ZIBELINE INTERNATIONAL PUBLISHING

ISSN: 2616-5961 (Online)
CODEN: IMCSBZ

Information Management and Computer Science (IMCS)

DOI: http://doi.org/10.26480/imcs.02.2024.73.79

RESEARCH ARTICLE

FACTORS AFFECTING THE INTEGRATION OF ARTIFICIAL INTELLIGENCE (AI) TECHNOLOGIES AMONG GROCERY STORE OPERATORS IN LAGUNA, PHILIPPINES

Marian P. Alfonso[a], Ma.Ricci Angeline P. Alfonso[b]

[a] Laguna Senior High School, Philippines
[b] University of the Philippines, Philippines
**Corresponding Author Email: marian.alfonso001@deped.gov.ph*

ARTICLE DETAILS

Article History:

Received 23 July 2024
Revised 18 August 2024
Accepted 30 September 2024
Available online 03 October 2024

ABSTRACT

The study was conducted to assess the extent of integration of artificial intelligence in grocery stores in Laguna. Specifically, it dealt with the current level of integration of AI technology in grocery stores, and factors affecting the Integration of AI technology for customer management in grocery stores in AI Integration. The descriptive-correlational research design was used in this study. The survey questionnaire was used to gather primary data. A total of 317 grocery store owners and managers in the province of Laguna were the respondents of the study. Descriptive and inferential statistics were used to analyze the data gathered. Findings revealed a minimal level of AI technology is integration among grocery stores in Laguna, reflecting a potential area for growth and development in leveraging AI to enhance customer engagement. As the grocery industry evolves, there is room for increased AI adoption to drive innovation and competitiveness in the retail sector. Thus, it is therefore recommended to provide guidelines for grocery store operators to facilitate the adoption of AI technologies for effective customer management. This entails equipping them with comprehensive insights and practical strategies to leverage artificial intelligence across various aspects of business operations.

KEYWORDS

Artificial Intelligence, Integration, Marketing Management, Challenges and Constraints, Guide, Customer Management

1. INTRODUCTION

Integrating Artificial Intelligence (AI) technologies is transforming industries worldwide, and grocery retail is no exception. In Laguna, Philippines, grocery store operators are increasingly recognizing the benefits of AI, including improved operational efficiency, enhanced customer experiences, and optimized inventory management. AI can automate routine tasks, analyze large amounts of data for better decision-making, and personalize customer interactions, thereby revolutionizing grocery store operations. However, several factors influence the adoption and implementation of AI technologies in grocery retail. Despite these clear benefits, the level of AI integration in Laguna is currently moderate, indicating a need for a comprehensive guide for effective AI technology use. Such a guide should provide best practices, training methodologies, and step-by-step instructions to help grocery stores maximize AI benefits.

This research focuses on the key elements affecting AI integration among grocery store operators in Laguna, Philippines. It aims to provide insights into the challenges and opportunities of this technological transition. By addressing these factors, grocery stores in Laguna can better navigate the complexities of AI adoption. The study aims to evaluate the current state of technological infrastructure in Laguna's grocery stores and identify barriers to effective AI integration. It will also analyze management support, staff training, and cultural factors influencing AI adoption. Additionally, the research will investigate how regulatory compliance and market responsiveness impact AI implementation in grocery stores. Furthermore, it will explore how the perceived usefulness and ease of use of AI technologies affect their adoption among grocery store operators.

While the benefits of AI in grocery retail are evident, the specific challenges and factors affecting its integration in the context of Laguna, Philippines, have not been thoroughly examined. This study aims to fill this gap by providing a comprehensive understanding of these factors and ultimately guiding effective implementation strategies. Understanding these factors will help grocery stores in Laguna navigate the complexities of AI adoption. Addressing technological, organizational, and environmental challenges, and leveraging the perceived benefits and ease of use of AI technologies, will ensure a smoother and more effective integration process. This, in turn, will lead to improved operational efficiencies, enhanced customer experiences, and a stronger competitive position in the market (Kumar, 2009).

2. LITERATURE REVIEW

Artificial Intelligence (AI) systems are increasingly used to assist human decision-making in high-stakes domains, forming human-AI teams where humans review AI inferences to make decisions. Effective collaboration requires humans to understand AI performance and its limitations. However, updates to AI can sometimes undermine user confidence and hinder overall team performance (Bansal, 2019). Integrating technologies into healthcare and other organizations is complex, requiring organizational readiness—a multifaceted construct involving motivational readiness, resources, staff attributes, and climate. Without such readiness, technological adoption is likely to fail, and enthusiasm for AI should not overshadow practical integration challenges (Hazarika, 2020; Mazurowski,

Quick Response Code	Access this article online	
	Website: www.theimcs.org	**DOI:** 10.26480/imcs.02.2024.73.79

Cite the Article: Marian P. Alfonso, Ma.Ricci Angeline P. Alfonso (2024). Factors Affecting the Integration of Artificial Intelligence (Ai) Technologies Among Grocery Store Operators In Laguna, Philippines. *Information Management and Computer Science, 7(2): 73-79*.

