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ARTIFICIAL INTELLIGENCE IN SOCIAL MEDIA MARKETING: ENHANCE ECONOMIC SUSTAINABILITY THROUGH CONSUMER PURCHASE PREDICTION MODELS

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ABSTRACT

Artificial intelligence and economic systems are becoming irreversibly linked as social media-fueled digital markets commit to data-centered decision-making aimed at boosting efficiency, resilience and long-term sustainability. In such markets, consumer purchase behavior is a form of economic heritage, a collection of institutional knowledge, trust and inter-temporal continuity embedded in repeated consumer-firm interactions. This research investigates the use of artificial intelligence applications in social media marketing such as consumer purchase prediction models to support economic sustainability through improved demand forecasting and reduced market uncertainty. Using an empirical dataset of e-commerce transactions, supervised machine learning models have been developed to predict the re-purchase behavior of consumers and the models have been evaluated using standard classification measures. The results show that the random forest model is better than the logistic regression model with accuracy, precision, recall and AUC values of 99.31%, 100%, 97.06% and 1.00 respectively. The predicted probability distributions show an obvious segmentation between repurchasing likely and unlikely consumers, which will allow for more stable demand management and continuity of revenues. The results show that AI-driven purchase prediction is part of the solution for economic sustainability in terms of informed allocation of resources, better financial planning and innovation-driven growth especially for the small and medium scale enterprises. Preservation of the historical consumer behavior and its operationalization makes such models the means of maintaining economic heritage and sustainable development within the digital market ecosystem.

KEYWORDS: Economic Heritage; Intertemporal Continuity; Sustainable Development; Consumer Purchase Prediction.

1. Introduction

Social media markets have emerged as a core architecture of the modern digital economy and fundamentally rework the way economic value is created, exchanged and perpetuated over time. The growth of social media platforms, coupled with the development of data gathering technologies, as well as the growing use of artificial intelligence (AI) in business procedures, has changed the course of competition across industries. Firms are operating now in dramatically data-rich environments, in which innovation cycles are fast-paced, algorithmic decision-making is a way of life, and where there is constant interaction between consumers and digital platforms. Within this context, AI has become a key enabler of predictive analytics for organizations to anticipate consumer behavior, improve decision quality and boost long-term economic performance.

From a sustainable development perspective, economic sustainability in social media-driven markets is not limited to short-term profitability and marketing efficiency. It includes the ability of digital market systems to be resilient, adaptive and efficient over time and manage uncertainty and structural change. Research on AI adoption in small and medium-sized enterprises show that artificial intelligence contributes to strengthening long-term economic viability through enhancing dynamic capabilities, innovation capacity, and strategic adaptability in the digital environments [1]. These system level benefits make the AI not just a marketing tool, but an infrastructural part of the sustainable economic development of social media markets.

Within digital economies the notion of heritage is created beyond traditional cultural or physical artefacts and comprises of accumulated economic knowledge locked into consumer behaviour, transactional routines, and institutional learning. In social media markets, repeated interactions between consumer and the marketplace - including engagement, purchasing and repurchasing - produce longitudinal behavioral data that constitute some form of economic heritage. This heritage is related to intertemporal continuity, as it captures the manner in which past consumer-firm interactions influence the future market outcomes. Artificial intelligence systems are pivotal in safeguarding and actualizing this economic history by learning from the past and adopting those consumption patterns into frameworks of predictive decision-making. By maintaining continuity of consumer knowledge and relational data, AI-driven analytics help maintain long-term market stability and partake in sustainable economic development in digital social media ecosystems.

Among the many ways that artificial intelligence can be used in the social media markets, the prediction of consumer purchases is certainly one of the most influential areas. These models have a direct impact on strategic decision-making regarding marketing communication, inventory planning, financial forecasting, and customer relationships management. Prior studies in the digital marketing domain emphasize the importance of AI-based predictive and personalization systems to increase consumer engagement and sustain consumption behavior on both social and mobile networks [2]. On top of practical value in managing purchasing decisions, purchase prediction models allow considering the broader ramifications of AI use on economic sustainability and heritage conservation in regard to social media markets.

1.1 Background Study

A growing body of research puts artificial intelligence at the forefront of economic sustainability, as a way to increase economic efficiency, resilience, and innovation capacity in the digital marketplace. Studies on AI-enabled business analytics highlight that predictive systems help in enhancing organizational performance because it helps firms to process complex data streams and respond better to environmental uncertainty [3]. In the case of digital and social media-enabled platforms, such capabilities enable predictive use to contribute to continuity of demand as well as long-term revenue generation that is key to sustainable economic systems.

Governance and transparency in algorithmic decision-making also research alleviates the significance of responsible AI implementation in sustainable development. It has been empirically proven that corporate disclosure of algorithmic decision systems affects stakeholder trust and institutional legitimacy in digital markets, which, in turn, strengthens the social and economic underpinning of sustainability [4]. On the contrary, the legal and regulatory studies warn that algorithmic bias if unregulated may undermine fairness, skew the outcomes of the markets and bring about the threat of unsustainable economic governance [5].

