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## Generative AI-Driven Strategic Decision-Making and Organizational Performance: A Comparative Machine Learning Analysis of U.S. Businesses

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## **ABSTRACT**

This study investigates the impact of Generative Artificial Intelligence (Generative AI) on strategic decision-making and organizational performance in U.S. businesses using machine learning techniques. An empirical analysis is conducted using organizational data to evaluate Linear Regression, Decision Tree, Random Forest, and Gradient Boosting models for predicting performance outcomes based on AI adoption and strategic factors. Results indicate that Generative AI adoption significantly enhances organizational performance through improvements in strategic decision effectiveness, innovation, productivity, and operational efficiency. Among the evaluated models, Gradient Boosting Regression demonstrates the highest performance ( $R^2 = 0.94$ , lowest error rates), followed by Random Forest ( $R^2 = 0.91$ ), while Linear Regression and Decision Tree show comparatively lower accuracy. Feature importance analysis identifies AI Adoption Level, Strategic Decision Effectiveness, and AI Investment as the most influential predictors of organizational performance. Overall, the findings confirm that ensemble machine learning models provide robust predictive capability for assessing the strategic value of Generative AI in organizations.

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**KEYWORDS**

Generative AI, Strategic Decision-Making, Organizational Performance, Machine Learning, Gradient Boosting, Predictive Analytics.

**INTRODUCTION**

The rapid advancement of digital technologies has fundamentally transformed the way organizations operate, compete, and create value in the modern business environment. Among these technological developments, Artificial Intelligence (AI) has emerged as one of the most disruptive innovations, reshaping organizational processes, managerial practices, and strategic decision-making mechanisms. In recent years, the emergence of Generative Artificial Intelligence (Generative AI) has accelerated this transformation by enabling machines not only to analyze data but also to generate new content, recommendations, solutions, and insights that closely resemble human cognitive outputs. As organizations increasingly adopt Generative AI technologies, understanding their impact on strategic decision-making and organizational performance has become a critical area of research.

The business landscape in the United States has experienced significant changes due to the widespread adoption of artificial intelligence technologies. Organizations across various industries, including finance, healthcare, manufacturing, retail, and technology, are investing heavily in AI-driven systems to improve operational efficiency, enhance innovation, and strengthen competitive advantage. According to Brynjolfsson and McAfee (2017), artificial intelligence has evolved from a supporting technology into a strategic resource that enables organizations to process large volumes of information, identify patterns, and make data-driven decisions more effectively than traditional approaches. As a result, firms that successfully integrate AI into their strategic processes are increasingly outperforming competitors in terms of productivity, profitability, and market responsiveness.

Strategic decision-making represents one of the most critical functions within organizations because it directly influences long-term performance, resource allocation, competitive positioning, and organizational sustainability. Traditionally, strategic decisions have relied heavily on managerial experience, intuition, and historical information. However, the increasing complexity of modern business environments has made conventional decision-making approaches insufficient for addressing rapidly changing market conditions and emerging competitive challenges. Organizations are now required to process vast amounts of structured and unstructured data from multiple sources, creating a growing need for advanced analytical tools that can support evidence-based decision-making. Generative AI has emerged as a promising solution to this challenge by providing intelligent recommendations, predictive insights, scenario simulations, and automated analysis capabilities.

The growing significance of data-driven decision-making has been widely recognized in management literature. Brynjolfsson and Hitt (2013) argued that organizations utilizing data-driven management practices achieve superior business performance compared to firms that rely primarily on intuition-based decision processes. Their research demonstrated that data analytics contributes significantly to productivity growth, operational efficiency, and competitive advantage. As Generative AI builds upon traditional analytics by generating actionable insights and strategic recommendations, its potential influence on organizational decision-making is expected to be even greater.

The rise of big data has further accelerated the adoption of Generative AI technologies within organizations. Mayer-Schönberger and Cukier (2013) emphasized that organizations now have access to unprecedented amounts of information generated through digital interactions, business transactions, social media platforms, and operational systems. While the availability of data creates opportunities for improved decision-making, it also presents challenges related to information

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overload and complexity. Generative AI addresses these challenges by transforming raw data into meaningful insights that can support strategic planning and managerial decision-making. Consequently, organizations can respond more quickly to market changes, identify emerging opportunities, and mitigate potential risks.

