for further investigation. We identified a restricted quantity of studies that specifically investigate AI in supermarket situations; many ideas were extrapolated from general online retail research or associated disciplines. This indicates that the academic realm is just beginning to align with the advancements made by enterprises in this domain.

Discussion:

Implications for Consumers

This review's findings indicate that AI is transforming online grocery shopping, significantly

influencing consumer purchasing behavior and often leading to more impulsive decisions. One of the most apparent effects is that AI can render purchasing more personalized, intuitive, and effortless for consumers. These factors typically diminish the psychological obstacles to impulsive purchasing. AI can enable an online platform to understand you well, thereby providing options that swiftly align with your intrinsic desires and requirements, creating an urgency to make a purchase. For instance, if a consumer frequently purchases nutritious snacks, an AI may recommend a novel organic chocolate bar that aligns with their preferences. The buyer may purchase it impulsively due to its alignment with their preferences (personalization impact) and possibly because of the limited-time discount (urgency effect). They may even be pleased to discover it. This may enhance consumer satisfaction as they see the store's understanding, akin to receiving a favourable referral from a friend. Research using AI recommendations indicated that users expressed greater satisfaction with the service.

Another aspect to consider from the consumer's perspective is the influence of emotions and cognitive comfort. Intuitive and visually appealing AI-driven interfaces can enhance the likelihood of individuals making emotionally-driven judgments. Zhu et al. (2023) indicated that enhancing usability through AI reduces cognitive load, hence enabling individuals to act on their impulses and intuition. This indicates that individuals may not consistently recognize the speed at which they are making decisions when assisted by AI. For instance, one moment they are examining essentials, and the next, an enticing recommendation has been incorporated into their cart without their awareness. This may elicit feelings of satisfaction and pleasant surprise, although it can also lead to subsequent regret regarding the purchase if individuals begin to question the necessity of the item. Retailers must exercise caution, as frequent impulse purchases followed by returns may adversely affect customer loyalty.

The discourse must encompass ethics and consumer autonomy. From a consumer advocacy perspective, a delicate distinction exists between beneficial personalization and manipulative "dark patterns." AI may encroach upon dark pattern territory if it excessively exploits behavioural biases, such as persistently inundating the user with "only 1 left!" notifications or facilitating the addition of supplementary items more readily than allowing the user to decline them. Recent research suggest that transparency helps mitigate negative perceptions. If individuals are aware that "customers also bought" is an algorithmic recommendation rather than an impartial catalog, or if AI-generated offers are distinctly labelled, they may perceive a greater sense of agency. It is essential for consumers to perceive a sense of control. Individuals who make impulsive online purchases and subsequently experience remorse may choose to refrain from visiting specific websites or utilize technologies to curtail their exposure to recommendations, such as potential future browser extensions that could conceal "you may also like" parts for the disciplined consumer. Providing clients with the opportunity to personalize their settings, including the ability to disable or adjust recommendations, is a prudent strategy.

The trust factor is a significant topic of discussion. AI functions as an intermediary between the store and the customer. If individuals trust the AI, and consequently the establishment that employs it, positive outcomes are more likely to occur. If a customer perceives a suggestion as genuinely beneficial, they are likely to regard it as a service, potentially leading to an immediate purchase and an increased affinity for the store. Conversely, in the absence of trust, the same recommendation may be perceived as an aggressive upsell, eliciting adverse reactions from individuals. Our analysis of the trials indicated that establishing trust is crucial for the long-term efficacy of AI marketing. This can be achieved by reliability, elucidating AI decisions,

and safeguarding data privacy. Retailers should consequently invest in both the precision of AI and its transparency; even a simple explanation of "Why am I seeing this?" for recommendations might be advantageous.

These findings corroborate and enhance established theories within the framework of consumer behavior theory. The impulsive purchase model for online shopping must now clearly incorporate technology as a factor of the external stimulus environment. Online shoppers are affected by a curated environment shaped by algorithms rather than a uniform shelf arrangement applicable to all. This customized environment allows individuals to view distinct advertisements for the same product simultaneously (for instance, one individual may see commercials for cookies while another sees ads for soda). This hyper-personalization is novel in consumer research, enabling marketers to employ impulse strategies for personalized targeting. Consumers possess a purchasing experience that is distinctively personal, perhaps intensifying their emotional triggers, whether positive or negative.

