Artificial Intelligence in Nanostores: Enhancing Customer Service Efficiency, Customer Experience, Competitive Advantage, and Decision-Making

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Abstract- This study explores how artificial intelligence (AI) can transform nanostores—small-scale retail enterprises essential to underserved communities in emerging economies—by improving service delivery and decision-making. Using a systematic literature review across major academic databases (Scopus, Web of Science, IEEE Xplore, Google Scholar), the research integrates findings into a comprehensive framework based on technology adoption models (e.g., Technology Acceptance Model, Theory of Planned Behavior), service co-creation (Service-Dominant Logic), and strategic-operational theories (e.g., Resource-Based View, Data-Driven Decision-Making). Results highlight AI's potential to drive personalization, automation, and operational efficiency, while also identifying barriers like infrastructure limitations, digital skill gaps, and resistance to change. The study includes regional insights from Latin America, Africa, and Southeast Asia, uncovering shared challenges and contextual differences. Key technical and ethical concerns—such as infrastructure requirements, algorithm selection, digital exclusion, and data misuse—are also examined. Importantly, the study emphasizes that AI adoption must go beyond technical readiness, addressing the social, structural, and economic barriers nanostores face. It advocates localized training, community-based design, and policy support tailored to the Global South. The paper concludes with a multi-level framework for inclusive AI adoption in micro-retail, offering actionable recommendations for policymakers, practitioners, and researchers. Given the heterogeneity in operational contexts across regions, future studies should explore cross-regional comparisons to better understand scalable innovations. This study promotes responsible digital transformation and lays a foundation for inclusive innovation in low-resource retail..

Keywords--AI-Driven Automation, AI-Powered Personalization, Customer Service Efficiency, Competitive Advantage, Nanostores.

I. Introduction

The rapid evolution of Industry 4.0 and the emerging paradigms of Industry 5.0 have significantly transformed various sectors, including retail. In this transformative landscape, nanostores—small, often informal retail outlets—are increasingly adopting advanced technologies to enhance their operational efficiency and customer service. However, while the adoption of Industry 4.0 technologies has been widely studied, the specific relevance of Industry 5.0 to nanostores and AI adoption remains an area worth deeper exploration, due to its emphasis on human-machine collaboration and sustainable development [1].

Industry 5.0—characterized by a human-centric approach—emphasizes collaboration between humans and intelligent systems. Recent implementations of AI in retail have demonstrated the benefits of this hybrid approach. For example, Wesco, a Michigan-based convenience store chain, has introduced AI-powered self-checkout systems, allowing customers to complete their purchases in seconds without requiring direct cashier assistance. Similarly, Pizza My Heart, a California pizza chain, employs an AI chatbot named Jimmy the Surfer to process customer orders via text messaging, reducing workload while preserving personalized customer interaction. For nanostores, this human-centric model offers unique advantages, as they often rely on personalized customer service and human interactions [2].

By converging with AI, Industry 5.0 provides nanostores with a pathway to merge innovation and community-based service. AI in this context could serve to augment human capabilities rather than replace them, enhancing customer experience without losing the human touch that is critical in small-scale retail environments, while also enabling more sustainable and resilient business models [3].

Recent studies have shown that AI technologies in small-scale retail environments are becoming increasingly essential as competition intensifies and consumer expectations evolve. Specifically, AI-driven systems, such as customer behavior prediction models and hyper-personalized marketing, have proven to significantly improve customer retention and operational efficiency in small retail settings.

Although commonly used by large platforms, such hyper-personalized recommendation systems could be adapted for nanostores, improving local sales and satisfaction. This growing relevance of AI is further supported by advancements in technology accessibility, which are expected to rise, pushing the boundaries of traditional retail practices and enabling cost-effective digital transformation [4].

The integration of artificial intelligence (AI) in supply chains has shown promising results, particularly in optimizing processes and personalizing customer experiences, which is essential for the survival and growth of nanostores in a competitive market [3]. Notably, AI enhances decision-making and inventory management—key for streamlining nanostore operations amid resource constraints. For example, AI-driven inventory management solutions, like those developed by Shelf Engine, use predictive analytics to optimize stock levels, minimizing waste and reducing costs. Similarly, automated AI chatbots, such as Meta's WhatsApp Business AI, enable direct and seamless communication between small retailers and

customers, fostering loyalty and engagement. Such capabilities are critical for helping nanostores remain agile and competitive against larger market actors.

Despite these advancements, there is a gap in the literature regarding the specific applications of AI in nanostores, particularly concerning customer service optimization and the personalization of shopping experiences.