Within the social media marketing literature, there has been a great deal of attention focused on AI-powered personalization and predictive advertising. Empirical studies show that the perceived trustworthiness, relevance and usefulness of AI-

driven advertising have a significant impact on consumer purchase intentions in digital environments [6]. Complementary research considering broader trends in artificial intelligence and data analytics suggests that predictive technologies are changing the digital marketing structure and promotional strategies at the systems level [7]. The strategic relevance of algorithmic targeting, in turn, is supported by the fact that AI-based predictive marketing has a quantifiable effect on consumer purchase intentions in social media settings, in particular [8].

In addition to short-term marketing results, customer retention and churn prediction research also demonstrates that machine learning models can be used to achieve long-term business performance because they help maintain relationships with customers and mitigate demand volatility [9]. Related studies combining machine learning with sustainability-driven inventory models show the importance of correct demand forecasting in resource efficiency and even reduction of environmental impact through better planning and avoiding waste [10]. More recent work on precision marketing confirms the value of machine learning in improving the power of consumer behavior prediction and strategic decision-making in digital markets [11]. Besides, RFM-based repurchase segmentation approaches emphasize the economic benefits of identifying high-retention consumer segments for long-term revenue stability [12].

Finally, there are studies on artificial intelligence-based customer service systems, which place a strong focus on the wider organization and labour implications of artificial intelligence adoption. Although automating operations using AI can enhance efficacy and compliance, it is also altering the position of workforce and skill levels, which also creates essential concerns with regards to human capital development and equity-based economic sustainability [13].

Despite this vast literature, heritage has been little used as an explicit analytical lens in studies of artificial intelligence and social media marketing. Existing research is largely concentrated on the predictive performance, engagement outcomes or issues of governance in isolation. Limited attention has been paid to artificial intelligence as a mechanism for the preservation of economic heritage via the systematic retention, interpretation, and use of historical consumer behavior. By stabilizing demand expectations, preserving institutional memory and supporting intertemporal continuity, AI-based models of consumer purchases have the potential to act as systemic stabilizers in social media market ecosystems. Addressing this conceptual gap is the basis for the current study.

1.2 Research Gap, Objectives, and Contributions

Despite the significant volume of research into artificial intelligence in the digital and social media markets, there are a number of important gaps. To begin with, the available literature focuses on predictive accuracy, consumer involvement, or sales performance alone, and relative little effort is focused on the role of AI-driven consumer purchase prediction as an aspect of economic sustainability in the form of demand stability, financial resilience, and long-term market viability. As a consequence, the role of predictive analytics at the system level in supporting sustainable development paths in digital market ecosystems is still inadequately explored.

Second, while the governance-related issues related to algorithmic transparency and accountability (and algorithmic bias) are gaining increasing scholarly attention, these issues are frequently studied separately from the performance and economic implications of predictive analytics. Similarly, discussions of labor transformation and human capital development are often treated as conceptual and policy-oriented debates, not empirically related to specific applications of AI (e.g. consumer purchase prediction). In this respect this fragmentation hinders the possibility of comprehending the interdependent effects of AI-based predictive systems on economic sustainability, government quality and workforce dynamics in digital markets.

Apart from these gaps, existing studies rarely conceptualize the AI-driven consumer purchase prediction as a mechanism for sustaining economic heritage and ensuring intertemporal continuity in digital market systems. While previous research recognizes the value of long-term relationships between customers and continuity of demand, consumer behavioral data are rarely analyzed as cumulative economic knowledge that is a form of institutional memory. Consequently, the role of artificial intelligence in the retention, interpretation, and operationalization of historical consumer behavior as economic heritage is underexplored in sustainability-oriented digital market research.

To overcome these limitations, the current study views consumer purchase prediction as an economic process going beyond marketing effectiveness and short term performance optimization. By empirically evaluating the performance of models based on artificial intelligence and digital market data and understanding the results of these evaluations in terms of economic sustainability and heritage

preservation, the research merges technological performance with general economic, managerial, and governance considerations. This approach allows for a more holistic understanding of the contribution of analytics with AI to sustainable development through stabilising demand, institutional continuity and resilience in decision-making in data-intensive digital markets.

Accordingly, the objectives of this study are:

- Objectives of the study: - To develop and empirically test artificial intelligence-based consumer purchase prediction models using data from digital and social media-enabled markets.
- Out of the three points, the first one should be adopted, to examine the role of AI-driven purchase prediction in supporting economic sustainability through mechanisms such as demand stability, resource efficiency and innovation-driven growth.
- To offer managerial and policy-relevant insights on the responsible and sustainable adoption of artificial intelligence, with special focus on governance, ethics considerations as well as human capital development in digital markets.