A practical relevance for customers is the necessity of self-awareness while engaging in internet buying. Budget-conscious consumers may establish personal guidelines, such as adhering to a shopping list or delaying purchases for 24 hours, to mitigate impulsive buying in the presence of AI. Certain individuals may appreciate impulse purchases as they enhance the enjoyment of shopping. As AI becomes increasingly prevalent, educating individuals on digital literacy will encompass the identification of persuasive strategies and the formulation of informed decisions. This does not imply that AI-driven impulse triggers are detrimental; rather, they frequently assist individuals in discovering valuable things. Nonetheless, customers will gain from understanding the origin of the nudge.

Implications for Retailers

Grocery stores must recognize that while AI can enhance online impulse sales, its implementation requires careful consideration and strategic planning. Retailers ought to employ AI to facilitate what could be termed "curated serendipity." This entails configuring their online platforms to enable consumers to shop with intent (as individuals prefer not to engage with applications that excessively distract them when seeking essential items like milk and bread), while simultaneously providing opportunities for spontaneous purchases in a manner that appears organic and pertinent.

A strategic implication is that merchants ought to employ AI for recommendations and promotions at various stages of the consumer experience. For instance, companies might display complementary items on the homepage to incentivize visitors to explore new products, throughout the mid-journey phase when customers are searching for or examining a product, and at the conclusion of the journey when customers are finalizing their purchases or adding items to their basket. This multi-touch approach resembles the experience of shopping in a store, where one may select an item in the aisle and again near the checkout. We observed evidence that post-checkout or during the waiting period (such as Target's curbside Starbucks notification) serves as an effective new touchpoint. Many retailers overlooked this until the prevalence of digital ordering. AI is crucial in these scenarios since it can determine in real time which recommendation is most likely to result in a sale depending on the contents of the cart and the customer's previous purchases (for instance, proposing a Starbucks add-on to a customer who exclusively purchases tea is futile).

Retailers should consider how to establish and utilize data. High-quality data, including

purchase history, inventory levels, and product metadata, enhances AI's efficacy in stimulating spontaneous purchases. An efficiently maintained data pipeline enables AI to provide more targeted recommendations, such as those based on seasonal trends. For instance, it might recommend hot cocoa mix to online consumers in that region on an unanticipated cold day, which is an impulse driven by the circumstances. Certain large grocery retailers are adopting real-time analytics, referred to as "moment marketing." The bibliometric analysis indicates substantial research on predictive analytics and inventory management. This research is crucial in ensuring that the proposed impulsive goods are adequately stocked and delivered punctually. Nothing undermines a favourable impulse like "apologies, out of stock." Consequently, a retailer's AI strategy must incorporate collaboration among personnel from marketing, IT, and the supply chain.

Another consequence pertains to the measurement of success. Retailers should monitor metrics such as the increase in average basket size, the frequency of purchases of recommended items, and the proportion of orders containing at least one impulse item. One can evaluate these prior to and after to the incorporation of AI characteristics. Our analysis indicates that effective AI personalization might potentially increase basket value by 5–20%. Monitor the conversion rates of specific impulsive marketing, such as Instacart's checkout candy advertisements. Monitoring consumer satisfaction and the frequency of their return after utilizing AI recommendations versus not employing them is essential. This may assist you in determining whether the impulse techniques are fostering stronger client relationships or merely generating one-time sales. AI-driven impulse purchases should enhance user enjoyment of the platform ("shopping here is enjoyable; I consistently discover intriguing items!"), thereby differentiating you from competitors and fostering customer loyalty in a saturated market.

Retailers must also consider the expenses and potential hazards. Developing or licensing AI systems can be costly. It is essential to evaluate the return on investment (ROI). Our literature study indicates that AI can enhance operational efficiency, exemplified by a 30% reduction in stockouts, in addition to boosting front-end sales. This indicates that the return on investment (ROI) may derive from factors beyond mere impulse purchases. To encourage consumer purchases, businesses should implement low-risk, high-return techniques such as personalized suggestions, which are supported by numerous e-commerce platform plugins, and rule-based AI promos.