2019).

Selecting the "best technology" alone is insufficient; alignment with end-user expectations and needs is crucial (Alami et al., 2019b; Topol, 2019). Integrating AI into grocery store operations is influenced by various environmental, technological, and organizational factors. From an environmental perspective, market competition plays a significant role in driving the adoption of AI to enhance operational efficiency and customer experience (Miller and Shih, 2020). Additionally, the regulatory environment impacts implementation strategies, as compliance with data privacy and AI deployment regulations is crucial (Janssen et al., 2021). Consumer expectations for personalized shopping experiences and convenience also push grocery stores to adopt AI-driven solutions (Wirtz et al., 2018).

Technological factors are equally important. Advances in AI technologies, such as machine learning and computer vision, enable the automation of inventory management, demand forecasting, and customer insights (Cui et al., 2019). The integration of AI systems with Internet of Things (IoT) devices allow real-time monitoring of store conditions and inventory levels (Raj, 2020). Moreover, the availability of high-quality, real-time data is crucial for AI algorithms to provide accurate predictions and recommendations (Lee et al., 2021; Kumar et al., 2023). Organizational factors include leadership support, employee skills, and organizational structure. Commitment from top management to invest in AI technology and foster a culture of innovation is essential (Fosso Wamba et al., 2020).

Training employees to work alongside AI systems and leveraging their insights enhances operational efficiency (Janssen et al., 2021). Agile organizational structures facilitate faster integration of AI systems into existing operations (Wamba et al., 2020). However, integrating AI into grocery store operations presents several challenges. Initial investment costs for AI integration may be high, impacting adoption rates among smaller grocery operators (Cui et al., 2019). Ensuring the security of customer data and compliance with data protection laws is another critical concern (Miller and Shih, 2020). Overcoming resistance to change and ensuring the smooth integration of AI systems into daily operations is a significant challenge.

AI adoption is driven by institutional factors such as competitors' activities, consultants, and the need to satisfy customers. These factors significantly impact organizational competitiveness, making AI a valuable investment (Iwuanyanwu, 2021). The COVID-19 pandemic has accelerated AI adoption to automate operations requiring physical human intervention (Sumbal et al., 2017; Ngonidzashe and Kumar, 2023; Jain et al., 2023). Institutional isomorphism theory explains that organizations conform to external pressures, with coercive, mimetic, and normative factors influencing AI adoption (Oyewo et al., 2019).

Consumer perceptions shape their attitudes and behavioral intentions towards AI-enabled services. AI enhances customer engagement and satisfaction in marketing and retail, but ethical considerations like bias-free messaging are crucial for trust and effectiveness (Beeler et al., 2022; Poppleton et al., 2019). Companies leverage AI for personalized marketing, operational efficiency, and better decision-making (Boerman et al., 2017; Canhoto and Clear, 2020). Perceived usefulness is critical for AI adoption in retail, enhancing competitiveness and customer management (Vieira et al., 2020).

AI and Robotic Process Automation (RPA) are transforming business processes, improving operational efficiency and decision-making (Calitz et al., 2017; Acemoglu and Restrepo, 2018). AI's integration into business applications is reshaping how information is integrated, analyzed, and used to improve decision-making (West and Allen, 2018). Consumer behavior research is evolving with AI advancements, enabling better understanding and interaction with consumers. AI applications in retailing provide insights into consumer behavior, helping companies to improve customer experience and operational efficiency (Shankar, 2018; Edelman and Abraham, 2022).

Trust is fundamental for AI-driven transformations. Consumers have reservations about AI in medical decision-making due to concerns about its ability to understand unique personal features (Longoni et al., 2019). AI systems support analysis for audio data, helping marketers in customer relationship management (Mogaji and Erkan, 2019; Rawwash et al., 2020). AI's ability to process big data aids in understanding customer trends, predicting behavior patterns, and building long-term relationships (Poppleton et al., 2019).

In online commerce, AI meets rapidly changing consumer demands and increases sales efficiency. AI's role in retailing is pivotal, providing personalized customer interactions and improving operational efficiency (Daley, 2018; Maynard, 2019). Effective AI integration requires a clear understanding of digital footprints and strategic use of AI tools, balancing speed, accuracy, autonomy, control, data privacy, and competitive advantage (Agrawal et al., 2018). Successful AI adoption in retail involves being proactive, agile, and continuously improving AI applications to enhance investment profitability (Oh and Polidan, 2018).