By accomplishing these goals, this study adds to the literature in three different ways. First, it provides a technical contribution by empirically assessing the predictive accuracy of AI-based models of consumer purchase behavior in the digital marketplace. Second, it advance the sustainability research by explicitly linking predictive analytics and system level economic sustainability outcomes not isolated firm level performance measures. Third, and most important from the point of view of heritage and sustainable development, the study makes a contribution when it introduces the consumer purchase prediction as a process of economic heritage preservation. By considering the behavior of consumers in the past as a form of accumulated economic knowledge and institutional memory, the research shows how artificial intelligence can be used to support intertemporal continuity and long-term sustainable development in digital market economies.

2. Research method

This study uses a quantitative, empirical research approach in the study of the role of artificial intelligence-based consumer purchase prediction models in supporting economic sustainability in the context of digital markets. Secondary data from an e-comm environment are used for developing and testing machine learning supervised models to predict consumer repurchasing behavior that is taken as a sign of stability of demand and long-term economic viability. The methodological framework combines elements of data preprocessing, predictive modeling, and model evaluation with economic interpretation that allows assessing both the prediction performance and the sustainability-related economic performance. With this approach, artificial intelligence can be studied not only as a technical forecasting tool but also as a decision support system for sustainable business and economic development.

In addition to predictive accuracy, the methodological design has a heritage-conscious approach, with historical data of consumer behavior being viewed as a store of historical economic information. The models reflect on the institutional memory and intertemporal continuity in digital markets by relying on the learning results of repeated interactions between consumers and firms over time. This approach makes the use of artificial intelligence not only a forecasting tool, but also a mechanism for maintenance of economic heritage, which is the basis for long-term sustainability.

2.1 Research design and analytical approach

This research takes a quantitative, empirical approach to investigate and study the role of artificially intelligent consumer purchase prediction models to improve economic sustainability in digital markets. The methodological framework is based on sustainability economics and data-driven decision theory and therefore artificial intelligence is placed as a predictive and analytical tool for long term economic stability not short term profit maximization. The empirical approach allows the systematic assessment of the performance of predictive models and implications for sustainable business and economics results.

The research combines machine learning methods and economic interpretation to determine the contribution of predictive accuracy in the repurchase behavior of consumers to demand stability, financial resilience, and innovation-driven growth. Consumer repurchase probability is used as an empirical measure of economic sustainability in digital markets because repeated purchasing behavior is an indicator of continuity of revenue, efficient resource allocation, and lessened market volatility. This approach is in line with modern economic literature which links sustained consumer engagement with long-term economic development and business sustainability.

Within this analytical framework, the consumer repurchase behavior is regarded not simply as a predictive result, but as a result of economic heritage in digital markets. Repurchase is an expression of the durability of consumer-firm relationships, accumulated trust, and recurring economic consumption in time, which reflects some form of institutional memory present in market behavior. Using actual consumer data from the past, the modeling of repurchase probability allows the analytical approach to operationalize the concept of intertemporal continuity and retain knowledge of past economic relationships. This framing allows artificial intelligence - based prediction to act as both an analytical and heritage-preserving mechanism that provides for long-term economic sustainability.

2.2 Data source and dataset description

The empirical analysis is based on the "Predicting E-commerce User Repurchase Behavior" [14] dataset acquired from Kaggle that is available in the public domain and is available in a CSV format, and is widely used in digital market analytics research. The dataset contains 1450 individual consumer observations that comes from an online retail environment, and it is suitable for modeling consumer behavior in platform based digital markets. The use of publicly accessible data set ensures methodological transparency, replicability and following ethical research standards. The dataset captures longitudinal consumer interaction patterns that can be used to analyze how accumulated behavioral heritage is used to inform sustainable decision making in digital markets.

The data sets contain an extensive range of variables that represent demographic characteristics, digital interaction behaviour, and economic transaction attributes. Demographic variables such as age, gender, income level and residential location are helpful in gaining insight into human capital and demographic economics. Behavioral variables such as time spent on the platform, page views, cart additions, and interaction with personalized recommendations can be considered as consumer engagement in digital markets. Economic variables like purchase frequency, average order value, total expenditure, and discount utilization represent financial behaviour that is relevant to the analysis of economic sustainability. The target variable represents whether or not a consumer repurchased within a certain window of time; in this case, supervised learning and predictive modeling of repeat purchase behavior can be performed.

The data set was chosen because of its good correlation to the research topic of artificial intelligence, consumer purchase prediction, and economic sustainability. By recording both the behavioral and financial aspects of consumer activity, the dataset enables the strong analysis of how AI-based predictions can be used to make sustainable business decisions and stimulate economic growth in digital markets.

2.3 Data preprocessing and feature preparation

The dataset used for the models went through a systematic preprocessing procedure prior to the development of the models to ensure data quality and reliability of the analysis. Missing values were analyzed and handled using suitable imputation methods and categorical variables, including gender, type of device, and campaign category, were converted into numerical values using suitable encoding techniques suitable for machine learning models. The continuous variables such as total spending, and time on site were normalized to minimize bias due to scale and enhance convergence of the models.