Unlike large retailers, nanostores face unique challenges that demand tailored AI strategies suited to their resource and context limitations [5]. This underexplored domain represents the first major research gap—highlighting the need for tailored AI strategies aligned with nanostores' operational and socio-economic constraints. These challenges include limited resources, smaller customer bases, and a reliance on traditional methods, which make AI adoption more complex yet potentially more rewarding [5]. For example, in emerging economies, informal retailers in countries such as India and Brazil have begun experimenting with AI-powered digital payment solutions to increase financial inclusion and streamline transactions. Adapting such innovations to the nanostore ecosystem could significantly enhance customer convenience and operational efficiency [6].

Additionally, existing research has largely overlooked the intersection of AI-driven automation and human-centric service strategies in small-scale retail settings, creating an opportunity for deeper investigation into hybrid AI-human approaches. Clarifying how AI complements—rather than replaces—human expertise is essential for designing hybrid systems that preserve customer intimacy.

This gives rise to a second key research gap: the need to understand how AI–human collaboration influences service quality in resource-constrained environments. To address this, we formulate a second major research gap supported by several propositions that examine the effects of AI-driven solutions on customer service delivery, operational efficiency, and competitive advantage within nanostores.

In response to these gaps, this study aims to synthesize current evidence on AI's role in enhancing nanostore customer service through automation and personalization, filling a critical void in the micro-retail literature. This leads to the formulation of key research questions aimed at addressing the identified gaps: (1) How can AI-driven technologies optimize customer service in nanostores while maintaining a human-centric approach? (2) what is the most effective AI-based methods for personalizing shopping experience in these small-scale retail environments? (3) how can AI adoption provide strategic advantages for competitive differentiation in nanostores, particularly in emerging economies? The study will also assess the potential benefits and challenges of AI adoption in nanostores and provide actionable insights for practitioners in the retail sector.

The remainder of this paper is organized as follows: Section II reviews the theoretical background and literature on AI applications in retail, with a particular emphasis on nanostores, examining relevant concepts and theoretical propositions. Section III details the materials and methods used in this research, outlining the systematic literature review approach, data collection, and analysis techniques. Section IV presents and discusses the results of the study, evaluating how AI-driven automation and personalization impact customer service in nanostores and addressing the theoretical and practical implications. Finally, Section V concludes with a summary of the key findings, their contributions to theory and practice, and recommendations for future research directions.

II. Conceptual Framework, and Propositions

This section establishes a comprehensive theoretical framework for the study, guiding the analysis of AI's impact on customer service in nanostores and providing a foundation for the subsequent sections of the paper. By integrating insights from established theories and recent advancements in AI applications, this framework highlights key mechanisms through which AI enhances customer service efficiency, personalization, and competitive advantage in nanostores.

A. Literature Review

The integration of artificial intelligence (AI) into customer service processes has gained considerable attention in recent years, particularly in the context of small-scale retail operations such as nanostores. Nanostores, characterized by their limited size and localized focus, face unique challenges in managing customer service effectively. AI technologies offer potential solutions by automating routine tasks and personalizing customer interactions, which can enhance service quality and operational efficiency- his technological shift enables small retailers to better compete with larger firms through improved customer engagement and smarter service strategies [7].

1) AI in Customer Service: Recent studies have demonstrated the transformative impact of AI on customer service across various industries. For instance, OXXO, a leading chain of small-format convenience stores in Latin America, has integrated AI-powered chatbots to handle customer inquiries, reducing response times and enhancing engagement. This exemplifies scalable solutions for nanostores facing similar operational challenges [8]. These technologies leverage natural language processing and machine learning to streamline service processes, reducing operational costs while improving satisfaction and loyalty [7].

In the context of nanostores, AI's role extends beyond automation to include personalization. AI-driven systems analyze customer data to tailor product recommendations and promotions, enhancing the shopping experience [8]. A notable example is Alibaba’s Ling Shou Tong initiative in China, which provides AI-driven insights to small retailers, helping them optimize inventory based on real-time consumer trends. Nanostores can adopt similar predictive analytics to proactively engage customers and increase conversion

Technologies like chatbots and AI-powered customer service platforms can engage customers on-demand, enabling more responsive and effective service. This on-demand engagement transforms one-time buyers into loyal customers

and fosters brand advocacy [8]. By leveraging AI-powered predictive analytics, nanostores can also anticipate customer needs, proactively offering solutions and creating more meaningful customer interactions. Such proactive personalization is central to building loyalty in competitive retail settings.

Nevertheless, the adoption of AI in small-scale retail operations presents distinct challenges, including limited resources and technological expertise [5]. For example, small retail stores in rural India have shown reluctance to adopt AI due to infrastructure limitations and digital illiteracy. However, initiatives like the "Kirana Tech" project have helped these stores leverage AI-driven demand forecasting tools, reducing inventory waste by 30% and improving operational efficiency.