Customer relationship management (CRM) involves collecting, managing, and intelligently using data with technology solutions to develop long-term customer relationships and exceptional customer experience. AI advancements support CRM systems in generating personalized marketing responses, tailoring products and services, and gaining competitive advantage (Kumar et al., 2023). Ethical processing of customer information requires identifying and addressing biases to avoid biased decision outcomes (Huang and Rust, 2018). AI bridges the gap between branding and improving customer experience using data, and solving ethical issues is essential for effective AI applications (Metcalf et al., 2019).

Artificial Intelligence (AI) is increasingly utilized in high-stakes decision-making contexts, including healthcare, where effective human-AI collaboration is essential. A group researcher highlight the importance of users understanding AI performance and its limitations to maintain trust and enhance team performance (Bansal et al., 2019). A group researcher emphasize that integrating technologies into organizations necessitates a multifaceted approach, involving motivational readiness, resources, staff attributes, and a supportive climate (Hazarika, 2020; Mazurowski et al., 2019). Without such readiness, technological adoption is likely to fail, regardless of the technology's potential benefits.

Integrating AI into grocery store operations is significantly influenced by the perceived ease of use and perceived usefulness of the technology. These factors are essential components of the Technology Acceptance Model (TAM), which explains how users come to accept and use a technology (Davis, 1989). Perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort (Davis, 1989). For grocery store operators, the ease of implementing AI technologies can determine their willingness to adopt these innovations. Studies show that when operators find AI systems user-friendly and easy to integrate with existing operations, they are more likely to embrace these technologies. For example, a study found that systems that are easier to use lead to higher adoption rates because they reduce the learning curve and the perceived burden on users (Venkatesh and Bala, 2008).

Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance their job performance (Davis, 1989). Grocery store operators are more inclined to integrate AI if they perceive that it will significantly improve their operational efficiency, inventory management, and customer service. Research by Gefen and Straub indicates that perceived usefulness is a strong predictor of technology adoption in organizational settings (Gefen and Straub, 2000). Operators who recognize the tangible benefits of AI, such as reduced operational costs and improved customer insights, are more likely to support its integration.

The combined effect of perceived ease of use and perceived usefulness on the behavior of grocery store operators toward AI integration is well-documented. Venkatesh and Davis expanded on TAM with the TAM2 model, which posits that these two factors directly influence users' intention to use technology (Venkatesh and Davis, 2000). In the context of grocery stores, operators who find AI systems easy to use and believe in their utility are more likely to integrate these technologies into their operations. A case study by Huang and Rust on AI integration in retail highlights how grocery stores that perceived AI technologies as both useful and easy to use reported higher adoption rates (Huang and Rust, 2018). The study found that operators who experienced fewer challenges in the initial implementation phase and saw immediate improvements in inventory management and customer service were more likely to continue using AI.

Furthermore, a survey by McKinsey and Company revealed that retailers who perceived AI as easy to use and beneficial saw a 20% increase in operational efficiency (McKinsey and Company, 2020). The survey underscored the importance of designing AI systems that are intuitive and offer clear value to users. Perceived ease of use and perceived usefulness play crucial roles in influencing the behavior of grocery store operators toward AI integration. These factors determine the likelihood of technology adoption by reducing perceived effort and highlighting tangible benefits. Understanding these dimensions can help technology developers and retail managers design and implement AI systems that meet the needs and expectations of grocery store operators, thereby enhancing overall

operational efficiency and customer satisfaction.

3. METHODS

The research utilized a comprehensive list of grocery stores in Laguna Province from the Department of Trade and Industry (DTI) Region IV-A as the sampling frame. Participants were selected using a random sampling method from this list. A structured questionnaire was then distributed to grocery store owners and managers to gather data on store operations. The completed questionnaires were analysed using Excel for various analysis techniques. Measures to ensure the validity and reliability of the questionnaire included conducting a pilot test, using established instruments, and assessing consistency through methods such as test-retest and internal consistency, while maintaining standardized procedures. Ethical considerations involved obtaining informed consent and ensuring confidentiality. Potential limitations, such as sampling biases and incomplete responses from participants, were acknowledged. Table 1 Provide a comprehensive overview of the total number of grocery stores across various municipalities in Laguna, Philippines.

