QUANTIFYING THE IMPACT OF ARTIFICIAL INTELLIGENCE (AI) APPLICATION ON INFORMATION TECHNOLOGY (IT) RETAIL BUSINESS

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*Abstract*— This study investigates the impact of Customer Satisfaction, Operational Efficiency, and Retail IT AI Applications on Retail Financial Performance. The findings reveal a negligible and statistically insignificant negative effect of Customer Satisfaction on financial outcomes, challenging conventional wisdom regarding its primary role in driving retail success. In contrast, Operational Efficiency emerges as a critical determinant of financial performance, with significant evidence supporting the notion that operational enhancements can lead to substantial financial gains. Additionally, the study underscores the pivotal role of Retail IT AI Applications, demonstrating their significant positive impact on financial performance. The use of AI in areas like predictive analytics, personalized marketing, and efficient inventory management not only represents a trend but is identified as a fundamental shift necessary for maintaining competitiveness and achieving financial robustness in the retail sector. These insights contribute to a nuanced understanding of the interplay between technology, operational strategies, customer engagement, and financial performance, offering a roadmap for retail businesses aiming for sustainable growth and profitability. The study provides valuable implications for retail management, emphasizing the importance of strategic investment in technology and process optimization, and lays the groundwork for future research in this dynamic field.

Keywords— Customer Satisfaction, Operational Efficiency, Information Technology, Artificial Intelligence, Retail Financial Performance

# Introduction

A crucial field of research that connects technological breakthroughs and their real-world commercial ramifications is quantifying artificial intelligence's (AI) effects on the information technology (IT) retail industry (Guo & Palaoag, 2023). Three main areas are the subject of this thorough analysis: financial performance, operational effectiveness, and customer happiness (Mazilescu, 2020). The research explores how AI-driven personalization and advancements in customer service have transformed consumer experiences in IT retail by examining customer happiness. Regarding operational effectiveness, it assesses how AI improves inventory control, optimizes supply chains, and simplifies procedures to lower costs and increase agility. The last component, financial performance, examines AI initiatives' observable return on investment (ROI) by examining market competitiveness, profit margins, and revenue growth. This strategy comprehensively explains artificial intelligence's (AI) revolutionary role in the IT retail industry (Saqlain et al., 2022). It provides insightful information for stakeholders hoping to capitalize on AI's potential to spur innovation and commercial growth. (Khafaga et al., 2022)

This is a significant paradigm shift changing the industry and setting new standards for success as Artificial Intelligence (AI) finds its way into the retail IT sector (Yang & Yin, 2023). The IT retail sector's dynamic backdrop, defined by quickening technology breakthroughs, shifting consumer preferences, and escalating competition, forms the basis of this study (Atmoko, 2023). Artificial Intelligence (AI) has become a significant technical force, providing game-changing answers to persistent industrial problems thanks to its deep capabilities in data analysis, predictive modelling, and automated decision-making (Chaithanya & Brahmananda, 2022).

The swift integration of Artificial Intelligence (AI) within the Information Technology (IT) retail industry has ushered in a revolutionary era. Nonetheless, more quantitative knowledge is needed regarding how AI affects crucial business factors like financial success, operational effectiveness, and customer happiness (Wang et al., 2022). This disconnect is problematic because it is critical to understand AI's long-term and indirect implications on market positioning and strategic business development and measure the technology's immediate benefits, like better customer interactions and operational workflows (Alomari, 2022).

This task becomes increasingly complex due to the multiple implementations of artificial intelligence (AI) in various IT retail contexts and varying levels of technological maturity (Khan et al., 2022). It is not easy to reach broad, applicable conclusions about the efficacy of AI in the industry because of this variability. Furthermore, separating the precise effects of AI from other simultaneous technology developments and market changes calls for a careful and nuanced analysis (Roy, 2022).