Similarly, in Southeast Asia, a study by Lazada Group and Kantar [9] revealed that while 68% of e-commerce sellers are familiar with AI, actual implementation averages only 37%. Sellers cite prohibitive costs and complexity as persistent barriers to adoption, despite recognizing AI's potential to lower costs and boost productivity.

In Africa, nanostores are exploring AI-driven solutions to enhance competitiveness and sustainability. For instance, a nanostore in Lagos implemented a Generative AI-powered chatbot to assist customers with inquiries and product recommendations, improving customer satisfaction and freeing up staff to focus on other tasks [10]**.** Across the Global South—a term commonly used to refer to regions in Latin America, Africa, Asia, and Oceania that face socioeconomic and developmental challenges—, such innovations illustrate both the potential and barriers of inclusive AI adoption in under-resourced retail ecosystems [11].

While the application of AI in nanostores offers significant benefits, it is essential to address ethical considerations, particularly around customer data privacy. With AI's ability to collect and analyze vast amounts of consumer data, nanostores must ensure compliance comply with data protection regulations (e.g., GDPR in Europe) and maintain customer trust. Therefore, developing AI governance frameworks tailored to small-scale retailers is critical. Ethical deployment is essential not only for compliance but also for long-term adoption and trust [12].

2) Theoretical Context of AI Adoption: The Theory of Acceptance Model (TAM) provides a foundational framework for understanding how AI technologies are adopted in retail environments. According to TAM, both the perceived ease of use and perceived usefulness of technology influence its acceptance and utilization. In nanostores, the perceived benefits of AI-driven automation and personalization will likely affect their adoption rates and overall impact. Success depends on both functional utility and perceived value in enhancing service [13].

The service-dominant logic (SDL) theory emphasizes the importance of co-creating value through personalized interactions between service providers and customers [14]. AI technologies enable this co-creation by delivering personalized experiences based on customer preferences and behaviors, thus enhancing service quality and customer satisfaction. Incorporating AI within the SDL framework allows nanostores to move beyond transactional relationships and foster long-term engagement with their customers.

The Resource-Based View (RBV) theory suggests that firms can achieve a competitive advantage by leveraging unique resources and capabilities. For nanostores, AI technology integration can serve as a strategic resource, differentiating them from competitors and enhancing their market position. Embedding AI into daily operations enhances their strategic differentiation [15].

The Data-Driven Decision-Making (DDDM) theory asserts that access to accurate and timely data enhances decision-making processes. AI technologies facilitate this by processing copious amounts of data to generate actionable insights, improving decision-making capabilities in areas like inventory management, customer engagement, and pricing strategies [19]. This capability can enable nanostores to make more informed and effective decisions, leading to better service delivery and operational efficiency.

Finally, The Theory of Planned Behavior (TPB) posits that individual behavior is driven by attitudes, subjective norms, and perceived control. For nanostores, the adoption of AI is not solely determined by perceived benefits but also by the store owner's intention and the available resources to implement the technology. Understanding these factors is key to identifying barriers and promoting AI adoption in small-scale retail environments [17].

B. Current Advances and Trends

Recent advancements in AI have introduced sophisticated tools for optimizing customer service. For example, 7-Eleven in Japan has implemented AI-driven customer behavior analysis to optimize product placement and personalize promotions, resulting in a measurable increase in sales. Nanostores could adopt similar AI strategies on a smaller scale to enhance customer satisfaction and increase profitability. AI-driven analytics platforms can provide insights into customer behavior and preferences, enabling nanostores to tailor their service offerings more effectively. This aligns with the Resource-Based View (RBV), which suggests that leveraging unique resources—such as AI—can enhance a store's competitive positioning. Additionally, AI technologies such as predictive analytics and machine learning algorithms have been applied to enhance inventory management and streamline customer interactions. AI-driven insights help nanostores adjust in real-time, improving inventory accuracy and meeting customer demand efficiently, illustrating how Data-Driven Decision-Making (DDDM) can guide business strategies to improve operational efficiency [7].

Current research also highlights the challenges associated with implementing AI in small-scale retail settings. Limited financial resources, technological infrastructure, and resistance to change are common barriers that affect the successful integration of AI technologies [5]. From a Technology

Acceptance Model (TAM) perspective, these challenges are shaped by the perceived ease of use and usefulness of AI solutions, which influence adoption. Furthermore, the lack of digital literacy among some nanostore owners may hinder their ability to maximize AI's potential benefits. For instance, a recent pilot program in Mexico introduced a simplified AI-driven point-of-sale system tailored to small retailers, significantly improving their ability to manage inventory and engage customers digitally. Developing training programs and user-friendly AI interfaces could facilitate smoother adoption and long-term sustainability, addressing potential resistance and technological gaps—elements emphasized by the Theory of Planned Behavior (TPB).