4. THE DECISION TREE MODEL

The research paradigm of the study integrates the Technology Acceptance Model (TAM), which has proven to be one of the most influential models in understanding technology acceptance and adoption. TAM visually represents the relationship between various factors influencing AI integration and the mediating variables of perceived ease of use and perceived usefulness. These mediating variables ultimately impact the level of AI integration in grocery stores in Laguna, Philippines. TAM proposes that perceived ease of use refers to the degree to which individuals believe that using a particular technology would be effortless and straightforward. Meanwhile, perceived usefulness pertains to the belief that the technology will enhance job performance and effectiveness. Together, these two variables influence the attitude towards using the technology, which in turn affects the actual usage behaviour.

In the context of the grocery retail industry in Laguna, Philippines, TAM serves as a theoretical framework to analyse how grocery store operators perceive the ease of use and usefulness of AI technologies. This perception directly influences their willingness to integrate AI systems into their operations. For instance, if operators perceive AI as easy to use and beneficial in improving operational efficiency, customer service, and inventory management, they are more likely to adopt and integrate these technologies.

By applying TAM, the study not only identifies the factors influencing AI adoption but also explores how these factors interact with perceived ease of use and usefulness to determine the level of AI integration. This approach provides a structured framework for understanding the dynamics of technology acceptance within the specific context of grocery stores in Laguna. Ultimately, it aims to provide valuable insights that can guide policymakers, researchers, and industry practitioners in promoting more effective and sustainable AI integration strategies in the region.

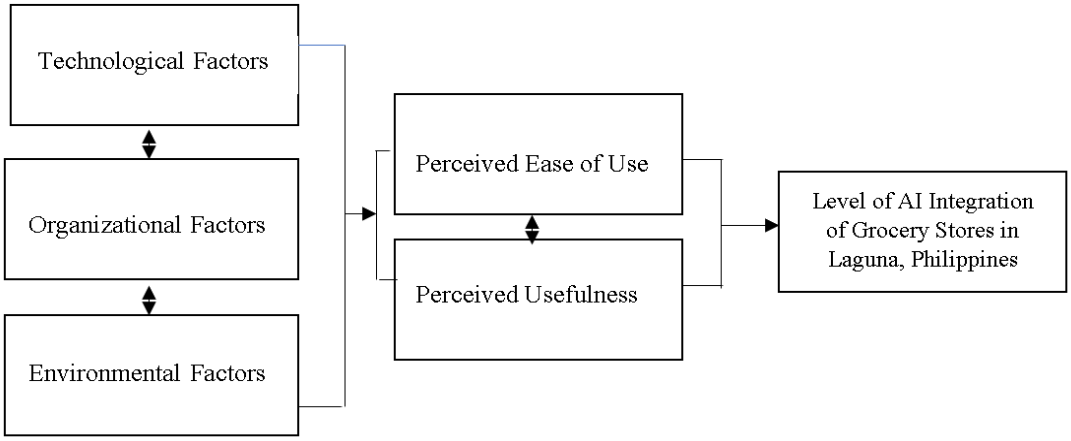

Figure 1: Research Paradigm

Figure 1 shows the research framework used to explore what affects the integration of Artificial Intelligence (AI) in grocery stores in Laguna, Philippines. This diagram breaks down the relationships between different factors—technological, organizational, and environmental—and how they impact how easy and useful AI technologies are perceived to be. It also illustrates how these perceptions together influence the overall level of AI adoption in grocery stores. Understanding this framework is essential for identifying the main drivers and barriers to successfully implementing AI in the retail sector.

5. THE LOGISTIC REGRESSION METHOD

The logistic regression model highlighted those technological, organizational, and environmental factors, along with perceived ease of use and perceived usefulness, significantly influence AI integration in grocery stores. Understanding these relationships helps identify key drivers and barriers, offering actionable insights for grocery store operators in Laguna to enhance AI adoption. By addressing these factors, grocery stores can improve operational efficiencies, gain competitive advantages, and successfully navigate the complexities of AI integration.

6. THE DATA ANALYSIS

In interpreting the data, the researcher utilized both descriptive and inferential statistics to provide a comprehensive analysis. Descriptive statistics included measures such as frequency count, percentage, and weighted mean. These techniques were employed to summarize and present the basic features of the data, providing a clear overview of the respondents' characteristics and their responses. To determine if there were significant relationships between and among the variables under study, a combination of inferential statistical techniques was used. Regression analysis was utilized to examine the relationship between one dependent variable and one or more independent variables.

This method helped in understanding the impact of various predictors on the outcome variable, allowing for more detailed and nuanced interpretations of the data. Additionally, ANOVA (Analysis of Variance) was employed to assess the variance between multiple groups or conditions. This technique allowed for the comparison of means across different levels of an independent variable, identifying any significant differences among the groups.

The findings of this study shown in Table 1, reveal a significant positive impact of technological factors on the integration of AI technologies among grocery store operators in Laguna. With a composite mean of 3.70, it is evident that technological attributes such as seamless data exchange and comprehensive data analysis capabilities play a crucial role in the successful adoption of AI. These findings highlight the importance of ensuring AI technologies are compatible with existing systems and enhance data management and utilization to drive effective integration.

