International Journal of Advanced Research in Commerce, Management &Social Science (IJARCMSS)
(An International Quarterly Multidisciplinary Double Blind Open Access Peer Reviewed Refereed Journal)
ISSN :2581-7930 (Online), Impact Factor (Cosmos): 7.270& PIF (I2OR): 5.010, Volume 09, No. 02(III), April-June, 2026, pp 129-144

Revolutionizing Grocery Retail Trade: A TCCM Analysis of Artificial Intelligence Applications

Sumi J.[1*] | Sreelakshmi M.[2]

[1]Research Scholar, Department of Commerce, S.D. College, Alappuzha, Kerala, India.
[2]Research Scholar, Department of Commerce, University of Kerala, Kerala, India.

[*]Corresponding Author: sumibritto91@gmail.com

Citation: *Sumi, J. & Sreelakshmi, M. (2026). Revolutionizing Grocery Retail Trade: A TCCM Analysis of Artificial Intelligence Applications. International Journal of Advanced Research in Commerce, Management & Social Science, 09(02(III)), 129–144. https://doi.org/10.62823/IJARCMSS/9.2(III).8984*

ABSTRACT

Artificial intelligence (AI) and technological ecosystems are revolutionizing the grocery retail industry by improving customer experiences, facilitating data-driven decision-making, and optimizing operations. Artificial Intelligence applications transform how grocery stores respond to changing consumer tastes and market demands with advanced tools like recommendation engines, inventory management systems, and predictive analytics. The study aims to analyze how AI-driven technologies change grocery retailing's operational efficiencies, customer engagement, and decision-making procedures using the TCCM (Theory, Context, Characteristics, and Methodology) framework. In this rapidly emerging domain, the study also seeks to identify research gaps and potential for the future by integrating framework-based analysis with a systematic evaluation of previous research to explore both academic and practical advancements. The major findings show that AI greatly improves operational efficiency by using predictive analytics and automation. Further, it enhances decision-making with real-time data insights and uses recommendation engines to personalize consumer experiences. Still, issues like low adoption in small-scale retail operations, high implementation costs, and data privacy concerns continue to be common. The study also outlines certain future research concerns, with a focus on interdisciplinary approaches and scalable AI solutions designed for small merchants. By utilizing the TCCM framework, the study provides deep insights into the convergence of grocery retail trade through the implementation of AI applications in the modern retail ecosystem.

Keywords: *Grocery Retail, Systematic Literature Review, TCCM Analysis, Artificial Intelligence.*

Introduction

Technological disruptions reshape the structure and operations of traditional businesses, influence the organisation's internal processes, and transform customer interactions and experiences in the retail economy(Oosthuizen, 2021). Innovative digital disturbances converge traditional business models by changing the marketplace, entering new rivalries, and transforming the customer journey design(Bolton et al., 2019; Carlsson, 2018; Kietzmann et al., 2018). Increased computing capability, mobile connectivity, the abundance of data, and affordable and effective technologies are the impulses for digital expansion(Campbell et al., 2020). Retailers are transitioning from brick-and-mortar to several online platforms as new technologies enter and alter the market(Brynjolfsson et al., 2013; Gupta, 2018). The technologies in the new digital era include artificial intelligence, IoT (Internet of Things), augmented reality, blockchain, big data, and cloud computing. The combined use of these technologies can yield unanticipated results in situations where market boundaries are faint (Day S. George & Schoemaker J.

H.Paul, 2019). Thus, the digital age is one of the most significant changes in society, affecting any aspects of daily life and business(Hagberg et al., 2016).

Retailers have found that artificial intelligence is a useful tool for creating more successful business operations. Its integration can improve customer experience, save expenses, and increase operational efficiency. According to the report of Fortune Business Insights 2023, the global artificial intelligence (AI) retail industry was estimated to be worth USD 7.14 billion in 2023 and is expected to increase at a compound annual growth rate(CAGR) of 31.8% from 2024 to 2032, from USD 9.36 billion to USD 85.07 billion. The retail industry will employ AI more frequently as voice and visual search solutions driven by AI are used more often to enhance the shopping experience for customers. Because more people are using AI-powered chatbots to improve customer experiences, artificial intelligence in the retail market in the United States is expected to develop rapidly and reach an estimated value of USD 17.76 billion by 2032.

Despite the growing adoption of AI in grocery retail, the industry needs to understand the specific challenges and opportunities of integrating AI into the grocery industry, and a thorough study of its long-term effects and real-world applications is still lacking. Previous research has focused only on limited AI-powered tools, such as recommendation agents, GAI, RegenAI, chatbots, and Intelligent Voice Assistants. None attempted to study the different AI applications in the grocery industry and their impact on the grocery ecosystem as a whole, including supply chain effectiveness, customer retention, and sustainability. Reviews of AI are common in the literature with diverse topics, but there aren't many on grocery commerce. The AI applications in grocery retail trade have not been extensively studied in the past. To close this gap, the current study attempts to explore the different aspects of AI applications in grocery retail through a systematic literature review process by adopting a TCCM framework-based method. A thorough systematic literature evaluation is significant as it can serve as a starting point for future studies (Collins et al., 2021; B. A. Kitchenham et al., 2011; Petersen et al., 2015).The purpose of this review paper is;

- To identify the different areas studied under the purview of AI applications and grocery.
- To analyze the theories, contexts, characteristics, and methods used in the research and suggest future research avenues.

The structure of the paper is presented in the figure.1

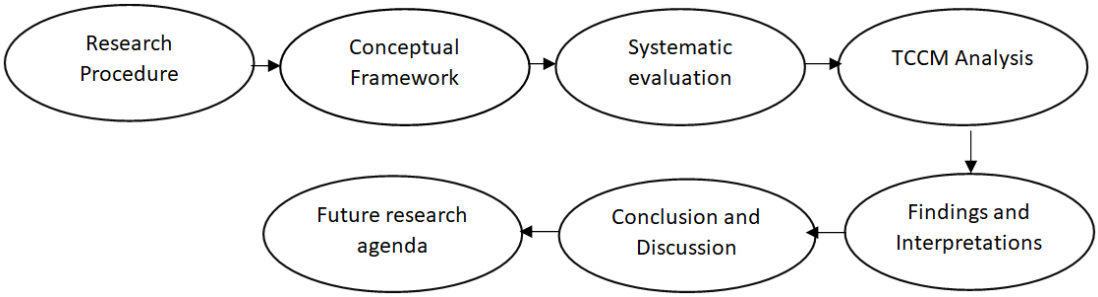


Figure 1: Structure of the review paper on AI applications in grocery retail trade

Research Procedure

For the study, a systematic literature review approach was chosen over a more traditional general review since it requires a repeatable, transparent, objective, rigorous, and scientific (Bhatia et al., 2021; Mulrow et al., 1997). A systematic literature review is a method of identifying, assessing, and interpreting all known research pertinent to a specific research question, topic area, or phenomenon of interest (B. Kitchenham, 2004) A Systematic review typically has the following objectives and contributions: generating new knowledge about the phenomenon under investigation, identifying contradictions or knowledge gaps that limit the capacity to make empirical generalizations in a particular field, and supporting the advancement of theory, contexts and methodologies for future research that expands the state of the art (Palmatier et al., 2018). Similar to empirical research papers, systematic reviews can be approached in a variety of ways. According to (Paul & Criado, 2020), the four primary categories of systematic review are method-based, theory-based, domain-based, and meta-analytical-based. These classes are characterized as follows;

Table 3: Characterisation of Different Review Methods of SLR

SLR Method	Nature
Domain-based review	Concentrates on a specific topic and includes structured, bibliometric, hybrid and framework b-based review
Theory-based review	Analyze the theories in a particular research domain
Method-based review	Examines the methodologies utilized in a specific area of research
Meta-analytical-based review	Focusing on statistical evaluations of a specific topic, similar effects are detected and discrepancies are analyzed.