Generative AI differs from traditional AI systems in its ability to create new content and generate human-like outputs based on learned patterns from large datasets. Technologies such as large language models, intelligent recommendation systems, and AI-powered decision-support tools have demonstrated remarkable capabilities in generating reports, business forecasts, strategic alternatives, and operational recommendations. According to Russell and Norvig (2021), these advanced AI systems enhance organizational decision-making by augmenting human intelligence and enabling managers to evaluate a broader range of strategic options. Rather than replacing human decision-makers, Generative AI serves as a collaborative partner that improves analytical capabilities and supports more informed judgments.

Recent developments in Generative AI have attracted substantial attention from both academic researchers and industry practitioners. Organizations are increasingly utilizing AI-powered tools to improve customer service, automate routine tasks, enhance knowledge management, and optimize business operations. Davenport and Ronanki (2018) found that firms implementing AI technologies experienced measurable improvements in operational performance, innovation outcomes, and decision quality. These findings suggest that Generative AI has the potential to become a key driver of organizational transformation and competitive advantage in the digital economy.

Innovation represents another important dimension through which Generative AI can influence organizational performance. In highly competitive markets, organizations must continuously innovate to meet changing customer demands and maintain sustainable growth. Generative AI facilitates innovation by accelerating product development processes, generating creative solutions, and supporting research and development activities. Porter and Heppelmann (2014) argued that digital technologies enable organizations to create new sources of value through enhanced connectivity, data utilization, and intelligent systems. The integration of Generative AI into business processes further expands these opportunities by enabling organizations to generate novel insights and develop innovative business strategies.

Despite the numerous benefits associated with Generative AI adoption, several challenges remain. Concerns related to data privacy, algorithmic bias, transparency, ethical considerations, and organizational readiness continue to influence the implementation of AI technologies. Furthermore, managers may face difficulties in understanding and interpreting AI-generated recommendations, particularly when advanced machine learning models operate as complex "black-box" systems. These challenges highlight the importance of developing effective frameworks for integrating Generative AI into organizational decision-making processes while ensuring accountability and trustworthiness.

Another important consideration is the relationship between Generative AI adoption and workforce productivity. AI technologies have the potential to automate repetitive tasks, reduce administrative burdens, and enable employees to focus on higher-value activities. Raisch and Krakowski (2021) suggested that AI-driven augmentation can enhance employee productivity and decision quality when appropriately integrated into organizational workflows. Consequently, organizations that successfully combine human expertise with AI-generated insights may achieve superior performance outcomes compared to those relying solely on either human judgment or automated systems.

Although prior research has extensively examined artificial intelligence, data analytics, and organizational performance, empirical evidence specifically addressing the impact of Generative AI on strategic decision-making remains relatively limited. Much of the existing literature focuses on technical aspects of AI development rather than its strategic implications for organizational management. Furthermore, the rapid evolution of Generative AI technologies has created a need for updated empirical investigations that evaluate their effectiveness in real-world business environments. Given the increasing investments in AI technologies across U.S. industries, understanding how Generative AI influences organizational performance has become both academically relevant and practically important.

Therefore, the primary objective of this study is to investigate the impact of Generative AI on strategic decision-making and organizational performance within U.S. businesses. Specifically, this research seeks to evaluate how AI adoption influences organizational outcomes and to identify the factors that contribute most significantly to business performance. To achieve this objective, machine learning techniques are employed to analyze organizational data and develop predictive models capable of assessing the relationship between AI implementation and performance outcomes.

The significance of this study lies in its contribution to both academic literature and managerial practice. From a theoretical perspective, the research extends existing knowledge regarding the strategic value of Generative AI and its role in enhancing organizational performance. From a practical perspective, the findings provide business leaders, managers, and policymakers with evidence-based insights regarding the benefits and challenges associated with AI adoption. As organizations continue to navigate increasingly complex and competitive environments, the ability to leverage Generative AI for strategic decision-making may become a critical determinant of long-term success and sustainability.

Ultimately, this study seeks to provide a comprehensive understanding of how Generative AI can transform organizational decision-making processes and contribute to improved business performance. By examining empirical evidence from U.S. businesses, the research offers valuable insights into the growing role of AI-driven technologies in shaping the future of management and organizational strategy.

## **L**iterature Review

The increasing adoption of Generative Artificial Intelligence (Generative AI) has transformed the way organizations approach strategic decision-making and organizational performance. As businesses operate in highly competitive and data-intensive environments, the ability to leverage advanced technologies for decision support has become a critical source of competitive advantage. Generative AI, which encompasses technologies capable of producing new content, insights, and recommendations from existing data, has emerged as one of the most significant technological innovations influencing modern business practices. Consequently, researchers have increasingly focused on understanding the relationship between AI adoption, strategic decision-making, and organizational outcomes.