These results highlight potential areas for improvement or focus for stakeholders involved in the adoption of AI technologies in grocery stores across Laguna. Enhancing compatibility features, such as data interoperability and accessibility, could lead to more seamless integration and optimized performance of AI systems, ultimately contributing to improved customer management practices within the grocery retail sector. Accurate market forecasting is essential in today's fast-paced and intensely competitive business environment, as it helps direct strategic decision-making and ensure maximum performance for businesses. The practice of market forecasting has been fundamentally altered by the development of Artificial Intelligence (AI), a game-changing technology that appeared recently. AI driven market enhances forecasting models, techniques and strengths, across a variety of business sectors (Tak, 2024).

Table 1: Technological factors Influencing the Integration of AI Technologies in Grocery Stores Across Laguna		
Technological Factors	**WM**	**Adjectival Rating**
1. May exchange data seamlessly with other systems, allowing for centralized data management and streamlined workflows.	3.62	Agree
2. Can access and analyse data from disparate sources, including transaction records, customer databases, and external datasets.	3.77	Agree
Composite Mean	**3.70**	**To a High Extent**

Table 2: Organizational Factors Influencing the Integration of AI Technologies for Customer Management in Grocery Stores Across Laguna		
Organizational Factors	**WM**	**Adjectival Rating**
Receive the necessary attention, funding, and priorities within the organization.	3.68	Agree
Provide training for grocery store staff on how to use AI-powered tools	3.78	Agree
Explore AI opportunities, share ideas, and collaborate on initiatives	3.79	Agree
Composite Mean	**3.75**	**To a High Extent**

The findings indicate that organizational factors are significantly influencing the integration of AI technologies among grocery store operators in Laguna, as evidenced by a composite mean of 3.75. This high extent of influence highlights the essential role of management support, staff training, and a collaborative culture in facilitating AI adoption. The strong agreement across these organizational aspects underscores their critical impact on the successful integration of AI within grocery store operations.

The findings show that environmental factors are significantly influencing the integration of AI technologies among grocery store operators in Laguna, with a composite mean of 3.74. This high level of influence underscores the importance of regulatory compliance and market responsiveness in facilitating AI adoption. The strong agreement across these environmental factors highlights their critical role in the successful integration of AI within the grocery store industry. The reliability of connectivity remains problematic, especially collecting consumer consumption for data-driven AI systems. Though some SMEs have sustainability leaders, senior management prioritizes financial stability and neglects to build AI skilled human resource and capability. Likewise, data availability is imperative in AI for sustainability, but external sources such as data owners (customers) with a lack of interest in participating in AI-driven initiatives and government agencies cannot provide up-to-date, complete, and accurate data for sustainability, (Hernandez, 2023).

Table 3: Environmental Factors Influencing the Integration of AI Technologies for Customer Management in Grocery Stores Across Laguna		
Environmental Factors	**WM**	**Adjectival Rating**
Include regulatory requirements related to data privacy and consumer protection	3.70	Agree
Comply with regulations related to data privacy, consumer protection, food safety, and employment practices in AI technology integration	3.71	Agree
Monitor market trends, anticipate shifting consumer demands, and adapt their AI strategies accordingly to remain competitive	3.82	Agree
Composite Mean	**3.74**	**To a High Extent**

Table 4: Overall Composite Mean of Factors Influencing the Integration of AI in Grocery Stores		
Factors	**WM**	**Adjectival Rating**
Technological Factors	3.70	To a High Extent
Organizational Factors	3.75	To a High Extent
Environmental Factors	3.74	To a High Extent
Overall Composite Mean	**3.73**	**To a High Extent**

The overall composite means of factors influencing the integration of AI technologies in grocery stores across Laguna, as summarized in Table 4, reflects the combined influence of various dimensions on the integration process. The current context of organizational readiness in using AI is marked by a perplexing gap between the willingness of decision-makers and technology promoters to capitalize on AI applications and the reality on the ground, where it is difficult to initiate the changes needed to realize their full benefits while avoiding their negative impacts. This is an important step to ensure its successful integration and avoid unnecessary investments and costly failures. Disconnects between reality and expectations have led to prior precipitous declines in the use of the technology, termed AI winters, and another such event is possible (Matheny, 2020)