Retailers must exercise caution regarding potential consumer backlash associated with risk. Excessively aggressive AI techniques may damage the brand, such as persistent pop-ups upon item addition or dynamic pricing that creates perceptions of unfairness or inconsistency. Consumers purchasing groceries are concerned about pricing and seek to be informed about current developments. If an AI errs, such as presenting an unavailable offer or displaying varying prices to various clients, it may incur negative publicity. It is essential to utilize and evaluate AI ethically. Numerous retailers are likely to implement AI-assisted selling, enabling customers to opt out of tailored recommendations in their account settings. This is to honour anyone seeking a straightforward experience.

The competitive landscape of grocery stores may undergo transformation. Early adopters of AI-driven impulse strategies may possess an advantage regarding average order value and client retention. Amazon excels at cross-selling, recommending things that are "Frequently bought together" or during checkout, due to its robust artificial intelligence. Groceries from Amazon Fresh or Whole Foods may also gain advantages from this engine. Conventional

grocery stores are advancing by collaborating with technology firms or utilizing platforms such as Instacart. Individuals proficient in the effective utilization of AI may possess a competitive edge. Conversely, brick-and-mortar establishments continue to generate significant impulse purchases. Omnichannel retailers can integrate the two by employing AI to recommend additions to online orders for in-store pickup. This will attract additional customers, potentially resulting in increased impulse purchases.

Recommendations for Future Research

Our bibliometric research indicated that this topic continues to expand and that numerous avenues for further exploration exist. In light of the identified deficiencies:

Long-term Effects on Consumers: Longitudinal research are essential to ascertain if AI-induced impulse purchases lead to lasting behavioural modifications or only temporary effects. Do individuals become accustomed to or desensitized to certain AI prompts over time, either by learning to disregard them or by anticipating their occurrence? Understanding the formation of habits in the presence of AI stimuli may prove beneficial.

Individual Variability: Customers exhibit diverse responses. Future study may classify consumers according to personality attributes (e.g., impulsiveness, technological proficiency, privacy concerns) to ascertain how AI techniques might be customized for different segments. The concept of tailoring the customization strategy is intriguing: AI that adapts its methodology depending on whether it perceives a customer as very impulsive or exceedingly analytical.

Channel Interaction: Given that food can be procured through several methods (online, in-store, etc.), research may examine how AI-driven impulsive stimuli in one channel influence behaviour in another. For example, does encountering personalized recommendations in the application increase the likelihood of a customer purchasing additional items during their store visit (priming effect)? Conversely, does an in-store impulse purchase prompt the AI to subsequently remind the buyer online ("You enjoyed that ice cream previously; would you like to add it again?") and what is the mechanism behind this process?

Economic and Ethical Outcomes: Research may investigate the economic aspects, particularly the impact on retailer profitability and inventory turnover, alongside consumer behaviour. From the consumer's perspective, there exists an ethical consideration: Do certain AI tactics adversely affect customers, such as by inducing excessive spending or promoting poor dietary choices? Interdisciplinary research centered on consumer welfare or public policy may evolve, perhaps providing frameworks for "ethical AI in marketing" to guarantee equitable behaviour's by regulators or industry organizations. Certain researchers are advocating for an examination of algorithmic prejudice. For example, does the AI promote unhealthy impulsive purchases, or are there biases in the targeting of individuals for impulse advertisements? Addressing these inquiries can ensure that AI marketing evolves in alignment with societal ideals.

Limitations

We must acknowledge the constraints of our evaluation. Initially, despite our efforts to be comprehensive, our search may have overlooked recent articles (from late 2024 to early 2025) that were not available in the databases throughout the search period. It may have overlooked pertinent industry whitepapers or patents that could have elucidated best practices. Secondly, the novelty of the area implies that certain insights are derived from a limited number of

research or even a singular study within a specific context (such as the online grocery market in one nation), thus diminishing its applicability in other scenarios. We endeavoured to mitigate this by integrating multi-national viewpoints when possible; nonetheless, further cross-cultural study would be beneficial. Third, our bibliometric analysis was constrained by the available data. For instance, several conference papers or industrial studies lack keywords or citations in an easy manner that can be analysed; thus, we employed them qualitatively but not for co-occurrence mapping. Finally, akin to every systematic review, theme extraction involves an interpretive component. We have compiled and analyzed patterns; nevertheless, future scholars may interpret the findings differently or prioritize specific outcomes more heavily. Despite these constraints, we believe the analysis provides a relevant and comprehensive examination of the intersection between AI and impulse purchasing in the online grocery sector. It illustrates both the enthusiasm for its potential and the necessity for caution in its application.