Both the statistical relevance and economic interpretability were used to select features. Variables were kept not only on predictive potential, but also on the contribution to explain economic behavior in digital markets. Such a two-fold focus makes sure that the models obtained are explainable economic instruments instead of black box algorithms. Consumer engagement intensity, purchasing capacity and exposure to digital governance mechanisms such as recommendation systems, marketing campaigns are also represented in the final feature set.

2.4 Artificial intelligence models and prediction framework

The study uses supervised machine learning models to forecast consumer repurchase behaviour, as repurchase probability is used as a measure of economic continuity of relations in digital markets. Multiple algorithms were considered to ensure robustness and comparative validity such as logistic regression, decision tree based models and ensemble learning techniques. These models have been chosen because of their proven application in economic forecasting and business analytics and their ability to balance predictive power and interpretability.

Model training and testing was performed in the usual train-test split manner to test generalization performance. Hyperparameter tuning has been performed with the help of cross-validation techniques to optimise model accuracy and model

stability. The predictive framework is explicitly connected to economic interpretation with model outputs analysed in terms of its implications for demand forecasting, revenue stability and strategic business planning. Artificial intelligence integrated with economics reasoning underpins the journal's focus on mathematical modelling of the economic processes and innovation driven sustainability.

2.5 Model evaluation and economic sustainability indicators

Model performance was assessed using known classification metrics such as accuracy, precision, recall and area under the receiver operating characteristic curve. While these sorts of metrics measure the effectiveness of prediction, the evaluation framework is not limited to measuring technical performance; it goes beyond that to interpret the economic implications of artificial intelligence-based prediction. In this study, sustainability is not quantified in terms of direct environmental/social indicators but understood through the generation of sustainability-enabling efficiency conditions through better predictive capability. Higher predictive accuracy in repurchase behavior is therefore seen as increased ability to anticipate consumer demand, minimize market uncertainty and aid more efficient resource allocation.

Economic sustainability is implemented in terms of structural metrics estimated from model predictions and dataset variables, for example, stability in repeat purchasing behaviors, projected customer lifetime value, and lessening dependence on excessive promotional intensity. These indicators have reflected the conditions that enable sustainability, including efficiency, intertemporal continuity, long-term value creation and financial resilience as opposed to direct sustainability outcomes. Via the connection of predictive performance to these structural economic mechanisms, the methodological approach makes the outputs of artificial intelligence a contributor to sustainable business practices, innovation-driven development and resilient decision-making in digital market environments.

2.6 Analytical framework and interpretation

The analytical framework combines the results of predictive modeling with economic and managerial interpretation to determine the wider implications of the adoption of artificial intelligence in digital markets. The research contextualizes predictions in the context of economic sustainability theory and business governance models that do not see the outputs of the model as separate technical outcomes. This strategy will allow exploring the potential of AI-inspired insights to help make informed decisions, improve the stability of the market, and promote sustainable economic development.

Implication to small and medium-sized businesses is also taken into account in the analysis as they tend to lack resources and are uncertain about the market in the digital world. By enhancing the predictability of demand and effectiveness of operations, predictive models for consumer purchases based on artificial intelligence can help in creating an inclusive economic environment and entrepreneurial innovation. These considerations are in line with the journal's focus on governance in business, innovation, and sustainable economic systems.

2.7 Ethical considerations and methodological limitations

The research is based on the use of anonymized and publicly accessible secondary data, which helps to ensure compliance with the ethical standards of research and data protection. No information that can be used to personally identify or distinguish individuals is included in the dataset and the analysis is done for academic and sustainability-oriented purposes only. This is due to the application of open and repeatable techniques, which contribute to responsible AI research and are in line with the new requirements of ethical decision-making based on data.

Methodological limitations (no direct environmental or life cycle assessment variables, limiting analysis to the economic dimension of sustainability); Additionally, the dataset reflects one digital market context, and may therefore have a limited generalisability across sectors or regions. These limitations are recognised in order to preserve the methodological rigour and to give direction for future research on incorporating the dimensions of environmental and social sustainability.

3. Results and discussion

3.1 Model performance results

The empirical analysis is based on a dataset of 1450 consumers that work in a digital market environment. The target variable is repurchase behavior in a given time period (23.31% of the consumers are repurchasers and 76.69% are non-repurchasers). This distribution is based on realistic digital market conditions, in which it is usually sustained consumer engagement concentrated in a minority of users.