Source: (Paul & Criado, 2020)

For a more insightful review, the authors can use a framework-based-approach by using certain well-known frameworks, such as TCCM (theories, contexts, characteristics and methods), TCM-ADO (Antecedents, Decisions and outcomes), or the 7P framework, 4W's structure, or 3A model (Lim et al., 2021; Paul & Benito, 2018; Paul & Mas, 2020; Rosado-Serrano et al., 2018). The current study employs a framework approach by utilizing TCCM (Theories, Contexts, Characteristics and Methods) (Paul & Rosado-Serrano, 2019) to explore the revolutionization of the grocery retail trade due to artificial intelligence applications.

Data Search Process

In order to find significant journal articles that addressed the use of AI applications in the grocery retail trade, we searched databases, including Scopus, Web of Science, EBSCOhost and Science Direct (Weber & Schütte, 2019). The articles found during the first stage of the search are shown in Table 2.

Table 2: Distribution of articles across databases before the refinement Process

Database	No of Articles
Scopus	116
Web of Science	26
EBSCO	*28*
Science Direct	*2070*
Total	*2240*

(Source: Compiled by the researcher)

This paper adopts the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol for the article search process. It includes four phases of evaluation: identification, screening, eligibility, and inclusion (B. Kitchenham, 2004; Moher et al., 2009). The primary objective of the study is to analyze the use of AI applications in grocery retail; the keywords chosen were 'Grocery' and 'Artificial Intelligence'. The table presents the search string and query used in the study.

Table 3: Search strategy

Database	String and Query
Scopus	(TITLE-ABS-KEY ("Grocery") AND TITLE-ABS-KEY ("Artificial intelligence")) AND (LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ECON")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))
Web of Science	(TITLE-ABS-KEY ("Grocery") AND TITLE-ABS-KEY ("Artificial intelligence")) AND (LIMIT-TO (SUBJAREA , "BUSINESS") OR LIMIT-TO (SUBJAREA , "MANAGEMENT") OR LIMIT-TO (SUBJAREA , "OPERATIONS RESEARCH MGT SCIENCE") OR LIMIT-TO (SUBJAREA , "COMMUNICATION") OR LIMIT-TO (SUBJAREA , "ENVIRONMENTAL STUDIES")) AND(LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))
EBSCO host	(TITLE-ABS-KEY ("AI applications in grocery retailing")) AND (LIMIT-TO (DOCTYPE , "academic journals")) AND (LIMIT-TO (LANGUAGE , "English"))
Science Direct	(TITLE-ABS-KEY ("AI application in grocery retailing")) AND (LIMIT-TO (DOCTYPE , "research articles") OR LIMIT-TO (DOCTYPE , "review articles")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO ("open access only"))

(Source: Researcher's work)

Out of the 2240 documents from the selected databases, our search was limited to only English-language. Journal articles within the fields of Business, management and accounting, social science, Economics, econometrics and finance from Scopus and Business, Management, Operations research management science and Environmental studies from Web of Science. From Science Direct, we select open-access journals only because the users can read, download, print, search, or link to the full texts of these publications without any financial, legal, or technical restrictions (Warlick & Vaughan, 2007). Using the above filter, a list of 214 articles was identified and screened, 7 duplicates were removed in the screening process, and 2 articles were missed due to technical problems during the extraction process. 205 documents were eligible for the study, which was manually narrowed down to 114 articles by eliminating 91 studies that are not under the purview of AI and retail-related studies. The detailed inclusion and exclusion criteria are portrayed in Figure 2.