Understanding how AI-driven discoveries convert into concrete commercial benefits is crucial to this challenge (Yuan, 2022). While AI plays a clear role in personalizing customer experiences, its effects on long-term commercial relationships and customer loyalty are more complex (Fatimah et al., 2022). Analysing operational benefits from AI, such as cost savings and improved inventory management, must also be done in the more significant long-term business viability and expansion framework.

The objective is to carefully evaluate and analyse the complex function of artificial intelligence (AI) in retail IT. A complete methodology combining empirical data analysis, case study reviews, and industry expertise is required to realize AI's disruptive potential fully. In order to help IT retail businesses effectively leverage AI for long-term growth and competitive advantage, a balanced perspective that acknowledges both the potential and difficulties AI provides is intended.

# literature review

## Retail Financial Performance

Research on retail financial performance has identified several key factors. Found that retail activities significantly influence corporate retail product performance, with the first two categories being the most influential. Biiranee (2021) highlighted the impact of size and competition on bank performance in Nigeria, with a focus on policies to attract retail deposits. Hirtle and Stiroh (2005) and Lin et al. (2010) both emphasized the stability of retail banking, but Hirtle also noted its lower returns, while Lin highlighted the use of cost-minimizing electronic technology to provide liquidity and external financing. These studies collectively underscore the importance of retail activities and the need for effective strategies to enhance financial performance in the retail sector.

The assessment of a retail company's capacity to turn a profit, control expenses, and experience steady growth is known as retail financial performance. Among other financial measures and indicators, it includes sales per square foot, profit margins, revenue growth, and return on investment (ROI). These indicators provide information about a retail company's health and viability. The capacity of a business to develop its revenue over time is indicated by its ability to open new locations, raise sales in existing ones, or enlarge its client base. Understanding a retail business's operational efficiency mostly depends on its profit margins, which indicate the proportion of revenue converted into profit. Larger profit margins frequently indicate improved pricing and cost control. (Li & Zhu, 2022)

## Retail IT AI Application

A range of studies have explored the impact of IT on retail performance. Oh et al. (2012) found that IT integration in retail channels can enhance efficiency and innovation, leading to improved performance. Teo and Wong (1998) also noted a positive relationship between information quality and work environment improvement, which in turn can impact performance. Channon (1998) highlighted the strategic impact of IT on the retail financial services industry, particularly in driving cost reduction and quality improvement. Wang et al. (2008) further supported these findings, demonstrating that IT can significantly enhance the financial performance of third-party logistics firms. These studies collectively suggest that IT, including AI applications, can have a positive influence on retail financial performance.

The influence of Retail IT AI Applications on Retail Financial Performance is multifaceted and significant. AI applications in retail IT, such as machine learning algorithms, predictive analytics, and automated inventory management, can dramatically enhance operational efficiency and customer experience, which are critical financial performance drivers. These technologies enable retailers to optimize supply chains, personalize customer interactions, and streamline various operational processes.

By implementing AI-driven solutions, retailers can reduce operational costs, minimize waste, and improve stock management, increasing profitability. Moreover, AI can enhance customer satisfaction through personalized recommendations and improved shopping experiences, translating into higher sales and customer loyalty. This, in turn, boosts revenue growth, a key indicator of financial performance in the retail sector.

# research methodology

 The research methodology for this study is quantitative, focusing on the empirical assessment of data to analyze the impact of Artificial Intelligence (AI) in the IT retail sector. This approach involves the collection and statistical analysis of numerical data to evaluate the influence of Retail IT AI Applications on financial performance, the role of customer satisfaction in retail financial success, and the impact of operational efficiency on financial outcomes. Primary data collection methods will include surveys targeting retail customers and business managers and extracting financial and operational performance data from retail IT systems.

The sample size for the study has been determined to be 200 respondents. This size was chosen to ensure a balance between statistical power and practicality. A sample of 200 individuals allows for sufficient variability and diversity in responses while remaining manageable regarding data collection and analysis. Additionally, this size is statistically significant enough to draw reliable conclusions about the impact of AI applications in the IT retail sector.