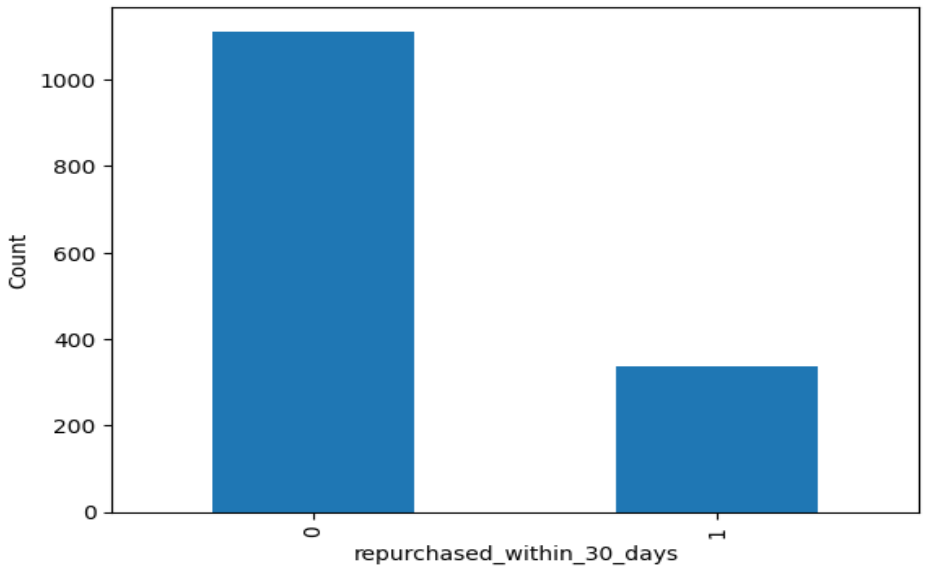

Figure 1. Distribution of repurchase and non-repurchase consumers.

Descriptive statistics for the key demographic, behavioral and economic variables used in the analysis are shown in Table 1. Consumers are highly heterogeneous in terms of frequency of purchase, average order amount, total spending, and digital engagement measures. These variations ensure that there is strong empirical evidence for using artificial intelligence models to model non-linear relationships in consumer purchasing behavior.

Table 1. Descriptive statistics of key demographic, behavioral, and economic variables.

Variable	N	Mean	Std. dev.	Min	25%	Median	75%	Max
Age (years)	1450	38.71	12.37	18.00	28.00	39.00	50.00	59.00
Purchase frequency	1450	7.35	4.10	1.00	4.00	7.00	11.00	14.00
Average order value	1450	104.85	53.87	10.02	58.21	106.46	150.17	199.97
Days since last purchase	1450	59.77	34.40	1.00	29.00	60.00	89.00	119.00
Total spending	1450	765.70	608.32	12.59	266.10	596.75	1152.80	2744.42
Time on site	1450	413.87	220.59	30.00	224.00	410.50	602.00	799.00
Page views	1450	30.82	16.33	3.00	17.00	31.00	45.00	59.00
Cart additions	1450	4.52	2.93	0.00	2.00	5.00	7.00	9.00
Wishlist additions	1450	2.00	1.39	0.00	1.00	2.00	3.00	4.00
Discount received	1450	10.07	7.06	0.00	5.00	10.00	15.00	20.00

Correlation analysis has shown that the number of days since last purchase is the most important determinant of the repurchase behavior as it shows a significant negative relationship with the target variable. Discount intensity, interaction with recommendation systems and cart activity have weaker but positive associations with repurchase likelihood. These relationships are summarised in Table 2 and visually shown in Figure 2, and points to the importance of purchase recency and targeted engagement mechanisms.

Table 2. Correlation between key predictors and consumer repurchase behavior.

Predictor	Correlation with repurchase
Days since last purchase	−0.718
Discount received	0.099
Recommendation clicked	0.061
Cart additions	0.046
Age	0.042
Average order value	0.036
Wishlist additions	0.030
Total spending	0.016
Time on site	0.014
Page views	−0.008
Purchase frequency	−0.005