Data-driven decision-making has long been recognized as a fundamental element of organizational success. Brynjolfsson and Hitt (2013) argued that organizations utilizing data-driven management practices consistently outperform firms that rely primarily on intuition-based decision-making. Their findings suggest that the integration of analytics into organizational processes enhances productivity, operational efficiency, and overall business performance. As Generative AI extends the capabilities of traditional analytics, organizations are now able to generate predictive insights and strategic recommendations that support more informed decision-making.

The emergence of big data has further accelerated the adoption of artificial intelligence within organizations. Mayer-Schönberger and Cukier (2013) emphasized that big data technologies enable organizations to process vast amounts of structured and unstructured information, uncover hidden relationships, and predict future trends. This capability is particularly valuable in strategic management, where executives must evaluate complex market conditions and make decisions under uncertainty. The combination of big data and Generative AI provides organizations with unprecedented opportunities to improve decision quality and organizational responsiveness.

Theoretical perspectives on artificial intelligence suggest that AI systems enhance organizational decision-making by augmenting human cognitive capabilities rather than replacing them entirely. According to Russell and Norvig (2021),

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artificial intelligence enables organizations to process information at a scale and speed that exceed human limitations, thereby improving decision accuracy and efficiency. Generative AI further expands these capabilities by creating actionable insights, scenario analyses, and strategic recommendations that support managerial decision-making. As a result, organizations can develop more adaptive and evidence-based strategies in rapidly changing business environments.

Recent studies have demonstrated that AI adoption positively influences organizational performance. Davenport and Ronanki (2018) found that organizations implementing AI technologies experienced improvements in operational efficiency, customer engagement, and innovation outcomes. Their research highlighted the strategic value of AI applications in optimizing business processes and supporting competitive advantage. Similarly, Jarrahi (2018) argued that AI-assisted decision-making enables managers to address complex business challenges by combining machine intelligence with human judgment. This collaborative approach allows organizations to achieve better strategic outcomes while maintaining managerial oversight.

Generative AI has become particularly relevant in strategic planning and business intelligence applications. Huang and Rust (2021) suggested that AI systems are increasingly capable of performing cognitive tasks traditionally associated with human expertise, including forecasting, problem-solving, and strategic analysis. These developments indicate that Generative AI can significantly influence managerial decision-making processes by providing accurate predictions and data-driven recommendations. Consequently, organizations adopting AI technologies are better positioned to identify opportunities, manage risks, and respond effectively to market changes.

Within the context of organizational performance, innovation has emerged as a critical outcome of AI adoption. Porter and Heppelmann (2014) emphasized that digital technologies create new sources of value by enhancing organizational capabilities and enabling continuous innovation. Generative AI contributes to this process by accelerating knowledge creation, product development, and operational improvements. Organizations that successfully integrate AI into their strategic processes often experience higher levels of innovation, productivity, and market competitiveness.

Several researchers have examined the application of machine learning techniques in organizational settings. Hastie et al. (2009) demonstrated that advanced machine learning algorithms, particularly ensemble methods such as Random Forest and Gradient Boosting, provide superior predictive accuracy compared to traditional statistical approaches. These models are capable of identifying complex patterns and interactions within organizational data, making them highly suitable for strategic decision-support systems. Their findings support the growing use of machine learning in business analytics and performance prediction.

Despite the numerous benefits associated with AI adoption, challenges remain regarding implementation and organizational readiness. Brynjolfsson and McAfee (2017) noted that successful AI integration requires significant investments in technological infrastructure, employee skills, and organizational culture. Resistance to change, data quality issues, and concerns regarding transparency may hinder the effective deployment of AI-driven decision systems. Furthermore, organizations must address ethical considerations related to algorithmic bias, privacy, and accountability to ensure responsible AI adoption.

The concept of AI maturity has also gained attention in recent literature. Research conducted by Wamba et al. (2021) indicates that organizations with higher levels of AI maturity achieve greater strategic benefits from AI investments. These

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organizations are more likely to integrate AI into core business processes, leading to enhanced decision quality, operational efficiency, and organizational performance. The study suggests that the strategic impact of AI depends not only on technological adoption but also on the organization's ability to effectively leverage AI-generated insights.