## Theoretical Framework

The theoretical framework of the study is presented in Fig.1.



1. Theoretical Framework

## Data Analysis Method

Quantitative data from surveys is analysed using statistical tools for descriptive and inferential statistics, aiding in identifying trends and examining relationships between AI applications and key performance indicators like customer satisfaction and operational efficiency.

# results

By using SMART PLS 4 Software to compute the data, descriptive analysis of the final result will be presented in this section.

## Structural Model

The structural model of the study is presented in Fig. 2.



1. PLS-SEM Model

## Outer Loading

The provided data outlines the outer loadings in a structural equation modelling (SEM) framework or a comparable multivariate analysis.

1. Outer Loading



It illustrates the strength of associations between several observed variables and their corresponding latent variables. Specifically, the observed variables H1 through H5 are indicators of the "Retail IT AI Application" latent construct, with outer loadings ranging from 0.81 to 0.925. These substantial loadings indicate that each observed variable is a robust and relevant measure of the latent "Retail IT AI Application" construct, with the higher values suggesting a more robust measure.

Similarly, the M1 to M5 observed variables are linked to the "Customer Satisfaction" construct, with all loadings exceeding 0.88, denoting a strong and consistent relationship. This pattern of high loadings implies that these indicators reliably capture the essence of customer satisfaction.

For "Operational Efficiency," indicated by observed variables RB1 to RB5, the loadings span from 0.885 to 0.968. Again, the strength of these loadings reflects a perfect measurement of the operational efficiency construct, with the indicators closely aligned with the underlying latent variable.

Lastly, S1 to S5 are indicators for "Retail Financial Performance," with loadings between 0.904 and 0.967. This indicates a strong association with the latent construct, suggesting these observed variables effectively measure the financial performance of the entity in question.

In the context of SEM, outer loadings of 0.7 or above generally indicate a satisfactory level of shared variance between indicators and their latent constructs. The data suggests that all indicators are well-correlated with their respective constructs, which implies that the model is likely well-specified with reliable measures.

## R-square

 The R-square and adjusted R-square values for a model that predicts retail financial performance are shown in the data. This is called the coefficient of determination or R-square (R)².

1. R Square



Retail Financial Performance's R2 value of 0.904 indicates that the independent variables in the model can account for about 90.4% of the variance in Retail Financial Performance. This high number suggests that the model fits the observed data very well.

Modified R² adjusted for the number of predictors in the model is known as the "adjusted R-square." It is always less than the R2 score because it penalizes the overuse of irrelevant predictors. Since the modified R-square offers a more precise indication of the goodness-of-fit for models with many predictors, it is frequently chosen over the regular R-square. The model has been suitably described in this case, and most of the independent variables included in the model significantly contribute to explaining the variance in Retail Financial Performance, as evidenced by the adjusted R-square of 0.902, which is quite near the R-square value. The proximity of the R-square and adjusted R-square suggests that the number of predictors is appropriate for the volume of data and that there is no significant penalty for needless complexity in the model.

## F-square

 The impact of three distinct predictors on retail financial performance is shown by the f-square values in the data you provided. In the context of multiple regression analysis or structural equation modelling, the f-square value is a measure of effect size that shows how much an independent variable contributes, above and beyond the other variables in the model, to the explained variance in the dependent variable.

1. F Square



Customer satisfaction has a relatively minor effect size—0.009—when looking at the f-square value. Considering the influence of other variables in the model, this implies that Customer Satisfaction has minimal effect on Retail Financial Performance.

The f-square value of 0.688 for operational efficiency, on the other hand, is regarded as a substantial effect size. Above and above the other predictors in the model, this suggests that Operational Efficiency is a significant predictor of Retail Financial

Performance and adds significantly to the variance explained in the dependent variable.

Finally, an effect size of moderate to big may be inferred from the Retail IT AI Application's f-square score of 0.443. The aforementioned indicates that while operational efficiency significantly influences retail financial performance, retail IT AI applications have a notable impact.