Table 5: Perceived Usefulness with the Adoption of AI		
Perceived Usefulness *With the adoption of AI, it…*	**WM**	**Adjectival Rating**
1. improves the accuracy of sales forecasts.	3.81	Agree
2. manages the level of inventory effectively.	3.92	Agree
3. can accurately predict demand and optimize inventory levels.	3.80	Agree
4. enhances the shopping experience for our customers.	3.83	Agree
5. streamlines operational processes such as checkout and restocking.	3.87	Agree
6. helps in making informed decisions about pricing and product placement.	3.78	Agree
7. can identify and categorize products on store shelves based on their visual characteristics.	3.90	Agree
8. can track and analyse customer movements within the store to understand shopping behaviour, traffic patterns, and dwell times.	3.75	Agree
9. can detect and recognize suspicious behaviour, such as shoplifting or unauthorized access to restricted areas.	3.72	Agree
10. contributes to cost savings or revenue generation	3.74	Agree
Composite Mean	**3.81**	**To a High Extent**

The findings reveal that perceived usefulness, with a composite mean of 3.81, significantly influences the level of AI integration among grocery store operators in Laguna. The strong agreement across various dimensions of AI usefulness highlights its critical role in driving AI adoption, emphasizing the importance of recognizing the practical benefits of AI technologies.

The findings underscore that perceived ease of use, averaging a composite mean score of 3.74 shown in Table 2 and 3, plays a pivotal role in shaping the extent of AI integration among grocery store operators in Laguna. This high level of consensus across different aspects of ease of use underscores its critical role in facilitating the adoption of AI technologies. It emphasizes that AI solutions designed to be user-friendly are essential for achieving successful implementation in real-world settings.

Table 6: Relationship of Perceived Usefulness in the Influencing Factors between the Level of AI Integration

Perceived Usefulness *With the adoption of AI, it…*	**WM**	**Adjectival Rating**
1. improves the accuracy of sales forecasts.	3.81	Agree
2. manages the level of inventory effectively.	3.92	Agree
3. can accurately predict demand and optimize inventory levels.	3.80	Agree
4. enhances the shopping experience for our customers.	3.83	Agree
5. streamlines operational processes such as checkout and restocking.	3.87	Agree
6. helps in making informed decisions about pricing and product placement.	3.78	Agree
7. can identify and categorize products on store shelves based on their visual characteristics.	3.90	Agree
8. can track and analyse customer movements within the store to understand shopping behavior, traffic patterns, and dwell times.	3.75	Agree
9. can detect and recognize suspicious behavior, such as shoplifting or unauthorized access to restricted areas.	3.72	Agree
10. contributes to cost savings or revenue generation	3.74	Agree
Composite Mean	**3.81**	**To a High Extent**

The robust agreement on ease of use among operators suggests that intuitive interfaces, clear functionalities, and minimal learning curves are significant factors influencing their decisions to adopt AI. These findings highlight the practical importance of ensuring that AI systems not only offer advanced capabilities but also prioritize usability and accessibility. Such user-centric design principles not only enhance initial acceptance but also contribute to sustained engagement and effective utilization of AI tools in enhancing operational efficiency and decision-making within grocery store environments.

Table 7: Relationship of Perceived Ease of Use in the Influencing Factors between the Level of AI Integration

Perceived Ease of Use	**WM**	**Adjectival Rating**
1. Integration of AI will be relatively easy	3.71	Agree
2. Learning to use AI-based customer management systems would be straightforward for our staff.	3.55	Agree
3. I believe that the monitoring carried out by AI would be clear and easy to understand.	3.67	Agree
4. I think that I can easily learn how to use AI.	3.78	Agree
5. The use of AI helps me monitor customers more rapidly.	3.89	Agree
6. AI help me get the most out of my time to monitor customer's needs.	3.83	Agree
7. The use of AI may promote good customer relations practices.	3.65	Agree
8. The use of AI is beneficial for customer satisfaction.	3.76	Agree
9. AI can improve my performance in customer relations management.	3.73	Agree
10. AI can facilitate good service to customers.	3.68	Agree
11. AI can help me to monitor the business operation.	3.85	Agree
Composite Mean	**3.74**	**To a High Extent**

7. Conclusion

This study aimed to identify and analyze factors influencing AI integration among grocery store operators in Laguna, Philippines. By examining technological infrastructure, organizational support, and environmental considerations, it sought to understand the challenges and opportunities in this transition. The insights are intended to help operators navigate AI adoption, leading to improved efficiency and competitive advantages.

Technological factors are essential, with a composite mean of 3.70 emphasizing their importance. These factors include seamless data exchange and comprehensive analysis capabilities, which ensure that AI systems can process large volumes of data efficiently and generate valuable insights. This capability is vital for enhancing decision-making processes and optimizing store operations.