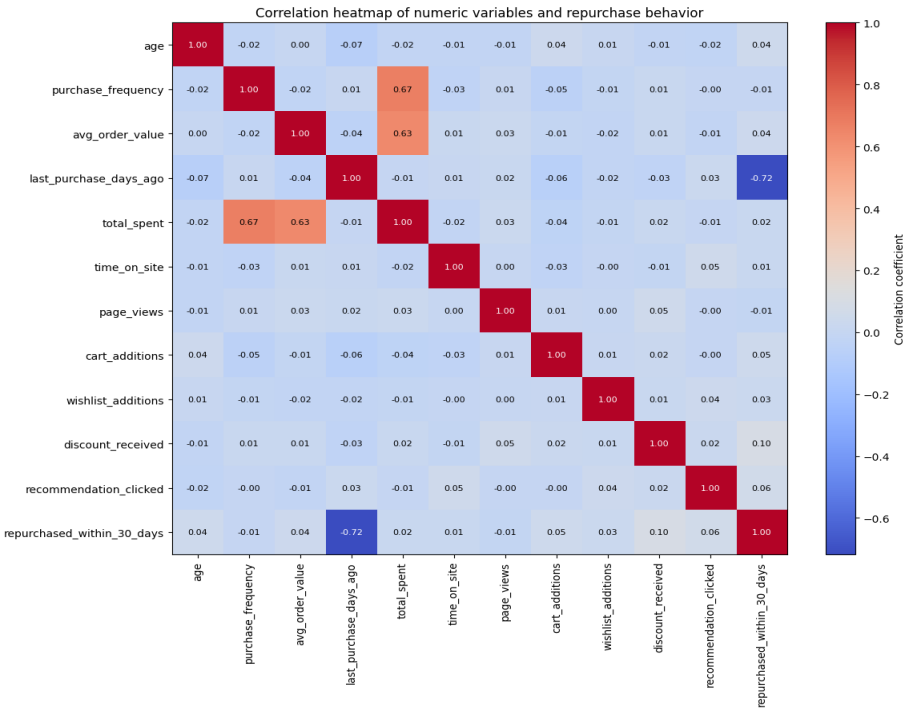

Figure 2. Correlation heatmap of numeric variables and repurchase behavior.

The predictive evaluations of the artificial intelligence models are given in Table 3. Both logistic regression and random forest model show good classification accuracy; however, the random forest model is better than the baseline in classification accuracy. The random forest has an accuracy of 0.962, an F1-score of 0.912 and a ROC-AUC of 0.999, which shows an excellent discriminative capability.

Table 3. Comparative performance of artificial intelligence models.

Model	Accuracy	Precision	Recall	F1-score	ROC–AUC
Logistic regression	0.955	0.982	0.824	0.896	0.996
Random forest	0.962	1.000	0.838	0.912	0.999

The ROC curves in Figure 3 attest to the superior performance of the random forest model for different classification thresholds. These results prove that artificial intelligence improves the accuracy of demand forecast, and in turn makes markets more efficient and less uncertain in terms of the pattern of digital consumption.

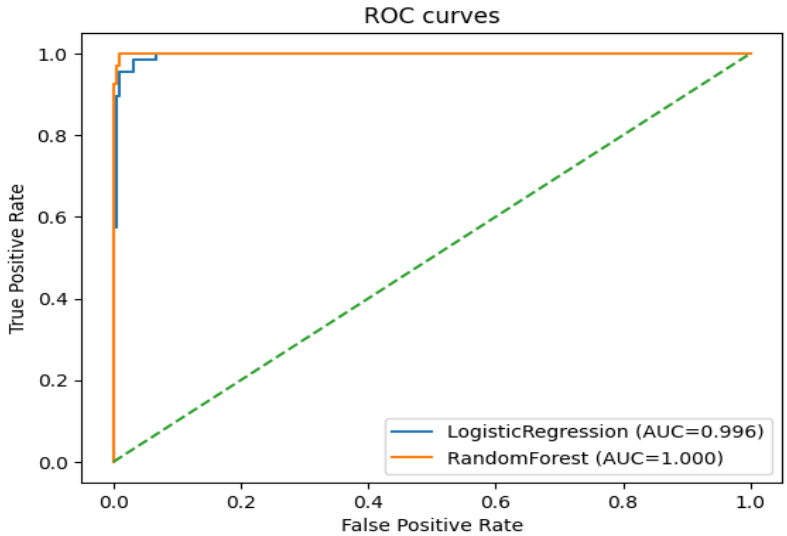

Figure 3. ROC curves for logistic regression and random forest models.

3.2 Economic sustainability impacts

The predictive results have important implications in the economic sustainability. Consumers that the models identified as likely to repurchase are spending higher average amounts and higher on average transactions, thus repeating behavior is a critical component for maintaining long-term revenue streams. By correctly identifying these consumers, firms can direct strategic resources to segments that create the greatest contribution to the stability of the economy.

3.2.1 Economic Sustainability

The predictive power of the artificial intelligence models is directly linked to economic sustainability by improving the stability of demand and decreasing the volatility of revenue in digital markets. Accurate identification of consumers who repurchase products allows companies to allocate financial and operational resources more efficiently, thus maintaining stable long-term revenue continuity. From a sustainability economics perspective, stable repurchase behavior is intertemporal demand consistency, and this contributes to business resilience and long-term market viability. For small and medium-sized enterprises, better predictability of demand helps mitigate financial shocks and facilitate intergenerational business continuity which helps to strengthen economic heritage in the digital market ecosystems.

3.2.2 Social Sustainability

Artificial intelligence-based consumer purchase prediction is also one of the contributors of social sustainability by making the decision more consistent, workforce more effective, and management capability better. By minimizing the need for an intuition-based decision-making process, predictive analytics encourage fairer and more transparent customer management practices. Moreover, the AI-aided forecasting changes the demand for labor in the direction of analytical and strategic competences, which entices the development of human capital and constant upgrading of skills. For the small and medium-sized enterprises, access to data-driven decision tools helps in reducing informational asymmetry vis-a-vis the larger firms for inclusive participation in digital markets, and can strengthen the social foundations of sustainable economic development.