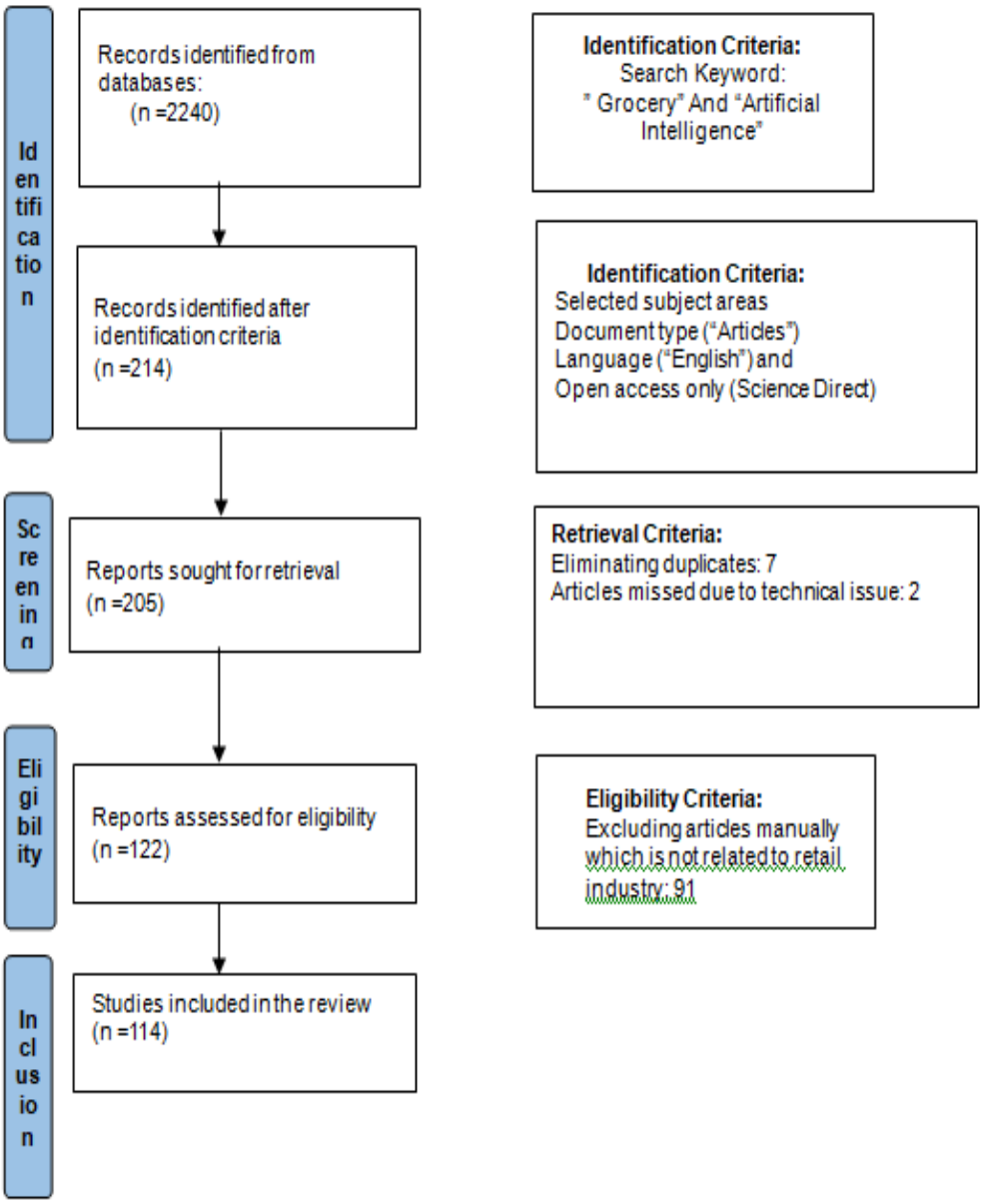


Fig 2: PRISMA diagram of the inclusion and exclusion of articles

Conceptual Framework

Artificial Intelligence applications are transforming the business environment and functions by facilitating human-robot interactions, assisting with item tracking in warehouses, and managing wholesalers' customer relationships (Daugherty et al., 2020). In order to remain competitive and thrive in a constantly shifting economy and diverse consumer market, retailers have begun to adopt various new technologies, including a range of AI-powered solutions. Major big-box retailers who have invested in technologies by using AI generate higher profits (Weber & Schütte, 2019).

As pointed out by (Dwivedi et al., 2021) , Artificial Intelligence is at the forefront of disruptive technologies, especially in retail. The term "artificial intelligence" was first used by (McCarthy K.P & Wellens. U, 1988),who defined it as "the science and engineering of making intelligent machines". Some notable definitions of AI are depicted in Table 1

Table 1: Notable definitions of "Artificial Intelligence"

Definition	Citation
"AI is concerned with methods of achieving goals in situations in which the information available has a certain complex character. The methods that have to be used are related to the problem presented by the situation and are similar whether the problem solver is human, a Martian, or a computer program."	(McCarthy K.P & Wellens. U, 1988)
"Computational agents that act intelligently."	(Poole. L David & Mackworth K. Alan, 2023)
"Technology that stimulates cognitive processes typically linked to human characteristics including communication, learning, and problem-solving."	(Russell et al., n.d.)
"Capacity to autonomously analyse and learn from outside facts in order to adapt flexibly and accomplish particular goals."	(McCorduck Pamela, 2004)

(Source: Compiled by the researcher)

To position the present review within the broader scholarship, Table 2 summarises a set of influential review-oriented studies that discuss AI-enabled transformation in retail and related information ecosystems, with specific insights relevant to grocery settings. Taken together, these reviews suggest that recent work has increasingly emphasised in-store digitalisation and customer-facing innovations (e.g., mobile applications, handheld scanners, and self-service checkouts) alongside advanced AI capabilities such as facial recognition and augmented/assisted shopping interfaces. Importantly, they also draw attention to potential unintended outcomesparticularly algorithmic information gatekeeping that may widen cognitive, social, economic, and psychological gapshighlighting that AI adoption should be assessed not only for efficiency gains but also for broader ecosystem and societal implications.

Table 2: Analysis of prior review papers on AI applications and grocery retail.

Author(s)	Title	Year	Source title	Review
Wolniak, Radosław, Stecuła Kinga, and Aydın, Barış	Digital Transformation of Grocery In-Store Shopping-Scanners, Artificial Intelligence, Augmented Reality and Beyond: A Review	2024	Foods	The study examines the digital transformation of grocery retail, focusing on technological innovations in stores, such as mobile applications, handheld scanners, self-service checkouts, and AI-powered tools like facial recognition and augmented reality. It also highlights significant achievements and future directions.
Potnis, Devendra, Tahamtan, Iman and McDonald,	Negative consequences of information gatekeeping through algorithmic	2024	Journal of the Associati on for Informati	This study examines the drawbacks of algorithmic technologies, including AI, decision support systems, and search technologies on information gatekeeping through thematic analysis.

Luke	technologies: An Annual Review of Information Science and Technology (ARIST) paper		on Science and Technology	These technologies have the potential to widen the gaps both online and offline by creating cognitive, social, economic and psychological weaknesses.
Morrison, Gwen , Marcotte, David	Looking to the future of commerce: retail transformation as connected consumers embrace smart homes and smart stores	2020	Journal of Brand Strategy	This study reviews the upcoming technologies that will impact the sector and predicts how customers will likely adjust. It emphasises that retailers have to strike a balance between existing systems while integrating advanced technologies like smart homes, and connected cities and retaining their current systems.

(Source: own work of the researcher)

In summary, this study synthesises the rapidly expanding literature on AI applications in grocery retail through a transparent PRISMA-guided screening process and a structured TCCM-based analysis. By consolidating evidence across theories, contexts, characteristics, and methodologies, the review clarifies how AI is currently being conceptualised and deployed to enhance customer experience and operational performance, while also foregrounding unresolved challenges such as adoption constraints for small retailers, system integration complexity, and data privacy and governance concerns. The study therefore contributes a coherent research map that can guide future empirical work and support practitioners and policymakers in implementing AI-enabled grocery retail solutions that are efficient, responsible, and sustainable