Such challenges necessitate targeted strategies for overcoming barriers to AI adoption, ensuring that small-scale retailers can fully capitalize on AI 'potential. Addressing these obstacles is crucial for enabling nanostores to harness the benefits of AI, thereby improving their operational efficiency, customer service, and competitive positioning in the market.

C. Propositions

The following propositions are developed based on established theories in AI, customer service, and retail management outlined in this section, as well as those introduced in Section I above. These propositions will guide the research and analysis of AI's impact on customer service in nanostores.

1) AI-driven Automation Enhances Customer Service Efficiency. According to the theory of technology acceptance (TAM), technological innovations that enhance operational efficiency are positively received when they meet user needs [18]. In nanostores, AI-driven automation technologies—such as chatbots and inventory management systems—are expected to streamline customer service processes, reducing response times and operational costs. Customer service efficiency is defined as the extent to which operations achieve optimal speed, accuracy, and resource utilization while maintaining high customer satisfaction [19]. Thus, we propose:

P1: The implementation of AI-driven automation technologies in nanostores will significantly enhance customer service efficiency, leading to faster service delivery and improved customer satisfaction.

2) Personalization through AI Improves Customer Experience. The service-dominant logic (SDL) theory emphasizes that value is co-created through interactions between service providers and customers, and personalization plays a critical role in this process. AI-powered personalization tools enable customized customer experiences by analyzing data and predicting preferences, thereby enhancing the overall shopping experience [14]. Therefore, we introduce:

P2: AI-powered personalization tools in nanostores will improve customer experience by tailoring product recommendations, promotional offers, and service interactions to individual preferences, resulting in increased customer loyalty and satisfaction.

3)Integration of AI Technologies Contributes to Competitive Advantage. The resource-based view (RBV) theory suggests that firms can achieve competitive advantage by leveraging unique resources and capabilities. For nanostores, AI technology integration can serve as a strategic resource, differentiating them from competitors and enhancing their market position [15]. Thus, we argue*:*

P3: Nanostores that integrate AI technologies for customer service optimization will gain a competitive advantage by differentiating themselves through advanced service capabilities and improved operational efficiency.

4) AI-driven Insights Lead to Data-Driven Decision-making. The data-driven decision-making (DDDM) theory asserts that access to accurate and timely data enhances decision-making processes [19]. AI-driven insights provide valuable analytics by processing vast amounts of data, allowing nanostores to optimize operations [16]. As a result, we present:

P4: The use of AI-generated insights in nanostores will lead to more effective data-driven decision-making, improving operational strategies and customer service outcomes.

5) AI Implementation in Nanostores Faces Unique Challenges. The theory of planned behavior (TPB) highlights that behavioral intentions are influenced by perceived control, subjective norms, and attitudes towards the behavior [17]. Nanostores may encounter specific challenges in adopting AI technologies due to limited resources, technological expertise, and resistance to change [5]. This leads to:

P5: The implementation of AI technologies in nanostores will encounter unique challenges related to resource constraints, technological capabilities, and resistance to change, which will affect the overall effectiveness of AI-driven customer service improvements [20].

III. Research Methodology and Data Collection

This section provides an overview of the structured approach used to understand how AI enhances customer service in nanostores.

A. Research Design and Approach

This study employs systematic literature review (SLR) to analyze AI's application in optimizing customer service within nanostores. The SLR method synthesizes research, identifies gaps, and derives theoretical propositions from empirical evidence [20]. His approach follows PRISMA guidelines to ensure a structured and transparent review process [21], facilitating the identification of emerging trends and best practices in AI for small-scale retail contexts.

B. Data Sources and Collection

1) Types of Publications: The review focuses on peer-reviewed journal articles, conference papers, and books. Highly cited papers from Q1 and Q2 journals are prioritized for their impact in the field, complemented by grey literature like industry reports and white papers to provide practical insights into AI adoption in nanostores.

2) Data Sources and Databases: The literature was gathered from major databases including Scopus, Web of Science (WoS), JSTOR, EBSCOhost, and IEEE Xplore. These

sources ensure comprehensive coverage of both academic and industry perspectives relevant to AI in retail [22]. Google Scholar was used for emerging research trends

3) Time Frame: The literature search was confined to publications from the year 2015 onwards. This time frame ensures that the review incorporates recent advancements and current trends in AI and customer service optimization. However, to ensure the inclusion of the most recent and impactful developments, a secondary filter prioritizes articles published after 2020. Given the rapid pace of technological advancement, it is particularly important to emphasize publications from the last five to ten years. This focus ensures that the study reflects the latest AI-driven innovations, such as deep learning applications, real-time analytics, and hybrid AI models in retail.