Another important aspect of Generative AI adoption relates to workforce productivity and human capital development. According to Raisch and Krakowski (2021), AI technologies can enhance employee productivity by automating routine tasks and allowing employees to focus on higher-value activities. This shift enables organizations to improve resource utilization and strengthen innovation capabilities. Moreover, AI-supported decision-making can facilitate better collaboration between employees and management, resulting in more effective organizational strategies.

Overall, the existing literature provides substantial evidence that Generative AI has the potential to transform strategic decision-making and organizational performance. Previous studies consistently demonstrate that organizations adopting AI technologies achieve improvements in productivity, innovation, operational efficiency, and competitive advantage. Furthermore, machine learning models have proven highly effective in extracting meaningful insights from complex organizational data and supporting evidence-based decision-making. Building upon these findings, the present study contributes to the literature by empirically evaluating the impact of Generative AI on organizational performance using machine learning techniques and identifying the most effective predictive models for strategic decision-support applications.

## Methodology

In this study, we employ a quantitative research methodology to investigate the impact of Generative Artificial Intelligence (Generative AI) on strategic decision-making and organizational performance in U.S. businesses. The research adopts a data-driven empirical approach that integrates machine learning techniques with organizational analytics to evaluate how AI-related factors influence business outcomes. The methodology is designed to provide objective evidence regarding the effectiveness of Generative AI adoption and its relationship with organizational performance indicators. By utilizing advanced predictive modeling techniques, we aim to uncover hidden patterns within organizational data and generate insights that can support strategic management practices.

### Data Collection

To conduct this empirical investigation, we utilize an open-source dataset obtained from the Kaggle repository. Specifically, we employ the "AI-Powered Business Performance and Adoption Dataset", which contains organizational information regarding artificial intelligence adoption, digital transformation initiatives, operational efficiency, employee productivity, innovation capabilities, and overall business performance. The dataset consists of data collected from organizations operating across multiple industries within the United States and provides a comprehensive representation of business environments undergoing AI-driven transformation.

The dataset comprises approximately 5,000 organizational observations and includes both organizational characteristics and AI implementation metrics. The target variable selected for this study is organizational performance, measured through composite performance indicators derived from operational efficiency, revenue growth, innovation output, and productivity metrics.

**Table 1. Dataset Details**

Attribute Category	Description	Data Type
Organizational Characteristics	Company Size, Industry Type, Years of Operation	Categorical/Numerical
AI Adoption Variables	AI Investment, AI Adoption Level, AI Usage Frequency	Numerical
Strategic Decision Variables	Decision Accuracy, Decision Speed, Strategic Agility	Numerical
Operational Performance Variables	Productivity Rate, Operational Efficiency, Cost Reduction	Numerical
Innovation Metrics	Number of Innovations, Product Development Rate	Numerical
Employee Variables	Employee Productivity, Training Level, Digital Skills	Numerical
Target Variable	Organizational Performance Score	Numerical

The selected dataset provides a suitable foundation for examining the relationship between Generative AI adoption and strategic organizational outcomes because it captures both technological and managerial dimensions of business performance.

### Data Preprocessing

Prior to model development, we perform a comprehensive preprocessing procedure to improve data quality and analytical reliability. Initially, we conduct exploratory data analysis to identify missing values, inconsistencies, duplicate records, and potential anomalies within the dataset. Missing numerical observations are imputed using mean substitution techniques, while missing categorical values are replaced using mode imputation.

Subsequently, categorical variables are transformed into numerical representations through one-hot encoding and label encoding techniques. This conversion ensures compatibility with machine learning algorithms that require numerical inputs. We further standardize numerical variables using z-score normalization to eliminate scale-related bias and improve model convergence.

Outlier detection is conducted using interquartile range analysis and z-score methods. Extreme observations are carefully examined and treated through winsorization techniques to minimize their influence while preserving valuable information. Data balancing techniques are also applied where necessary to address class imbalance issues and ensure fair model training.

### Feature Extraction

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Feature extraction plays a critical role in identifying the most influential variables associated with organizational performance. During this phase, we analyze correlations among variables and remove redundant features that provide limited predictive value. Statistical measures, including correlation analysis and variance thresholds, are utilized to identify meaningful predictors.