Results and Findings

Table 4: Article Distribution Across Diverse Journals

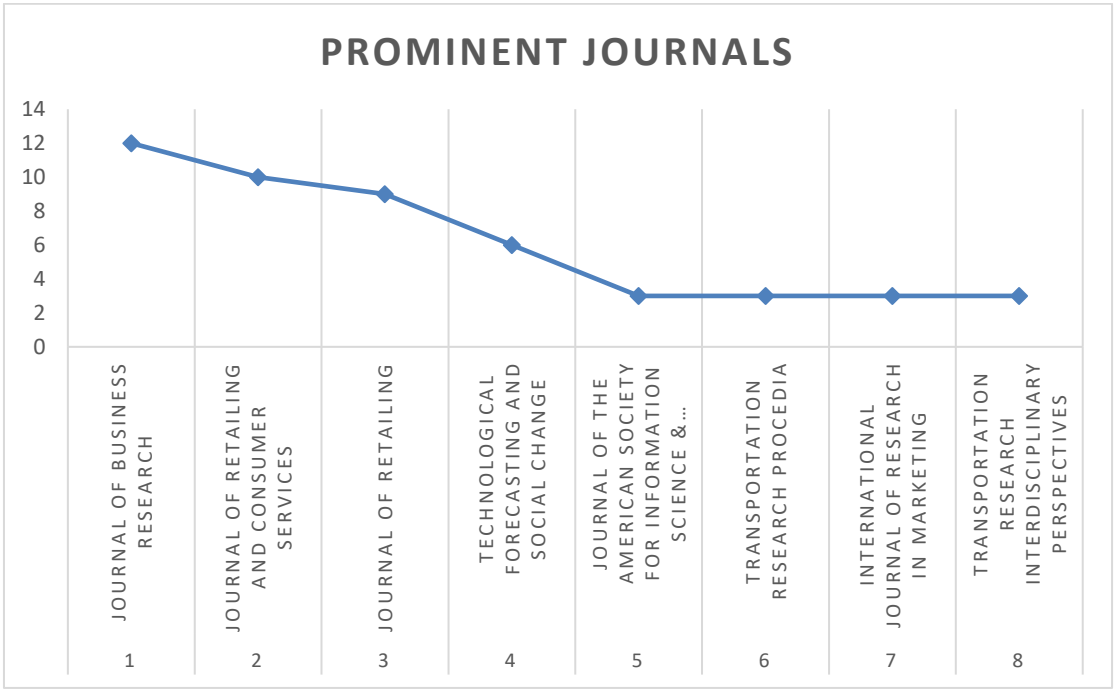
Sl. No.	Source Title	No of Articles
1	Journal of Business Research	12
2	Journal of Retailing and Consumer Services	10
3	Journal of Retailing	9
4	Technological Forecasting and Social Change	6
5	Journal of the American Society for Information Science & Technology	3
6	Transportation Research Procedia	3
7	International Journal of Research in Marketing	3
8	Transportation Research Interdisciplinary Perspectives	3
9	Decision Support Systems	2
10	International Journal of Production Economics	2
11	Visual Communication	2
12	The Journal of Design, Economics, and Innovation	2
13	International Journal of Information Management	2
14	Journal of Innovation & Knowledge	2
15	Journal of Business Venturing Insights	2
16	Transportation Research Part E: Logistics and Transportation Review	2
17	Procedia - Social and Behavioral Sciences	2
18	Sustainability (Switzerland)	1
19	International Journal of Innovation and Technology Management	1
20	International Journal of Services, Technology and Management	1
21	Journal of Risk and Financial Management	1
22	Journal of International Consumer Marketing	1
23	Artificial Intelligence Review	1

24	Journal of Modelling in Management	1
25	Production and Operations Management	1
26	Electronic Commerce Research	1
27	Frontiers in Sustainable Cities	1
28	Vanderbilt Law Review	1
29	IEEE Engineering Management Review	1
30	Human Factors and Ergonomics In Manufacturing	1
31	International Review of Retail, Distribution and Consumer Research	1
32	International Journal of Speech Technology	1
33	International Journal of Computing and Digital Systems	1
34	Journal of the Operational Research Society	1
35	Journal of Medical Internet Research	1
36	Information (2078-2489)	1
37	Journal of Academic Librarianship	1
38	Information Systems Management	1
39	EMedia Magazine	1
40	Quarterly Bulletin of the International Association of Agricultural Information Specialists	1
41	Socio-Economic Planning Sciences	1
42	International Journal of Information Management Data Insights	1
43	Finance Research Letters	1
44	City, Culture and Society	1
45	Journal of Rural Studies	1
46	Sustainable Technology and Entrepreneurship	1
47	Journal of Business Venturing	1
48	Organizational Dynamics	1
49	Computers in Human Behavior	1
50	Telematics and Informatics	1
51	Cleaner Logistics and Supply Chain	1
52	Information & Management	1
53	Industrial Marketing Management	1
54	Technology in Society	1
55	Journal of Industrial Information Integration	1
56	Journal of Co-operative Organization and Management	1
57	Journal of Interactive Marketing	1
58	The Journal of Strategic Information Systems	1
59	Journal of World Business	1
60	Journal of Urban Mobility	1
61	Long Range Planning	1
62	Asia Pacific Management Review	1
63	Regional Science Policy & Practice	1
64	Annals of Tourism Research Empirical Insights	1
	Total	114

(Source: Researcher's work)

Articles about AI applications in grocery retail trade appear in 64 different journals: The Journal of Business Research, The Journal of Retailing and Consumer Services, and the Journal of Retailing are the prolific Sources in the research domain. Fig 3 displays the most influential sources in the field of "Grocery Retail Trade and AI applications."

Fig. 3: Most influential journals in the research field



The most well-known sources are displayed in the chart, and it is evident that the Journal of Business Research is regarded as the king of sources because it generates the most documents on a variety of topics, including value co-creation routine dynamics, Voice assistants for transactional purposes, socio-technical framework, market mash-ups, empathic voice assistants, algorithmic bias in machine learning etc. Other well-known journals that have covered topics like service innovativeness in retailing, Consumer-firm data exchange, Website attributes, substitution policy in online grocery shopping, anthropomorphism in socio-cognitive perceptions, etc.,are the Journal of Retailing and Consumer Services and the Journal of Retailing.

Table 5: Document analysis on the topmost sources of the research domain

Sl. No	Source Title	Documents
1	Journal of Business Research	Enhancing trust in online grocery shopping through generative AI chatbots(Chakraborty et al., 2024)
		Smart sensing technology and self-adjustment in service systems through value co-creation routine dynamics (Mele et al., 2023)
		Rising with the machines: A sociotechnical framework for bringing artificial intelligence into the organization(Makarius et al., 2020)
		I am attracted to my Cool Smart Assistant! Analyzing Attachment-Aversion in AI-Human Relationships(Guerreiro & Loureiro, 2023)
		Consumer perceived risk of using autonomous retail technology(Sohn, 2024)
		Empathic voice assistants: Enhancing consumer responses in voice commerce(Mari et al., 2024)
		Consumers' adoption of autonomous cars as a personal values-directed behaviour (Crisafulli et al., 2025)
		Digitalization driven retail business model innovation: Evaluation of past and avenues for future research trends(Mostaghel et al., 2022)
		The role of the human-robot interaction in consumers' acceptance of