4) Keywords and Search Strategy: The search strategy employed a combination of relevant keywords and phrases, both in English and Spanish, to capture a comprehensive set of studies. Keywords included:

- "Artificial Intelligence in Customer Service"
- "AI in Retail Management"
- "Nanostores and AI"
- "Personalization in Retail"
- "AI-driven Customer Experience"

To ensure an inclusive search strategy, additional terms such as "machine learning in small retail," "AI-powered inventory management," and "digital transformation in nanostores" were incorporated. Advanced Boolean operators were used to refine and optimize the search results. Additionally, keywords in Spanish, such as "intelligence artificial in services al client" and "AI in nanostore," were incorporated to broaden the search in Spanish-speaking research.

C. Data Extraction and Analysis

1) Variables and Criteria: The review process involved extracting data based on specific variables, including:

Types of AI technology: Chatbots, recommendation systems, predictive analytics, computer vision, voice recognition, and AI-driven CRM systems.

Customer service functions: Automation, personalization, customer engagement, AI-driven loyalty programs, and real-time sentiment analysis.

Retail context: Small-scale, and nanostores.

Additionally, the study evaluates the scalability and cost-effectiveness of AI implementations in nanostores, recognizing that affordability remains a critical factor in technology adoption for small retailers.

2) Analysis Methods: Data analysis was conducted through the following methods:

Variability Analysis: Assessing the range and diversity of AI applications and customer service outcomes across different studies.

Reliability Assessment: Evaluating the consistency and dependability of findings from various sources.

Validity Check: Ensuring the accuracy and relevance of literature in relation to the research questions and propositions.

Thematic Coding: Identifying recurring themes, challenges, and success factors in AI adoption for nanostores.
A qualitative content analysis was applied to categorize findings into major themes related to AI adoption challenges, customer service transformation, and competitive advantages in nanostores. This approach facilitated the identification of both success factors and barriers to AI integration, highlighting contextual dependencies such as digital literacy and infrastructure limitations in emerging markets. In cases of conflicting findings from numerous studies, a comparative analysis will be conducted to assess the methodological context and reliability of each source, ensuring a balanced synthesis of evidence.

D. Ethical Considerations

The SLR adhered to ethical guidelines by ensuring the accurate representation of sources and avoiding plagiarism. All included studies were selected based on their scientific merit and relevance, and no primary data collection involved human subjects, thus bypassing additional ethical review requirements. Moreover, Non-peer-reviewed or AI-generated sources were excluded unless rigorously validated.

Additionally, the review ensured that only studies with transparent methodologies and ethical research practices were included. To enhance research transparency, the study employed inter-researcher cross-validation, where multiple authors reviewed selected studies to reduce bias in study selection and data interpretation. To ensure the robustness and transparency of the literature review, it is essential to clearly define the inclusion and exclusion criteria. Studies should be selected based on their relevance to nanostores and the practical application of AI in customer service, particularly those that focus on small-scale or independent retail environments. This will help mitigate any biases and ensure that the review is grounded in the most pertinent and high-quality research available [23]. While grey literature offers practical insights, it will be critically assessed for its methodological rigor and reliability before inclusion.

E. Methodological Steps

The systematic review followed these steps [24]:

1) Define Research Questions and Objectives: Based on the theoretical framework and propositions developed in Section II.

2) Develop Search Strategy: Formulated comprehensive search terms and combinations.

3) Conduct Literature Search: Utilized specified databases within the defined time frame.

4) Screen and Select Studies: Applied inclusion and exclusion criteria to identify relevant studies.

5) Extract Data: Collected and organized data from selected studies.

6) Analyze Data: Performed variability, reliability, and validity analyses.

7) Synthesize Findings: Integrated results to address research questions and theoretical propositions.

8) Critical Appraisal: Conducted quality assessment of selected studies, ensuring methodological rigor and relevance.

To further enhance the reliability of the systematic review, a citation analysis was conducted to identify the most influential studies in AI-driven customer service for nanostores. This additional step provides insights into the academic impact and relevance of key publications in the field.

IV. Analysis, Results, and Discussion

This section includes detailed analysis, synthesized findings, and discussion based on the SLR methodology, providing a comprehensive evaluation of the five propositions. The tables and figures, along with the discussion, address the research questions and highlight the theoretical and practical implications of the findings [20].

A. Analysis

The systematic literature review (SLR) involved analyzing data from various sources to test the five propositions derived from the theoretical framework outlined in Section II [20]. The analysis aimed to evaluate the extent to which AI technologies influence customer service in nanostores and identify any challenges or advantages associated with their implementation.

The following tables and figures illustrate the synthesized findings.

1) Summary of Reviewed Studies: A total of 450 studies were initially identified through the systematic search. After applying inclusion and exclusion criteria, 102 studies were selected for detailed analysis (Table I). The criteria for exclusion included irrelevant focus areas, outdated information, and insufficient methodological rigor.