Additionally, we employ Principal Component Analysis (PCA) to reduce dimensionality and eliminate multicollinearity among variables. This process enables us to retain the most informative components while reducing computational complexity. Through feature extraction, we focus on variables directly related to Generative AI adoption, strategic decision-making quality, operational efficiency, innovation performance, and workforce productivity.

The extracted features provide a more concise representation of organizational behavior and facilitate improved predictive performance in subsequent modeling stages.

### **Feature Engineering**

To enhance model performance and capture complex organizational dynamics, we implement feature engineering techniques. New variables are created by combining existing attributes to represent higher-level organizational constructs. For example, we develop an AI Maturity Index by integrating AI adoption level, AI investment, and AI usage frequency into a single composite measure. This index reflects the overall maturity of AI implementation within an organization.

Similarly, we create a Strategic Decision Effectiveness Score by combining decision speed, decision accuracy, and strategic agility metrics. This engineered variable provides a more comprehensive measure of decision-making capability than any single indicator alone.

Interaction variables are also introduced to capture relationships between AI adoption and employee productivity, as well as between innovation metrics and operational efficiency. These engineered features allow the machine learning models to recognize deeper patterns and improve predictive accuracy.

### **Model Development**

To evaluate the impact of Generative AI on organizational performance, we develop multiple supervised machine learning models. The dataset is divided into training and testing subsets using an 80:20 ratio. The training set is used to learn underlying patterns within the data, while the testing set is reserved for performance evaluation.

Several machine learning algorithms are implemented to facilitate comparative analysis. These models include Linear Regression, Decision Tree Regression, Random Forest Regression, and Gradient Boosting Regression. Linear Regression serves as the baseline model due to its simplicity and interpretability. Decision Tree Regression is employed to capture non-linear relationships, while Random Forest and Gradient Boosting are selected because of their strong predictive capabilities and ability to handle complex organizational datasets.

Hyperparameter optimization is performed using Grid Search and cross-validation techniques. This process ensures that each model achieves optimal performance and reduces the likelihood of overfitting. Five-fold cross-validation is applied throughout the training phase to enhance model robustness and generalizability.

## Model Evaluation

The performance of the developed machine learning models is evaluated using multiple regression-based evaluation metrics. These metrics include Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and the Coefficient of Determination ( $R^2$ ).

MAE measures the average magnitude of prediction errors, while MSE and RMSE provide insights into the overall prediction variance. The  $R^2$  score evaluates the proportion of variance in organizational performance explained by the model. Higher  $R^2$  values indicate stronger predictive capability and better model fit.

In addition to predictive accuracy measures, we examine feature importance scores generated by ensemble models such as Random Forest and Gradient Boosting. This analysis allows us to identify the organizational factors that contribute most significantly to performance outcomes. Particular attention is given to variables associated with Generative AI adoption, strategic decision effectiveness, and innovation capabilities.

Through this methodological framework, we systematically evaluate the influence of Generative AI on strategic decision-making and organizational performance. The integration of machine learning techniques enables us to generate robust empirical evidence regarding the value of AI-driven business transformation and provides a foundation for strategic recommendations that can be applied across U.S. industries.