		humanoid retail service robots(Song & Kim, 2022)
		Why do people avoid and postpone the use of voice assistants for transactional purposes? A perspective from decision avoidance theory(Malodia et al., 2022)
		Market mash ups: The process of combinatorial market innovation(Geiger & Kjellberg, 2021)
		Algorithmic bias in machine learning-based marketing models(Akter et al., 2022)
2	Journal of Retailing and Consumer Services	Service innovativeness in retailing: Increasing the relative attractiveness during the COVID-19 pandemic(Pilawa et al., 2022)
		Rapport with a chatbot? The underlying role of anthropomorphism in socio-cognitive perceptions of rapport and e-word of mouth(Kayeser Fatima et al., 2024)
		From customer experience to human experience: Uses of systematized and non-systematized knowledge(Roggeveen & Rosengren, 2022)
		Inclusive or exclusive? Investigating how retail technology can reduce old consumers' barriers to shopping(Pantano et al., 2022)
		Competitive advantage: A longitudinal analysis of the roles of data-driven innovation capabilities, marketing agility, and market turbulence(Alghamdi & Agag, 2024)
		Unlocking (re)purchase potential through corporate responsiveness on social networks: The role of perceived customer orientation(Stuhldreier, 2024)
		Explanation of time perspectives in adopting AI service robots under different service settings(Dang et al., 2025)
		Creating and detecting fake reviews of online products(Salminen et al., 2022)
		Why do people purchase from food delivery apps? A consumer value perspective(Tandon et al., 2021)
		Drivers and outcomes of a shopper-retailer's app relationship(Abu Farha et al., 2024)
3	Journal of Retailing	Autonomous Shopping Systems: Identifying and Overcoming Barriers to Consumer Adoption(de Bellis & Venkataramani Johar, 2020)
		Sorry, the product you ordered is out of stock": Effects of substitution policy in online grocery retailing(Hoang & Breugelmans, 2023)
		Leveraging In-Store Technology and AI: Increasing Customer and Employee Efficiency and Enhancing their Experiences(Grewal et al., 2023)
		Facilitating retail customers' use of AI-based virtual assistants: A meta-analysis(Blut et al., 2024)
		Reimagining personalization in the physical store(Scholdra et al., 2023)
		The Future of Retailing(Grewal et al., 2017)
		Should online retailers emphasize efficiency or experience? First insights on the evolution and heterogeneity of website attributes(El-Manstrly et al., 2024)
		Insight is power: Understanding the terms of the consumer-firm data exchange(Krafft et al., 2021)

(Source: Researcher's work)

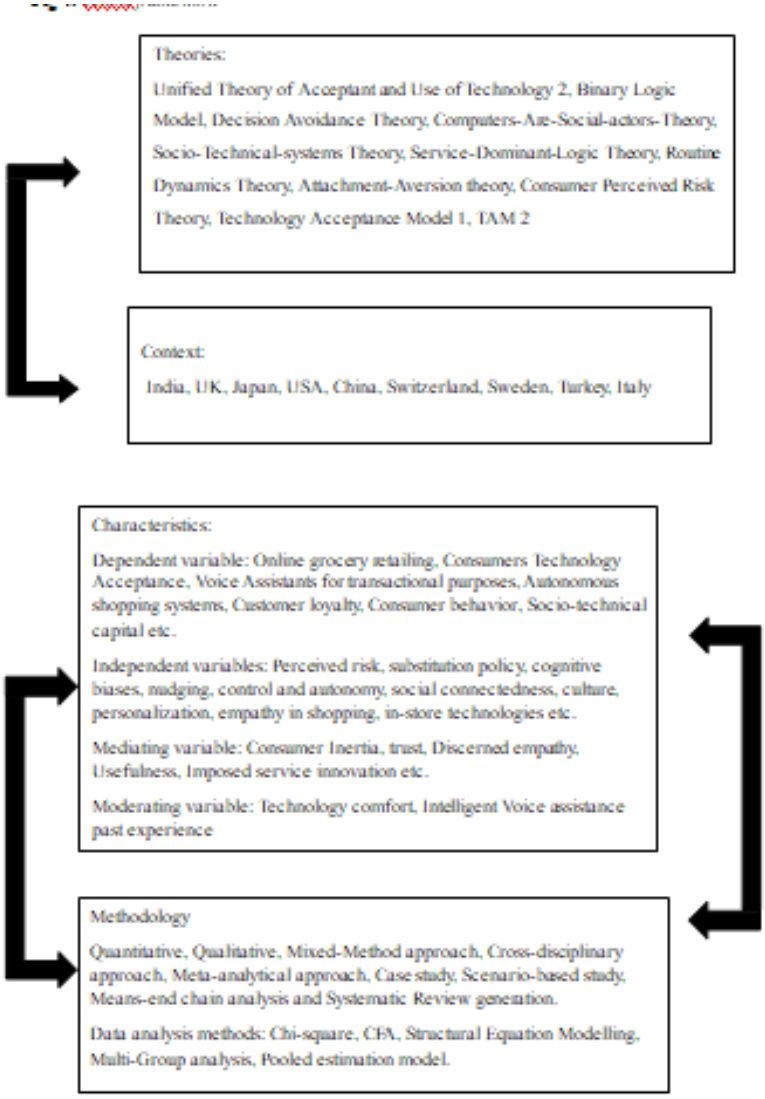
Table 6: Recent documents in the field of AI applications in grocery retail

Sl. No	Author(s)	Title	Source Title	Review
1	Heins, Caroline ; Scheler, Sebastian	Customer acceptance of unmanned stores with a focus on grocery retail	International Journal of Services, Technology and Management	The study examines the customer acceptance and intention towards unmanned stores by using the TAM model and found that significant customers accept the stores considering the strategic location and technological harmony of the stores.
2	Chakraborty, Debarun; Kumar Kar, Arpan ; Patre, Smruti ; Gupta, Shivam	Enhancing trust in online grocery shopping through generative AI chatbots	Journal of Business Research	This paper explores the determinants that affect the trust levels in online grocery shopping using GAI chatbots through fsQCA.
3	Zwanka, Russell J, ; Zondag, Marcel M.	Tired or Inspired: A Conceptual Model for Using Regenerative Artificial Intelligence to Create Context, User, and Time-Aware Individualized Shopping Guidance	Journal of International Consumer Marketing	The study outlines the ReGenAI, which is intended for FMCG products, and it categorizes the customers as“tired’ or ‘inspired’ to produce relevant data for planning and retail operations.
4	Nielsen, Ann Merrit Rikke ; Due, Brian L; Lüchow, Louise	The eye at hand: when visually impaired people distribute ‘seeing’ with sensing AI	Visual Communication	The study uses video ethnography to demonstrate how technologies make visual behaviours possible in visually impaired persons.
5	Rohden, Simoni F. ; Espartel, Lélis Balestrin	Consumer reactions to technology in retail: choice uncertainty and reduced perceived control in decisions assisted by recommendation agents.	Electronic Commerce Research	This study highlights that although AI-powered recommendation agents reduced purchase decision-making by lowering the choices in online grocery shopping,they also increased the level of uncertainty.
6	Adulyasak, Yossiri ; Cohen, Maxime C. ; Khern-Am-Nuai, Warut; Krause, Michael	Retail Analytics in the New Normal: The Influence of Artificial Intelligence and the Covid-19 Pandemic.	IEEE Engineering Management Review	The study pointed out that retailers created value for AI and data analytics by integrating both online and offline during the pandemic to handle the disturbances of panic buying and online food demand.
7	Rana, Jyoti ; Jain, Ruchi ; Nehra, Vibha	Utility and Acceptability of AI-Enabled	International Journal of Computing and	The study presented that most customers are worried about the security and accuracy of chatbots

		Chatbots on the Online Customer Journey in E-Retailing.	Digital Systems	in their online shopping journey.
8	Waseem Abbas, Zuping Zhang, Muhammad Asim, Junhong Chen, Sadique Ahmad	AI-Driven Precision Clothing Classification: Revolutionizing Online Fashion Retailing with Hybrid Two-Objective Learning	Information	The study proposes a hybrid model to handle the difficulties ofcategorizing clothing items in the online fashion industry.