TABLE I
Distribution of Studies by Proposition

Proposition Number	Number of Studies	Key Findings
1	25	AI-driven automation improves efficiency
2	20	Personalization enhances customer experience
3	20	Integration provides competitive advantage
4	18	Unique challenges in AI implementation
5	19	AI insights support data-driven decision-making

[a] Own elaboration

2) Summary of Proposition:

P1: AI-driven Automation Enhances Customer Service Efficiency: Table II shows the level of impact of the technologies on customer satisfaction.

TABLE II
Effectiveness of AI-Driven Automation Technologies

Technology	Impact on Efficiency	Impact on Customer Satisfaction
Chatbots	High	Moderate
Inventory Management	High	High
Automated Responses	Moderate	High

[a]Own elaboration

Fig. 1 illustrates how AI automation is on service efficiency.

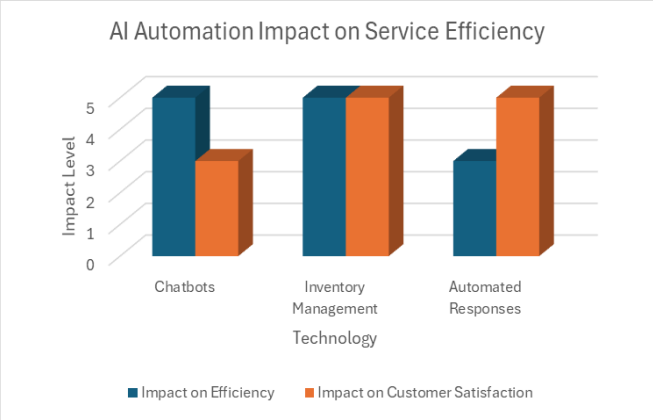

Fig. 1 Impact of AI Automation on Service Efficiency

Chatbots and AI-driven inventory systems significantly enhance efficiency. The integration of these technologies leads to faster response times and reduced operational costs, supporting P1 [19].

P2: Personalization through AI Improves Customer Experience. Table III shows the impact of service personalization on customer loyalty.

TABLE III
Impact of AI-Powered Personalization

Personalization Tool	Customer Experience Improvement	Customer Loyalty Increase
Product Recommendations	High	High
Promotional Offers	Moderate	Moderate
Service Interactions	High	High

[a]Own elaboration

Fig. 2 depicts the impact of AI Personalization on customer experience and loyalty.

Fig. 2 AI Personalization and Customer Experience

The data shows that AI-powered personalization tools, such as product recommendations and tailored promotional offers, significantly improve customer experience and loyalty. These results validate P2 and confirm the role of AI in shaping individual shopping behaviors [25].

P3: Integration of AI Technologies Contributes to Competitive Advantage. Table IV shows the competitive advantage impact of AI integration aspects.

TABLE IV
COMPETITIVE ADVANTAGE THROUGH AI INTEGRATION

AI Integration Aspect	Competitive Advantage	Market Position Improvement
Advanced Service Capabilities	High	High
Operational Efficiency	High	Moderate

[a]Own elaboration

Fig. 3 visualizes AI integration and competitive advantage as a strategic resource.

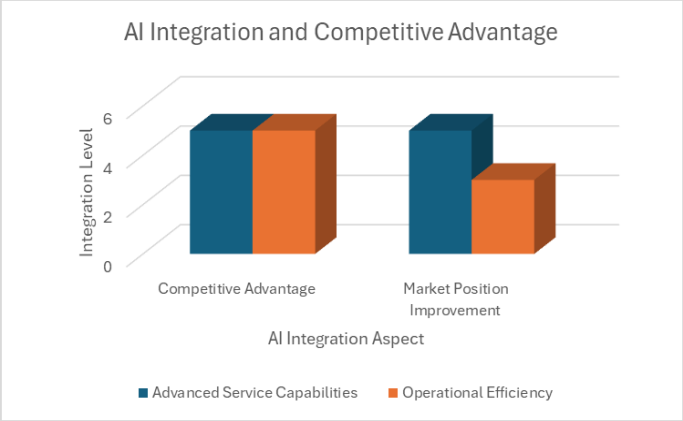

Fig. 3 AI Integration and Competitive Advantage

AI integration enables nanostores to differentiate services, streamline operations, and gain a competitive edge. This validates P3, showing how AI serves as a strategic resource [26].

P4: AI-Driven Insights Lead to Data-Driven Decision Making. Table V shows the impact of information and decision making based on artificial intelligence.