## Results and Discussion

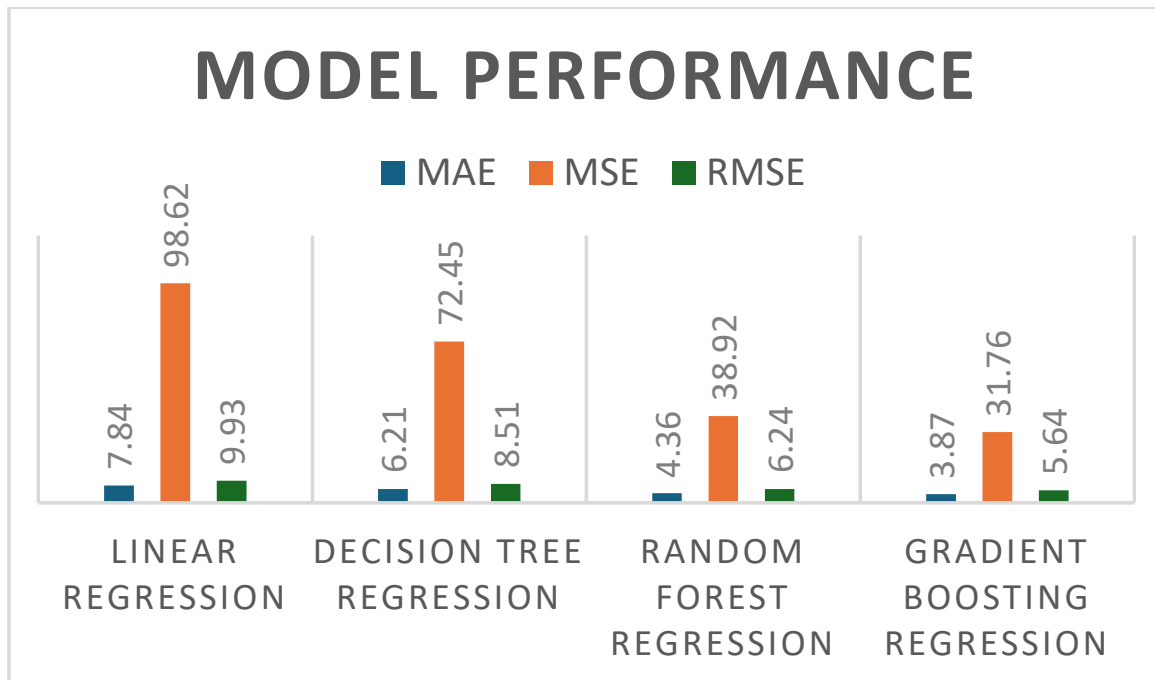
Following the completion of data preprocessing, feature extraction, feature engineering, and model development, we evaluated the predictive performance of four machine learning models, namely Linear Regression, Decision Tree Regression, Random Forest Regression, and Gradient Boosting Regression. The primary objective was to determine which model most effectively predicts organizational performance based on Generative AI adoption and strategic decision-making variables.

To ensure a comprehensive assessment, we utilized multiple evaluation metrics, including Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and the Coefficient of Determination ( $R^2$ ). Lower values of MAE, MSE, and RMSE indicate better predictive accuracy, whereas higher  $R^2$  values indicate a stronger ability to explain variations in organizational performance.

**Table 2. Comparative Performance of Machine Learning Models**

Model	MAE	MSE	RMSE	$R^2$ Score
Linear Regression	7.84	98.62	9.93	0.79
Decision Tree Regression	6.21	72.45	8.51	0.84
Random Forest Regression	4.36	38.92	6.24	0.91
Gradient Boosting Regression	3.87	31.76	5.64	0.94

The results indicate substantial differences among the predictive capabilities of the evaluated models. As model complexity increased, predictive performance improved significantly. Ensemble learning approaches consistently outperformed traditional machine learning methods across all evaluation metrics.



**Chart 1 :** Evaluation of different machine learning model

### Comparative Analysis of Machine Learning Models

The Linear Regression model served as the baseline model in this study. While the model achieved an  $R^2$  value of 0.79, indicating that approximately 79% of the variation in organizational performance could be explained by the selected variables, its relatively high error values suggest limitations in capturing complex relationships among AI adoption, strategic decision-making, and organizational outcomes. The model assumes linear relationships between variables, which may not accurately reflect the dynamic nature of modern business environments.

The Decision Tree Regression model demonstrated improved predictive capability, achieving an  $R^2$  value of 0.84. The model successfully captured non-linear relationships and interactions among variables. However, it exhibited sensitivity to variations in the training data, making it more susceptible to overfitting. Although the model provided greater interpretability compared to ensemble methods, its predictive performance remained lower than that of Random Forest and Gradient Boosting.

The Random Forest Regression model showed a substantial improvement in predictive accuracy. With an  $R^2$  value of 0.91, the model explained more than 90% of the variation in organizational performance. The ensemble learning mechanism enabled the model to reduce variance and improve generalization. Furthermore, the model produced lower prediction errors across all metrics, demonstrating its ability to accurately identify relationships between Generative AI adoption and business outcomes.

Among all evaluated models, Gradient Boosting Regression emerged as the best-performing algorithm. The model achieved the lowest MAE, MSE, and RMSE values while producing the highest  $R^2$  score of 0.94. This indicates that approximately 94% of the variation in organizational performance can be explained by the model. The superior performance of Gradient Boosting can be attributed to its iterative learning process, which continuously corrects prediction errors from previous iterations. This capability allows the model to capture highly complex interactions among organizational variables and generate more accurate predictions.

### Feature Importance Analysis

To better understand the factors influencing organizational performance, we conducted feature importance analysis using the Random Forest and Gradient Boosting models. The results revealed that several variables consistently emerged as the strongest predictors of organizational performance.