Organizational factors also play a pivotal role in AI adoption, as indicated by a composite mean of 3.75. Key aspects include robust management support, extensive staff training, and fostering a collaborative culture within the organization. These elements are crucial for overcoming resistance to change and ensuring that employees are well-equipped to utilize AI technologies effectively. Support from top management and a culture that encourages innovation and teamwork are essential for embedding AI into the organizational fabric and facilitating its successful adoption.

Environmental factors, with a composite mean of 3.74, underscore the importance of regulatory compliance and market responsiveness in the integration of AI in grocery stores. Grocery stores must navigate and adhere to various regulatory requirements to ensure their AI applications are legally compliant. Additionally, staying responsive to market trends and consumer demands is vital for leveraging AI to gain a competitive edge. These elements ensure that AI adoption aligns with external constraints and opportunities, contributing to the store's success.

The perceived usefulness of AI, demonstrated by improvements in sales forecasts, inventory management, and customer experience, acts as a strong motivator for AI adoption. When grocery store owners and managers recognize tangible benefits such as enhanced accuracy in predicting sales, optimized inventory levels, and better customer satisfaction, they are more likely to invest in and embrace AI technologies. These improvements highlight the practical advantages of AI, making its

adoption more appealing and justified.

Perceived ease of use is crucial for AI systems in grocery stores because it facilitates staff engagement and efficient utilization of AI technologies. When AI systems are intuitive and easy to learn, employees are more likely to adopt and use them effectively. This reduces the learning curve and increases productivity, as staff can quickly become proficient in using AI tools without extensive training. An emphasis on user-friendly AI systems ensures that the technology is accessible and beneficial to all employees, enhancing overall store performance.

Given the moderate level of AI integration observed in Laguna, it is recommended to develop a comprehensive guide for effective AI technology use. This guide should address best practices, training methodologies, and step-by-step instructions to help grocery stores maximize the benefits of AI. By providing clear guidelines and practical advice, the guide can support grocery stores in overcoming challenges and achieving successful AI integration, ultimately improving operational efficiencies and gaining competitive advantages in the market.

Collectively, these findings and perceptions enhance the positive impact of technological, organizational, and environmental factors on AI integration. By addressing these factors, grocery stores in Laguna can drive successful implementation and adoption of AI technologies, leading to improved operational efficiencies and competitive advantages in the market.

References

Aashish, J., Rohit, K., Rajendra, K., and Ram, C.S., 2023. Machine Learning based Comprehensive Analysis of COVID-19 and its Vaccination in India. Indian Journal of Natural Sciences, 14 (78), Pp. 57584- 57599.

Acemoglu, D., and Restrepo, P., 2018. AI and Robotic Process Automation. American Economic Association Papers and Proceedings, 108, Pp. 1-7.

Agrawal, A., 2018. Strategic use of AI tools in retail. Journal of Retailing and Consumer Services, 44, Pp. 203-211.

Alami, Z., 2019. AI integration challenges in healthcare organizations. International Journal of Medical Informatics, 123, Pp. 98-104.

Bansal, A., 2019. Human-AI collaboration in decision-making. Journal of Artificial Intelligence Research, 65, Pp. 923-937.

Beeler, J., 2022. Ethical considerations in AI-enabled services. Journal of Business Ethics, 171, Pp. 465-478.

Boerman, S.C., 2017. AI in marketing and retail. Journal of Interactive Marketing, 39, Pp. 34-48.

Calitz, A.P., 2017. Business process transformation through AI and RPA. International Journal of Advanced Computer Science and Applications, 8 (10), Pp. 23-31.

Canhoto, A.I., and Clear, F., 2020. AI in retail marketing. Journal of Retailing and Consumer Services, 53, Pp. 101768.

Cui, L., Fan, X., and Fang, Y., 2019. Application of Artificial Intelligence Technology in Retail Industry: A Case Study of Fresh E-commerce. In 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM) (pp. 2102-2106).

Daley, M., 2018. AI and online commerce. Journal of Retailing and Consumer Services, 41, Pp. 82-89.

Davis, F.D., 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13 (3), Pp. 319-340.

Department of Trade and Industry (DTI) Regional IV-A CALABARZON. 2024. Total Number of Grocery Stores in Laguna, Philippines [Unpublished data]. Retrieved from [source if available].

Edelman, D., and Abraham, A., 2022. AI applications in retailing. Journal of Retailing and Consumer Services, 64, Pp. 102967.

Fosso, W.S., Akter, S., Edwards, A., Chopin, G., and Gnanzou, D., 2020. How Blockchain and IoT Technology Could Impact Organizations and Lead to Sustainable Smart Cities. Journal of Organizational Computing and Electronic Commerce, 30 (2), Pp. 83-112.