The distribution of predicted repurchase probabilities, Figure 4, illustrates a highly skewed distribution with a relatively small proportion of consumers having a high tendency to repeat purchase. This segmentation facilitates focused marketing and increased financial planning policies which minimise wastage and stabilise revenue streams.

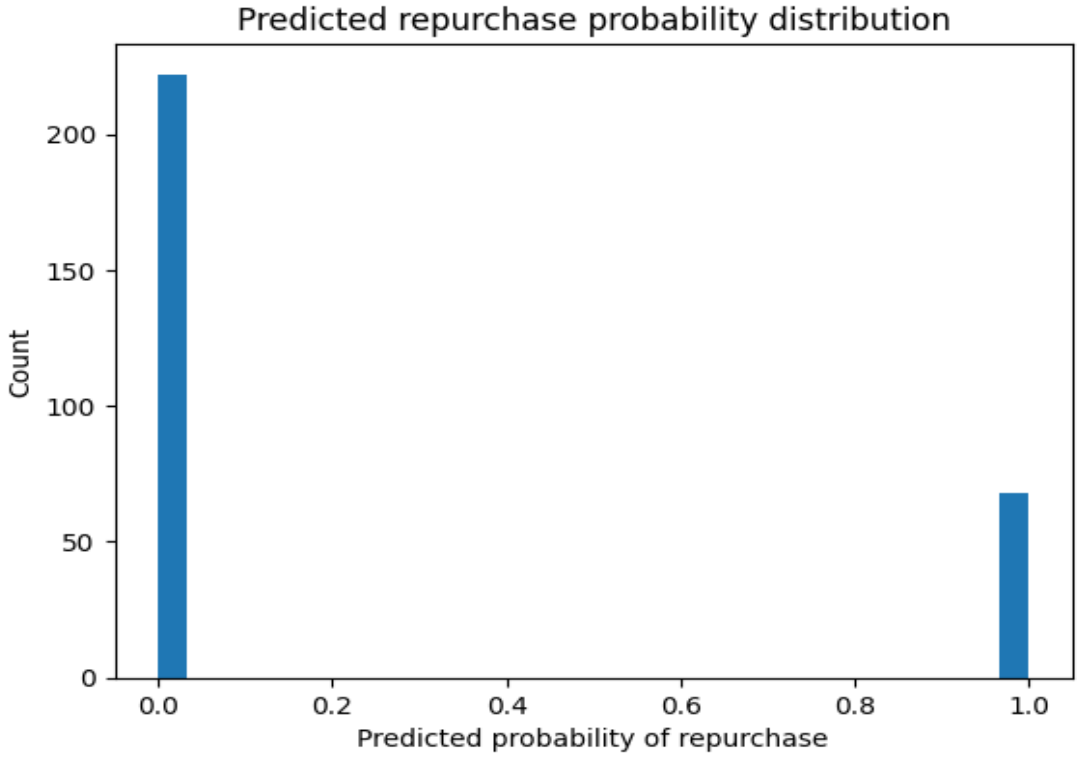

Figure 4. Distribution of predicted repurchase probabilities.

Improved predictability of demand is also aiding in sustainable inventory and production planning. By matching supply decisions with expected demand from consumers, companies can lower excessive inventory and alleviate inefficient operation and indirectly meet resource efficiency and sustainability goals.

3.3 Discussions

The findings highlight the importance of artificial intelligence as a strategic factor for innovation and business management in digital markets. By turning big data from consumers into useful predictions, Artificial Intelligence (AI) powered analytics enables companies to shift from reactive decision-making to proactive and data-driven strategies. The customer-centric orientation made possible by AI is consistent with evidence that greater consumer engagement and affective attachment can boost purchase intention to help reinforce managerial value in the personalization of analytics [15]. This capability is especially useful for small and medium-sized enterprises, which are often constrained by financial and organizational limitations and are unable to conduct extensive market analysis. Previous studies show that the adoption of AI supports innovation capability of SMEs through digital capability enhancement and increased responsiveness to competitive and environmental forces [16]. In this context, the predictive models that will be used in this study offer the SMEs practical instruments for better customer targeting, demand forecasting and strategic planning, so that to guarantee the competitiveness at the same time favor the economic sustainability. Artificial intelligence is also serving as an institutional memory keeper in preserving knowledge from past consumer-firm transactions and embedding them in strategic decision-making processes supporting long-term continuity.

The findings are also in line with empirical research indicating that AI-driven marketing analytics can help businesses improve outcomes by making promotional and customer management decisions more effective. By learning from historical patterns of behavioral patterns, these models create institutional learning while turning past market experience into forward-looking and economic intelligence. Evidence from e-commarce contexts points to the fact that marketing applications of AI lead to better sales performance in terms of better targeting and efficiency of operations [17]. The present study extends these insights by showing that making accurate purchase prediction is not only a part of short-term marketing effectiveness but also a part of longer-term revenue stability and more resilient business models. By allowing companies to identify consumers who have a high probability of repeat purchasing, AI helps entrepreneurial innovation through more efficient use of marketing, financial and operational resources, especially in markets where the signal to demand can change rapidly through digital media. This ability to maintain demand over time is a reflection of the maintenance of accumulated market knowledge, ensuring intertemporal continuity and the generation of value in the long run in digital business models.