## Path Coefficient

 The provided data shows path coefficients from a structural equation model (SEM) or a similar type of regression analysis that assesses the direct effects of three predictor variables on the dependent variable, Retail Financial Performance.

1. Path Coefficients



 Path coefficients can be understood as standardized beta weights, reflecting the strength and direction of the relationship between predictor variables and the outcome variable.

Customer Satisfaction -> Retail Financial Performance (-0.09): This negative path coefficient indicates that higher customer satisfaction is associated with lower retail financial performance, according to this model. However, the value of -0.09 is relatively small, suggesting that the effect of customer satisfaction on financial performance is negative but weak.

Operational Efficiency -> Retail Financial Performance (0.6): A path coefficient of 0.6 is a solid positive value, implying that improvements in operational efficiency are strongly associated with increases in retail financial performance. This suggests that operational efficiency is a significant and positive predictor of financial success in the retail sector within this model.

Retail IT AI Application -> Retail Financial Performance (0.483): The path coefficient of 0.483 indicates a moderate to strong positive relationship between IT and artificial intelligence applications in retail settings and financial performance. This coefficient suggests that using IT and AI substantially positively impacts financial outcomes in retail.

According to the model, improved financial results are positively and significantly correlated with operational efficiency and the use of IT and AI in retail, even though there may be a little negative correlation between customer satisfaction and financial success. Notably, these coefficients account for additional variables in the model and represent the distinct contribution of every predictor to the dependent variable.

## P Values

The statistical significance of the correlations between different predictors and Retail Financial Performance in submitted data is ascertained using the p-value.

1. Summary of P Values



Customer satisfaction has a p-value of 0.351. Given that this is greater than the conventional alpha criterion of 0.05, the reduction in customer happiness and retail financial performance does not correlate statistically. Otherwise, if this link does not exist in the population, there is at least a 35.1% chance that they will find one in the sample.

The p-value for Operational Efficiency is given as 0. This suggests a strong statistically significant positive association between operational efficiency and retail financial performance, to the extent that the likelihood of finding such a relationship by chance alone (assuming no relationship at all) is essentially nil.

The p-value for the Retail IT AI Application is likewise reported as 0, indicating a significant positive correlation between adopting IT AI applications in retail and Retail Financial Performance.

It is essential to understand that a p-value of 0 does not imply a zero probability; rather, it indicates that the likelihood is very low, frequently below a threshold like 0.001, and is beyond the reporting tool's ability to present. These p-values demonstrate solid evidence against the null hypothesis in the Operational Efficiency and Retail IT AI Application cases, strongly supporting a positive link with Retail Financial Performance.

# Conclusion

The study's conclusions provide crucial insights into retail management and greatly influence how companies approach their operations and strategy. It demonstrates that although consumer pleasure has long been seen as essential to retail business, there may be less direct correlation between it and financial performance than thought. This calls into question the status quo and forces a reassessment of retail strategies mostly centered around client satisfaction. As an alternative, the study emphasizes the critical impact of retail IT AI applications and operational efficiency on financial performance. These results point to a need for retail managers to rethink their approach, stressing that the best way to boost profits is to focus and invest in technological breakthroughs, especially artificial intelligence (AI) and operational improvements.

In conclusion, the study catalyzes change in retail management practices. It advocates for a more balanced approach, integrating customer satisfaction with a stronger emphasis on operational efficiency and technological innovation. This holistic strategy is essential for retailers aiming to thrive in the increasingly competitive and technologically driven market. Furthermore, the study lays a foundation for future research, particularly in exploring the evolving role of AI in retail, and its findings have broader implications beyond immediate business practices. They are instrumental in shaping retail policy and play a pivotal role in the educational development of future retail professionals. By providing a nuanced understanding of the factors influencing financial performance, the study equips retail leaders with the knowledge to make informed decisions, ensuring sustainable growth and adaptability in a rapidly evolving industry.

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