(Source: Researcher's work)

Fig 4: TCCM framework



***Theories (T)*:** To progress the scholarly literature in the field of AI applications and grocery retail trade, knowledge of theoretical frameworks is significant. The theories included in the collected documents are Technology Acceptance Model, Innovative Diffusion theory, Decision Avoidance Theory, Computers-Are-Social-actors-Theory, Socio-Technical-systems Theory, Service-Dominant-Logic Theory, Routine Dynamics Theory, Attachment-Aversion theory, Binary Logit Model. Several theories, including institutional theory, stakeholder theory, behavioral economics and consumer decision-making theory, consumer behavior theory, and dynamic capabilities theory, are lacking in this review and can be used in subsequent research.

***Contexts (C)*:**The identified papers about AI applications and grocery retail trade are conducted in various contexts, including India, the UK, Japan, the USA, China, Switzerland, Sweden, Turkey, Italy, etc. Some papers do not specify the nation and some conduct studies by taking respondents from different nations.

***Characteristics (C)*:** Theresearch area's dimensions are mainly concentrated on 'Consumer-centred behavior and psychological factors,' 'service innovations and retailing,' and 'technology innovation and advancements.' The review should consider several areas, like readiness of AI technologies, system integration complexity, Competitive pressure and Managerial support in AI adoption, resource availability in AI implementation, and ethical practices of AI technologies in customer-facing applications.

***Methodology(M)*:** Mixed-method approaches, Cross-disciplinary approaches, meta-analytical approaches, Case studies, scenario-based studies, means-end chain analysis and systematic reviews are some of the widely used methodologies in the field of study. Alternative approaches like data gathering strategies, analytical tools, and predictive analytics have not been used in the review but can be used in subsequent research.

Discussion and Conclusion

AI technologies significantly improve sustainability, customer engagement and operational efficiency in the retail ecosystem. Conventional retail processes have changed as a result of AI-powered solutions, including demand forecasting, inventory management, personalized marketing, and dynamic pricing. Even if the use of AI is growing, there are still a number of obstacles to overcome, such as the requirement for deep insights, integrating difficulties and data protection issues. Based on this, the current study attempts to conduct a systematic evaluation in order to explore more about the AI applications utilized in grocery retailing through a systematic review. Using the most renowned databases, such as Scopus, Web of Science, Science Direct, and EBSCOhost, the articles related to the field of study are identified.

The PRISMA protocol was used to refine the final list of 114 articles, which was then examined using the TCCM framework to explore the various theories, contexts, characteristics, and methodologies in the prior literature.

The analysis also includes the most prestigious journals of the research domain, document analysis in the most prolific journals and the current documents published in AI applications and grocery retailing for deeper insights. Findings revealed that the research domain had expanded significantly in recent years, and the highest production of articles was in 2023, with around 22 publications, followed by 2022 with 20 publications. Numerous AI technologies, such as AI-enabled chatbots, Intelligent Voice Assistance, ReGenAI, retail analytics etc., have been shown in recent documents to improve the operational efficiency of the retail economy. AI improves the customer experience by offering individualized suggestions, expedited checkout, and effective customer support. It streamlines processes by enhancing personnel scheduling, supply chain effectiveness and inventory management. AI technologies optimizeprofitability by boosting sales, improving operational efficiency and reducing waste.

Future Research Avenues and Limitations

Future studies should concentrate on establishing ethical standards, building frameworks for efficient AI deployment, and expanding AI's contribution to the development of customer-focused and sustainable food retail ecosystems. By addressing these special issues, grocery retail can become more innovative and competitive over the long run.

Table 7: Future Research Directions

Themes	Avenues
Technological innovations	• Examine the use of AI-powered tools in demand forecasting, inventory management, customer segmentation and recommendation systems. • Exploring in-store automation like smart checkout, personalized offers, and AI-driven navigation systems.
Customer centric	• Investigation on AI customizes product recommendations and promotions based on real-time data. • Assess the integration of AI systems and customer experiences through digital interfaces and convenience-driven technologies.
Business and Operational benefits	• Analyse the AI-powered logistics and services for reducing costs and increase operational efficiency
Strategic and managerial challenges	• Identifying the risk factors related to data privacy, security and reliability through AI innovations in the retail environment

(Source: Researcher's work)

There are a few restrictions that must be considered, such as the fact that we only looked at sources that were accessible through the databases, such as Scopus, Web of Science, EBSCO and Science Direct, excluding the other significant databases, including Google Scholar, JSTOR, PubMed and others, which would have been used for a far more thorough examination. In this study, articles were only analysed. Other materials that were less likely to undergo peer review, such as book chapters, reports, and conference proceedings, were removed (Volkmann et al., 2012).Our study includes only the TCCM framework analysis; other methods of systematic literature review, such as Hybrid analysis, domain-based analysis, and meta-analysis are not included. This analysis only provides a few specific suggestions about AI applications. Analysis of non-English materials is not included, which could have been challenging for readers who do not speak English to continue their studies. Therefore, in order to get a comprehensive understanding of the research, future scholars should concentrate on the other fields of systematic literature review.

References

1. Abu Farha, A. K., El Hedhli, K., Alnawas, I., Zourrig, H., & Becheur, I. (2024). Drivers and outcomes of a shopper-retailer's app relationship. *Journal of Retailing and Consumer Services*, *81*. https://doi.org/10.1016/j.jretconser.2024.104002
2. Akter, S., Dwivedi, Y. K., Sajib, S., Biswas, K., Bandara, R. J., & Michael, K. (2022). Algorithmic bias in machine learning-based marketing models. *Journal of Business Research*, *144*, 201–216. https://doi.org/10.1016/j.jbusres.2022.01.083
3. Alghamdi, O. A., & Agag, G. (2024). Competitive advantage: A longitudinal analysis of the roles of data-driven innovation capabilities, marketing agility, and market turbulence. *Journal of Retailing and Consumer Services*, *76*. https://doi.org/10.1016/j.jretconser.2023.103547
4. Bhatia, R., Bhat, A. K., & Tikoria, J. (2021). Life insurance purchase behaviour: A systematic review and directions for future research. In *International Journal of Consumer Studies* (Vol. 45, Issue 6, pp. 1149–1175). John Wiley and Sons Inc. https://doi.org/10.1111/ijcs.12681
5. Blut, M., Wünderlich, N. V., & Brock, C. (2024). Facilitating retail customers' use of AI-based virtual assistants: A meta-analysis. *Journal of Retailing*, *100*(2), 293–315. https://doi.org/10.1016/j.jretai.2024.04.001
6. Bolton, R. N., Chapman, R. G., & Mills, A. J. (2019). Harnessing Digital Disruption With Marketing Simulations. *Journal of Marketing Education*, *41*(1), 15–31. https://doi.org/10.1177/0273475318803417
7. Brynjolfsson, E., Hu, Y. J., & Rahman, M. S. (2013). Competing in the Age of Omnichannel Retailing. *MIT SLOAN MANAGEMENT REVIEW*, *54*(4), 23–29.
8. Campbell, C., Sands, S., Ferraro, C., Tsao, H. Y. (Jody), & Mavrommatis, A. (2020). From data to action: How marketers can leverage AI. *Business Horizons*, *63*(2), 227–243. https://doi.org/10.1016/j.bushor.2019.12.002
9. Carlsson, C. (2018). Decision analytics—Key to digitalisation. *Information Sciences*, *460–461*, 424–438. https://doi.org/10.1016/j.ins.2017.08.087