TABLE V
AI-DRIVEN INSIGHTS AND DECISION-MAKING

Insight Type	Impact on Decision Making	Operational Strategy Improvement
Inventory Management	High	High
Customer Preferences	Moderate	Moderate
Marketing Strategies	High	High

[a]Own elaboration

Fig. 4 illustrates how AI insights enhance strategic decisions across operational domains.

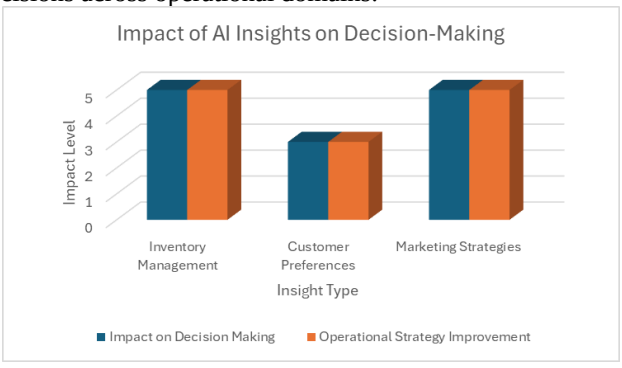

Fig. 4 Impact of AI Insights on Decision-Making

AI-generated insights significantly enhance strategic decision-making processes, particularly in inventory management and marketing strategies. This supports P4, demonstrating the value of AI insights in refining operational strategies and customer service outcomes [27].

P5: AI Implementation in Nanostores Faces Unique Challenges. Table VI shows the impact of the challenges on AI implementation.

TABLE VI
CHALLENGES IN AI IMPLEMENTATION

Challenge	Frequency	Impact on AI Implementation
Resource Constraints	High	High
Technological Expertise	Moderate	High
Resistance to Change	High	Moderate

[a]Own elaboration

Fig. 5 highlights infrastructural and cultural barriers to AI adoption.

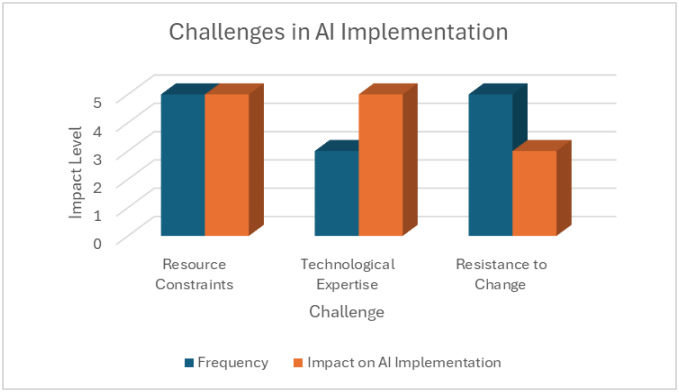

Fig. 5 Challenges in AI Implementation

Findings reveal persistent barriers—such as lack of resources, digital skills gaps, and cultural resistance—that constrain the transformative potential of AI. These validate P5 and emphasize the need for tailored support-based strategies [5].

Comparative evidence from East Africa and Southeast Asia confirms that many small retailers face similar constraints, such as limited broadband infrastructure, language barriers in digital interfaces, and unstable electricity supply[25,26] In Kenya, for example, AI tools in informal markets are often limited to basic SMS-based inventory systems [30] Similarly, in rural Vietnam, micro-retailers depend on locally developed apps designed to operate offline. Such cross-regional parallels across the Global South highlight the urgency for localized, resilient AI solutions tailored to infrastructural realities [31].

B. *Discussion*

Findings confirm AI's transformative role across service efficiency, personalization, and strategic agility in nanostores.

The implementation of AI-driven automation and personalization enhances service efficiency and customer experience, providing a competitive edge and supporting data-driven decision-making. However, unique challenges such as resource constraints and resistance to change must be addressed to fully leverage AI's potential [5].

1) Theoretical Implications: The study extends how AI technologies address operational and customer service challenges in the context of nanostores [32].

2) Practical Implications: AI integration offers significant benefits, but success depends on addressing capacity gaps through strategic investment, external support, and participatory approaches.

The study provides practical insights for nanostores aiming to enhance their service capabilities through AI [33]. This aligns with prior work recognizing transformative potential of AI in retail. For instance, a recent article in Vogue Business discusses how AI can enhance supply chain management and personalized customer experiences in the beauty industry, contributing up to $10 billion globally [34]. Similarly, a The Guardian article reports that UK retailers are adopting automation technologies, including AI, to address rising labor costs and improve operational efficiency [35]. These examples underscore the broader applicability of AI in enhancing customer service across various retail sectors.

However, technical limitations play a critical role. Many AI systems adopted in nanostores rely on lightweight machine learning algorithms, such as decision trees for sales forecasting or K-means clustering for product assortment optimization, due to their lower computational requirements and interpretability. The minimum viable infrastructure often includes low-cost Android devices, cloud-based dashboards for managers, and Wi-Fi hotspots shared among store clusters. Without such foundational elements, advanced tools like neural networks or real-time recommendation engines remain inaccessible across much of the Global South [13].