From a methodology point of view, the high level of predictive performance of machine learning models in this study is in line with the results of previous studies that showed the effectiveness of computational methodologies in retail demand prediction and consumer purchase prediction. It has been shown that ensembles made with tree-based models and deep learning models have the capability to learn a variety of complex, non-linear patterns that can be useful in predicting demand in a retail setting [18]. Similarly, experiments combining behavioral theory and machine learning reveal the potential of predictive models to create insights that can be applied to guide consumer decision-making mechanisms [19]. Related ethical and sustainability-oriented scholarship has also emphasized that it is important not only to assess AI readiness and deployment in terms of accuracy, but also in terms of responsible design choices and downstream impacts [20]. Taken together, this body of evidence provides support for the methodological position of the present study and adds strength to the interpretation of prediction by AI as a decision support tool for economically sustainable outcomes.

However, with these advantages, the use of AI-based decision systems poses governance, cybersecurity, and ethical issues, which need to be resolved to enable sustainable use. As predictive algorithms play an increasingly important role in shaping pricing strategies, promotions, and customer engagement strategies, it is important that data security and consumer privacy are safeguarded to ensure trust and legitimacy in the market. Besides, it is essential to ensure algorithmic transparency and accountability because autonomous systems can replicate or enhance biases present in past data. Prior research suggests the autonomy of algorithmic decision agents can have a substantial impact on consumer purchase behaviour emphasising the need for governance mechanisms to maintain human oversight and consumer agency [21]. In this regard, artificial intelligence is a governance-supporting

mechanism that institutionalizes rules for decision-making over time, which helps maintain trust, accountability, and continuity in the operation of the markets.

The implications of the adoption of AI also spread to labor economics and human capital development. AI-driven decision systems transform the needs of the workforce by driving demand for analytical, digital, and strategic skills, and decreasing the need for routine data processing. In parallel, progress in predicting the consumer based on hybrid deep learning and machine learning approaches provide a prospect that technical capability will continue increasing, which in turn supports the need for continuous workforce upskilling and adaptive organisational learning [22]. To maintain these shifts, it is necessary that institutional knowledge inherent in AI systems is accompanied by constant development of the human capital in order to establish the continuity of economic capabilities across generations.

Recent research also lays emphasis on understanding customer behavior across the digital touchpoints to support sustainable business outcomes. Evidence from customer journey analytics shows that data-driven insights into consumer interaction can be used to improve long-term value creation and sustainability-oriented marketing strategies, even if no advanced artificial intelligence techniques are used. These findings complement the current study by reinforcing the importance of economic relevance of predictive approaches in order to stabilize demand and enhance decision-making in digital markets [23].

Overall, the results show that artificial intelligence-based consumer purchase prediction models can not only improve the predictive accuracy of the predictions in digital markets but also contribute to the larger goals of economic sustainability by preserving institutional memory, continuity, and accumulated market knowledge by supporting innovation, improving managerial decision-making, strengthening responsible governance, and enabling human capital development.

Conclusion

This paper investigated the role of artificial intelligence-based consumer purchase prediction models in improving economic sustainability in the social media-based digital markets. Using empirical data of e-commerce and the supervised machine learning techniques, the results show that AI models can predict consumer repurchase behavior successfully and capture the patterns of demand stability and long-term consumer-firm interaction. Ensemble approaches and especially random forest classifiers have been found to be superior in predicting performance, suggesting that artificial intelligence may be a viable way to substantially reduce demand uncertainty and enhance the quality of decision-making in data-intensive digital environments.

The results have important implications both for managerial practice and for policy. From a business point of view, the use of AI to predict purchases contributes to revenue stability, more efficient inventory management and innovation-based marketing strategies in social media markets. These benefits are particularly relevant for small and medium-sized enterprises, at which level predictive analytics has the potential to reduce the asymmetries in information and to increase their competitive resilience. At the same time, the study supports the need for responsible AI adoption. A well-developed system of governance that covers issues of data security, transparency of the algorithm, and ways to reduce a biased data flow are needed to ensure that people trust AI and guarantee that economic benefits of AI could be used to make a long-term market sustainable.

Viewed through the lens of heritage and sustainable development, consumer purchasing behavior is an accumulation of economic legacies and repeated interactions, trust and institutional learning in digital markets. Artificial intelligence - based purchase prediction models serve as the caretakers of this legacy, by translating the past into a future state of action that helps reinforce economic development, market continuity and intergenerational relevance. In this way, artificial intelligence in social media marketing should be considered not only as a technological tool, but as a strategic mechanism for maintaining economic heritage and helping in sustainable development paths in changing digital economies.

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