10. Chakraborty, D., Kumar Kar, A., Patre, S., & Gupta, S. (2024). Enhancing trust in online grocery shopping through generative AI chatbots. *Journal of Business Research*, *180*. https://doi.org/10.1016/j.jbusres.2024.114737
11. Collins, C., Dennehy, D., Conboy, K., & Mikalef, P. (2021). Artificial intelligence in information systems research: A systematic literature review and research agenda. *International Journal of Information Management*, *60*. https://doi.org/10.1016/j.ijinfomgt.2021.102383
12. Crisafulli, B., Guesalaga, R., & Dimitriu, R. (2025). Consumers' adoption of autonomous cars as a personal values-directed behavior. *Journal of Business Research*, *189*. https://doi.org/10.1016/j.jbusres.2024.115106
13. Dang, S., Quach, S., & Roberts, R. E. (2025). Explanation of time perspectives in adopting AI service robots under different service settings. *Journal of Retailing and Consumer Services*, *82*. https://doi.org/10.1016/j.jretconser.2024.104109
14. Daugherty, P., Ghosh, B., & Wilson, J. (2020). *Your legacy or your legend? A CEO's guide to getting the most out of new technologies*.
15. Day . S. George, &Schoemaker . J H . Paul. (2019). *See Sooner, Act Faster How Vigilant Leaders Thrive in an Era of Digital Turbulence*. MIT Press.
16. de Bellis, E., & Venkataramani Johar, G. (2020). Autonomous Shopping Systems: Identifying and Overcoming Barriers to Consumer Adoption. *Journal of Retailing*, *96*(1), 74–87. https://doi.org/10.1016/j.jretai.2019.12.004
17. Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., … Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, *57*. https://doi.org/10.1016/j.ijinfomgt.2019.08.002
18. El-Manstrly, D., Herhausen, D., Guha, A., Blut, M., & Grewal, D. (2024). Should online retailers emphasize efficiency or experience? First insights on the evolution and heterogeneity of website attributes. *Journal of Retailing*, *100*(2), 274–292. https://doi.org/10.1016/j.jretai.2024.03.002
19. Geiger, S., & Kjellberg, H. (2021). Market mash ups: The process of combinatorial market innovation. *Journal of Business Research*, *124*, 445–457. https://doi.org/10.1016/j.jbusres.2020.11.010
20. Grewal, D., Benoit, S., Noble, S. M., Guha, A., Ahlbom, C. P., & Nordfält, J. (2023). Leveraging In-Store Technology and AI: Increasing Customer and Employee Efficiency and Enhancing their Experiences. *Journal of Retailing*, *99*(4), 487–504. https://doi.org/10.1016/j.jretai.2023.10.002
21. Grewal, D., Roggeveen, A. L., & Nordfält, J. (2017). The Future of Retailing. *Journal of Retailing*, *93*(1), 1–6. https://doi.org/10.1016/j.jretai.2016.12.008
22. Guerreiro, J., & Loureiro, S. M. C. (2023). I am attracted to my Cool Smart Assistant! Analyzing Attachment-Aversion in AI-Human Relationships. *Journal of Business Research*, *161*. https://doi.org/10.1016/j.jbusres.2023.113863
23. Gupta, Sunil. (2018). *Driving digital strategy : a guide to reimagining your business*. Harvard Business Review Press.
24. Hagberg, J., Sundstrom, M., & Egels-Zandén, N. (2016). The digitalization of retailing: an exploratory framework. *International Journal of Retail and Distribution Management*, *44*(7), 694–712. https://doi.org/10.1108/IJRDM-09-2015-0140
25. Hoang, D., & Breugelmans, E. (2023). "Sorry, the product you ordered is out of stock": Effects of substitution policy in online grocery retailing. *Journal of Retailing*, *99*(1), 26–45. https://doi.org/10.1016/j.jretai.2022.06.006
26. Kayeser Fatima, J., Khan, M. I., Bahmannia, S., Chatrath, S. K., Dale, N. F., & Johns, R. (2024). Rapport with a chatbot? The underlying role of anthropomorphism in socio-cognitive perceptions of rapport and e-word of mouth. *Journal of Retailing and Consumer Services*, *77*. https://doi.org/10.1016/j.jretconser.2023.103666
27. Kietzmann, J., Paschen, J., & Treen, E. (2018). Artificial intelligence in advertising: How marketers can leverage artificial intelligence along the consumer journey. In *Journal of Advertising Research* (Vol. 58, Issue 3, pp. 263–267). World Advertising Research Center. https://doi.org/10.2501/JAR-2018-035