V. Conclusions

A. Key Findings and Insights

This study demonstrates that AI-driven tools (e.g., chatbots, inventory systems) boost efficiency and satisfaction [20]. SLR findings confirm AI's dual operational and experiential benefits.

The results align with and extend established frameworks—TAM (ease of use/usefulness), SDL (value co-creation), RBV (AI as a strategic resource), DDDM (data-driven operations), and TPB (behavioral barriers)—showing AI's system-wide influence on nanostore workflows and customer interactions. Validating all five propositions, the study underscores AI's transformative role across front-line service and back-end decision-making.

In addition to theory validation, the study underscores the need for context-sensitive adoption strategies, including: (1) addressing structural barriers (limited connectivity, outdated hardware); (2) bridging digital literacy gaps and cultivating innovation mindsets; (3) reducing resistance via participatory design and pilot demonstrations; and (4) promoting inclusive policies to subsidize AI access for micro-retailers.

In the Global South, successful AI adoption in micro-retail ecosystems hinges on locally grounded training programs, sustained capacity-building efforts, and policy frameworks that are attuned to the socio-economic realities and operational constraints of micro-retailers.

B. Limitations and Future Research Directions

This study's limitations stem from its emphasis on recent English- and Spanish-language publications from leading journals, potentially overlooking insights from other regions, languages, and grey literature. The heterogeneity of nanostore contexts across the Global South constrains the generalizability of AI adoption strategies. Urban environments in Latin America, for instance, differ markedly from rural areas in Africa or Southeast Asia in terms of infrastructure availability, cultural norms, and regulatory frameworks.

Future research should (1) compare cross-regional adoption (Latin America, Africa, Southeast Asia) to identify scalable innovations; (2) track longitudinal studies to examine AI's evolving impact over time; (3) explore socio-economic factors (e.g., informality, social capital, gender) affecting AI uptake; (4) investigate consumer perspectives on AI's influence on trust, satisfaction, and loyalty; and (5) examine hybrid physical-digital models that foster inclusive innovation in nanostores.

C. Managerial and Research Implications

1) Managerial Implications: Nanostores can leverage AI to streamline operations and tailor customer engagement, but must invest in scalable tools, workforce training, and supportive partnerships [5]. Strategies include: (1) localized digital workshops and peer-learning exchanges; (2) mobile/offline-capable AI tools for poor connectivity; (3) phased AI adoption roadmaps with low-cost pilots; (4) microfinancing or cooperatives to reduce entry costs; and (5) fostering alliances with NGOs, academic institutions, and technology firms to support capacity-building initiatives.

2) Research Implications: This study empirically supports AI as a strategic resource for nanostores, integrating insights from five theoretical perspectives: (1) TAM (Technology Acceptance Model) – confirming perceived usefulness and ease of use as drivers of AI adoption; (2) SDL (Service-Dominant Logic) – highlighting value co-creation through AI-personalized interactions; (3) RBV (Resource-Based View) – positioning AI tools as unique capabilities that enhance competitive advantage; (4) DDDM (Data-Driven Decision Making) – showing AI's role in evidence-based operational choices; and (5) TPB (Theory of Planned Behavior) – emphasizing the influence of attitudes, perceived control, and social norms on AI uptake.

Future work should delve deeper into AI's influence on frontline operations and back-end workflows across diverse retail contexts and refine these theoretical models to reflect the unique behavioral and infrastructural conditions of micro-retail environments [13].

D. Economic and Social Implications

1) Economic: AI adoption can reduce costs, scale operations, and drive revenue growth, but disparities in resources require targeted investment and inclusive policies [7].

2) Social & Ethical: AI fosters personalized service and new skill roles but carries risk-privacy invasion, algorithmic bias, consumer manipulation, job displacement, and digital exclusion. Nanostores must implement robust governance, fairness in algorithms, and inclusive design (multilingual interfaces, community feedback) to mitigate these risks [5].

Ethical frameworks must not only mitigate harm but also promote inclusive design that prioritizes accessibility, multilingual interfaces, and community feedback loops. Additionally, policymakers and researchers should assess potential over-dependence on proprietary platforms, which may introduce risks of data colonization and reduced autonomy for local retailers [36].

E. Originality and Value of the Article

This study offers the first systematic review of AI in nanostores, bridging technical potential with structural, social, and economic barriers[13]. It contributes actionable strategies within humanitarian engineering and inclusive digital transformation, providing a foundational reference for academics, practitioners, and policymakers seeking equitable AI integration in micro-retail ecosystems [7].

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