Gefen, D., and Straub, D.W., 2000. The Relative Importance of Perceived Ease of Use in IS Adoption: A Study of E-Commerce Adoption. Journal of the Association for Information Systems, 1 (1), Pp. 1-28.

Hazarika, D., 2020. Organizational readiness for technological integration. Technological Forecasting and Social Change, 151, Pp. 119806.

Huang, M.H., and Rust, R.T., 2018. Artificial Intelligence in Service. Journal of Service Research, 21 (2), Pp. 155-172.

Huang, M.H., and Rust, R.T., 2018. Ethical issues in CRM using AI. Journal of Business Research, 82, Pp. 247-259.

Iwuanyanwu, O., 2021. Institutional factors driving AI adoption. Journal of Business Strategy, 42, Pp. 26-34.

Janssen, M., Charalabidis, Y., and Zuiderwijk, A., 2021. Benefits, Adoption Barriers and Myths of Open Data and Open API. Information Systems Management, 38 (4), Pp. 367-387.

Kumar, R., 2009. Information and Communication Technologies, Laxmi Publications.

Kumar, R., Jain, V., Leong, W.Y., Teyarachakul, S., 2023. Convergence of IoT, Blockchain and Computational Intelligence in Smart Cities, Taylor and Francis, CRC Press, ISBN: 9781032404240

Kumar, R., Singh R.C., Khokher, R., 2023. Framework for modeling, procuring, and building systems for smart city scenarios using blockchain technology and IoT, Book Chapter in The Data-Driven Blockchain Ecosystem: Fundamentals Applications and Emerging Technologies, CRC Press.

Lee, J.W., Lee, H.E., and Kim, S.W., 2021. The Role of Big Data and AI in the Era of the Fourth Industrial Revolution: An Organizational Information Processing Perspective.

Longoni, C., 2019. AI in medical decision-making. Journal of Business Ethics, 160, Pp. 739-754.

Maynard, M., 2019. AI role in retailing. Journal of Retailing and Consumer Services, 51, Pp. 340-350.

Mazurowski, M.A., 2019. Technological integration in healthcare. Journal of Digital Imaging, 32, Pp. 593-0.

McKinsey and Company., 2020. The State of AI in 2020. Retrieved from [https://www.mckinsey.com/featured- insights/artificial-intelligence] (https://www.mckinsey.com/featured-insights/artificial-intelligence).

Metcalf, J., 2019. Ethical issues in AI applications. Business Horizons, 62, 389-396.

Miller, D., and Shih, H., 2020. AI in Retail: Trends, Applications, and Future Directions. Journal of Retailing and Consumer Services, 54, Pp. 101990.

Mogaji, E., and Erkan, I., 2019. AI support for audio data analysis in marketing. Industrial Marketing Management, 76, Pp. 14-24.

Ngonidzashe, M.K., Rajendra, K., 2023. A Simplified Approach to Covid-19 Pneumonia Classification. Academic Journal of Health Sciences, 2023/38 (5), Pp. 117-121. doi: 10.3306/AJHS.2023.38.05.117

Oh, W., and Polidan, M., 2018. Successful AI adoption in retail. Journal of Retailing and Consumer Services, 43, Pp. 248-259.

Oyewo, A.S., 2019. Institutional isomorphism theory and AI adoption. Journal of Business Research, 98, Pp. 157-166.

Poppleton, S., 2019. Consumer perceptions and AI-enabled services. Journal of Retailing and Consumer Services, 51, Pp. 72-81.

Rawwash, A., 2020. AI analysis of big data for customer trends. Journal of Business Research, 118, Pp. 149-157.

Shankar, V., 2018. AI applications in retailing and consumer behavior. Journal of Retailing, 94, Pp. 1-18.

Sumbal, M.S., 2017. AI adoption in response to the COVID-19 pandemic. Healthcare Management Review, 42, Pp. 159-167.

Topol, E., 2019. AI and healthcare expectations. Nature Reviews Genetics, 20, Pp. 57-58.

Venkatesh, V., and Bala, H., 2008. Technology Acceptance Model 3 and a

Research Agenda on Interventions. Decision Sciences, 39 (2), Pp. 273-315.

Venkatesh, V., and Davis, F.D., 2000. A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. Management Science, 46 (2), Pp. 186-204.

Vieira, V.A., 2020. AI adoption in retail and perceived usefulness. Journal of Retailing and Consumer Services, 52, Pp. 101933.

West, D.M., and Allen, J., 2018. AI integration into business applications. Brookings Papers on Economic Activity, Spring, Pp. 325-374.

Wirtz, J., So, K.K.F., Mody, M.A., Liu, S.Q., and Chun, H.H., 2018. Platforms in the Peer-to-Peer Sharing Economy. Journal of Service Management, 29 (5), Pp. 546-564