28. Kitchenham, B. (2004). *Procedures for Performing Systematic Reviews*.
29. Kitchenham, B. A., Budgen, D., & Pearl Brereton, O. (2011). Using mapping studies as the basis for further research - A participant-observer case study. *Information and Software Technology*, *53*(6), 638–651. https://doi.org/10.1016/j.infsof.2010.12.011
30. Krafft, M., Kumar, V., Harmeling, C., Singh, S., Zhu, T., Chen, J., Duncan, T., Fortin, W., & Rosa, E. (2021). Insight is power: Understanding the terms of the consumer-firm data exchange. *Journal of Retailing*, *97*(1), 133–149. https://doi.org/10.1016/j.jretai.2020.11.001
31. Lim, W. M., Yap, S. F., & Makkar, M. (2021). Home sharing in marketing and tourism at a tipping point: What do we know, how do we know, and where should we be heading? *Journal of Business Research*, *122*, 534–566. https://doi.org/10.1016/j.jbusres.2020.08.051
32. Makarius, E. E., Mukherjee, D., Fox, J. D., & Fox, A. K. (2020). Rising with the machines: A sociotechnical framework for bringing artificial intelligence into the organization. *Journal of Business Research*, *120*, 262–273. https://doi.org/10.1016/j.jbusres.2020.07.045
33. Malodia, S., Kaur, P., Ractham, P., Sakashita, M., & Dhir, A. (2022). Why do people avoid and postpone the use of voice assistants for transactional purposes? A perspective from decision avoidance theory. *Journal of Business Research*, *146*, 605–618. https://doi.org/10.1016/j.jbusres.2022.03.045
34. Mari, A., Mandelli, A., & Algesheimer, R. (2024). Empathic voice assistants: Enhancing consumer responses in voice commerce. *Journal of Business Research*, *175*. https://doi.org/10.1016/j.jbusres.2024.114566
35. McCarthy K.P, & Wellens. U. (1988, June 17). *Measurements of 900 MHz propagation for microcellular communications systems design*.
36. McCorduck Pamela. (2004). *Machines Who Think A Personal Inquiry into the History and Prospects of Artificial Intelligence* (2nd ed.).
37. Mele, C., Tuominen, T., Edvardsson, B., & Reynoso, J. (2023). Smart sensing technology and self-adjustment in service systems through value co-creation routine dynamics. *Journal of Business Research*, *159*. https://doi.org/10.1016/j.jbusres.2023.113737
38. Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., Antes, G., Atkins, D., Barbour, V., Barrowman, N., Berlin, J. A., Clark, J., Clarke, M., Cook, D., D'Amico, R., Deeks, J. J., Devereaux, P. J., Dickersin, K., Egger, M., Ernst, E., Gøtzsche, P. C., … Tugwell, P. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. In *PLoS Medicine* (Vol. 6, Issue 7). Public Library of Science. https://doi.org/10.1371/journal.pmed.1000097
39. Mostaghel, R., Oghazi, P., Parida, V., & Sohrabpour, V. (2022). Digitalization driven retail business model innovation: Evaluation of past and avenues for future research trends. *Journal of Business Research*, *146*, 134–145. https://doi.org/10.1016/j.jbusres.2022.03.072
40. Mulrow, C., Cook, D., Cook, D. J., Greengold, N. L., Ellrodt, ; A Gray, Weingarten, S. R., & Mcmaster, F. (1997). Systemic Review Series Series Editors: The Relation between Systematic Reviews and Practice Guidelines. In *Ann Intern Med* (Vol. 127). http://annals.org/
41. Oosthuizen, K. (2021). *ARTIFICIAL INTELLIGENCE IN RETAIL: THE AI-ENABLED VALUE CHAIN*. https://scholar.sun.ac.za
42. Palmatier, R. W., Houston, M. B., & Hulland, J. (2018). Review articles: purpose, process, and structure. In *Journal of the Academy of Marketing Science* (Vol. 46, Issue 1). Springer New York LLC. https://doi.org/10.1007/s11747-017-0563-4
43. Pantano, E., Viassone, M., Boardman, R., & Dennis, C. (2022). Inclusive or exclusive? Investigating how retail technology can reduce old consumers' barriers to shopping. *Journal of Retailing and Consumer Services*, *68*. https://doi.org/10.1016/j.jretconser.2022.103074
44. Paul, J., & Benito, G. R. G. (2018). A review of research on outward foreign direct investment from emerging countries, including China: what do we know, how do we know and where should we be heading? *Asia Pacific Business Review*, *24*(1), 90–115. https://doi.org/10.1080/13602381.2017.1357316
45. Paul, J., & Criado, A. R. (2020). The art of writing literature review: What do we know and what do we need to know? *International Business Review*, *29*(4). https://doi.org/10.1016/j.ibusrev.2020.101717
46. Paul, J., & Mas, E. (2020). Toward a 7-P framework for international marketing. *Journal of Strategic Marketing*, *28*(8), 681–701. https://doi.org/10.1080/0965254X.2019.1569111

47. Paul, J., & Rosado-Serrano, A. (2019). Gradual Internationalization vs Born-Global/International new venture models A review and research agenda. *International Marketing Review*. https://doi.org/https://doi.org/10.1108/IMR-10-2018-0280
48. Petersen, K., Vakkalanka, S., & Kuzniarz, L. (2015). Guidelines for conducting systematic mapping studies in software engineering: An update. *Information and Software Technology*, *64*, 1–18. https://doi.org/10.1016/j.infsof.2015.03.007
49. Pilawa, J., Witell, L., Valtakoski, A., & Kristensson, P. (2022). Service innovativeness in retailing: Increasing the relative attractiveness during the COVID-19 pandemic. *Journal of Retailing and Consumer Services*, *67*. https://doi.org/10.1016/j.jretconser.2022.102962
50. Poole. L David, & Mackworth K. Alan. (2023). *Artificial Intelligence: Foundations of Computational Agents, 3rd Edition* (3rd ed.). Cambridge University Press.
51. Roggeveen, A. L., & Rosengren, S. (2022). From customer experience to human experience: Uses of systematized and non-systematized knowledge. *Journal of Retailing and Consumer Services*, *67*. https://doi.org/10.1016/j.jretconser.2022.102967
52. Rosado-Serrano, A., Paul, J., & Dikova, D. (2018). International franchising: A literature review and research agenda. *Journal of Business Research*, *85*, 238–257. https://doi.org/10.1016/j.jbusres.2017.12.049
53. Russell, S. J., Norvig, P., Davis, E., Edwards, D. D., Forsyth, D., Hay, N. J., Malik, J. M., Mittal, V., Sahami, M., Thrun, S., Columbus, B., New, I., San, Y., Upper, F., River, S., Cape, A., Dubai, T., Madrid, L., Munich, M., … Tokyo, T. (n.d.). *Artificial Intelligence A Modern Approach Third Edition*.
54. Salminen, J., Kandpal, C., Kamel, A. M., Jung, S. gyo, & Jansen, B. J. (2022). Creating and detecting fake reviews of online products. *Journal of Retailing and Consumer Services*, *64*. https://doi.org/10.1016/j.jretconser.2021.102771
55. Scholdra, T. P., Wichmann, J. R. K., & Reinartz, W. J. (2023). Reimagining personalization in the physical store. *Journal of Retailing*, *99*(4), 563–579. https://doi.org/10.1016/j.jretai.2023.11.001
56. Sohn, S. (2024). Consumer perceived risk of using autonomous retail technology. *Journal of Business Research*, *171*. https://doi.org/10.1016/j.jbusres.2023.114389
57. Song, C. S., & Kim, Y. K. (2022). The role of the human-robot interaction in consumers' acceptance of humanoid retail service robots. *Journal of Business Research*, *146*, 489–503. https://doi.org/10.1016/j.jbusres.2022.03.087
58. Stuhldreier, S. M. (2024). Unlocking (re)purchase potential through corporate responsiveness on social networks: The role of perceived customer orientation. *Journal of Retailing and Consumer Services*, *81*. https://doi.org/10.1016/j.jretconser.2024.104041
59. Tandon, A., Kaur, P., Bhatt, Y., Mäntymäki, M., & Dhir, A. (2021). Why do people purchase from food delivery apps? A consumer value perspective. *Journal of Retailing and Consumer Services*, *63*. https://doi.org/10.1016/j.jretconser.2021.102667
60. Volkmann, C. K., Tokarski, K. O., & Ernst, K. (2012). Background, Characteristics and Context of Social Entrepreneurship. In *Social Entrepreneurship and Social Business* (pp. 3–30). Gabler Verlag. https://doi.org/10.1007/978-3-8349-7093-0_1
61. Warlick, S. E., & Vaughan, K. T. L. (2007). Factors influencing publication choice: Why faculty choose open access. *Biomedical Digital Libraries*, *4*. https://doi.org/10.1186/1742-5581-4-1
62. Weber, F. D., & Schütte, R. (2019). State-of-the-art and adoption of artificial intelligence in retailing. *Digital Policy, Regulation and Governance*, *21*(3), 264–279. https://doi.org/10.1108/DPRG-09-2018-0050.

❑❑❑