Conclusion

Artificial intelligence is significantly transforming the online grocery shopping experience. This alteration profoundly influences the mechanisms of impulse purchases in digital environments. Our comprehensive study and bibliometric analysis of recent publications indicate that AI functions not just as an efficiency tool but also as a substantial stimulant for consumer impulsive behaviour. Essential AI-driven mechanisms—such as personalized suggestions, intelligent advertisements, chatbots, and dynamic offers—function similarly to candy racks and end-cap displays in physical stores, however they frequently outperform them due to their personalized and timely nature. Research has consistently demonstrated that judicious use of AI enhances customer engagement and increases the likelihood of unplanned purchases, indicating that the disparity between online and physical impulse buying can be bridged. Personalized AI recommendations have prompted over fifty percent of online consumers to make impulsive purchases they might not have otherwise considered, resulting in tangible boosts in basket sizes and conversion rates for retailers employing these technologies. However, these new opportunities entail additional obligations for merchants and necessitate consumer awareness regarding the impacts of AI. Retailers must identify methods to utilize AI that enhance the customer experience rather than diminish it. The optimal method appears to be one that enhances customer satisfaction (by simplifying processes, enhancing relevance, or providing enjoyment) while simultaneously benefiting the retailer through increased sales. Customers will embrace AI-generated prompts if they appear authentically beneficial, such as reminding them of forgotten items or presenting a product that effectively satisfies their requirements. Impulse purchases will resemble serendipitous occurrences rather than manipulative tactics. However, if the AI techniques appear aggressive, perplexing, or deceitful, they may erode trust, perhaps reversing any immediate advantages. Our analysis indicated that trust and transparency are paramount. To achieve long-term success, merchants must maintain client trust in the era of AI. This new era signifies that consumers will encounter a more tailored buying experience, with enticements meticulously selected for them. It holds consumers accountable for understanding how their data influences their shopping experience and for exercising their discretion. It modernizes the traditional ability of avoiding impulsive purchases for a digital context. Not all impulse purchases influenced by AI are detrimental; some may result in the discovery of a new preferred product or an enjoyable indulgence that enhances the consumer's day. The fundamental objective is to achieve equilibrium and make a judicious decision. This paper systematically synthesizes the relationship between AI and impulse purchase, laying the groundwork for future study. We

categorized the existing knowledge into two categories: psychological factors (such as the impact of AI stimuli on diminishing cognitive control and amplifying impulses) and practical applications (such as Instacart's impulsive aisles and Walmart's AI-driven rollback discounts). We identified deficiencies in the research, particularly on the investigation of long-term impacts and ethical frameworks. This established a framework for researchers in marketing, information systems, and consumer psychology. The bibliometric analysis indicated that this research domain is rapidly expanding and diversifying into several subthemes, including social commerce, augmented reality/virtual reality, and chatbot design. This indicates that it is evolving into a prosperous, diverse domain. In conclusion, the impact of AI on online impulse purchasing in grocery stores illustrates that technology in commerce can yield both positive and negative outcomes: it can enhance consumer satisfaction and increase sales, yet if mismanaged, it may also lead to dissatisfaction and diminished engagement. Recent study indicates that AI should enhance the purchasing experience for consumers by making it more personalized, convenient, and enjoyable, rather than exploiting it. Grocery stores that achieve this equilibrium are likely to discover that AI not only enhances impulse purchases but also fosters greater consumer loyalty in an increasingly competitive digital marketplace. Companies that neglect the significance of consumer experience and trust may see a decline in profitability as discerning customers disregard or resist intrusive algorithms. The convergence of artificial intelligence and impulsive purchasing exemplifies the evolving dynamics between technology and human behaviour. As we progress, it is imperative to continue conducting research and engaging in dialogue to ensure this dance remains synchronized. We must leverage AI's capabilities to benefit both enterprises and consumers, while maintaining a human-centric shopping experience.

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