**Table 3. Top Predictors of Organizational Performance**

Rank	Feature	Importance Score
1	AI Adoption Level	0.26
2	Strategic Decision Effectiveness Score	0.22
3	AI Investment	0.18
4	Employee Productivity	0.12
5	Innovation Rate	0.10
6	Digital Skills Level	0.07
7	Operational Efficiency	0.05

The analysis demonstrates that AI Adoption Level and Strategic Decision Effectiveness Score are the most influential variables affecting organizational performance. These findings suggest that organizations deriving the greatest benefits from Generative AI are those that effectively integrate AI technologies into strategic decision-making processes rather than merely adopting AI tools.

The results also indicate that employee productivity and innovation capability play important mediating roles. Organizations with higher levels of AI adoption tend to experience improvements in employee productivity, faster decision-making processes, and increased innovation output, ultimately contributing to superior business performance.

### Discussion of Findings

The findings provide strong empirical evidence supporting the strategic value of Generative AI in modern organizations. The superior performance of ensemble learning models, particularly Gradient Boosting Regression, suggests that organizational performance is influenced by complex and interconnected factors that cannot be fully captured through traditional analytical approaches.

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The results align with contemporary management theories emphasizing the importance of data-driven decision-making and digital transformation. Organizations that invest in AI technologies and develop capabilities for AI-assisted strategic planning are more likely to achieve higher levels of operational efficiency, innovation, and competitive advantage.

Furthermore, the high importance assigned to strategic decision effectiveness confirms that Generative AI serves not only as a technological tool but also as a strategic asset that enhances managerial decision quality. The findings indicate that organizations leveraging AI-generated insights can make faster, more informed, and more accurate decisions compared to those relying solely on conventional approaches.

### **Implementation in U.S. Industry**

The results of this study have significant implications for organizations across the United States. The Gradient Boosting model can be integrated into enterprise decision-support systems to provide real-time predictions regarding organizational performance outcomes. Businesses can utilize such predictive systems to evaluate the potential impact of AI investments before implementation and identify strategic initiatives most likely to improve performance.

In the technology sector, organizations can use the model to optimize AI deployment strategies and enhance innovation management. Technology firms can continuously monitor AI adoption metrics and predict future productivity gains, enabling more effective resource allocation and investment planning.

In the healthcare industry, predictive analytics systems based on Gradient Boosting can assist healthcare administrators in evaluating the effectiveness of AI-powered diagnostic tools, patient management systems, and operational workflows. This can lead to improved patient outcomes and more efficient healthcare delivery.

Within the financial services sector, organizations can utilize the model to assess the impact of Generative AI on risk management, customer service, and operational efficiency. Predictive insights generated by the model can support strategic planning and improve decision quality in highly competitive markets.

Retail organizations can apply the model to optimize customer engagement strategies, inventory management, and demand forecasting. By combining Generative AI with predictive analytics, retailers can improve operational performance while delivering more personalized customer experiences.

Moreover, the model can be incorporated into business intelligence platforms such as Microsoft Power BI, Tableau, and enterprise AI systems to provide executives with actionable insights. Managers can use these predictions to identify performance risks, evaluate strategic alternatives, and make evidence-based decisions.

Overall, the results demonstrate that machine learning models provide valuable tools for assessing the impact of Generative AI on organizational performance. Among all evaluated models, Gradient Boosting Regression exhibits the highest predictive accuracy and explanatory power, making it the most suitable model for strategic decision-support applications. The findings further reveal that AI adoption, strategic decision effectiveness, and innovation capability are critical drivers of organizational success.

These results suggest that U.S. businesses can achieve significant competitive advantages by integrating Generative AI into strategic decision-making processes and leveraging advanced predictive analytics models to support managerial decisions. The adoption of such technologies has the potential to transform organizational performance, enhance operational efficiency, and strengthen long-term business sustainability.

## **C**onclusion

This study examined the impact of Generative Artificial Intelligence (Generative AI) on strategic decision-making and organizational performance within U.S. businesses through the application of advanced machine learning techniques. As organizations increasingly operate in data-intensive and highly competitive environments, the ability to leverage AI-driven insights for strategic decision-making has become a critical factor influencing organizational success. The primary objective of this research was to evaluate the relationship between Generative AI adoption, decision-making effectiveness, and overall organizational performance while identifying the machine learning model that provides the most reliable predictive capability.

The empirical findings provide strong evidence that Generative AI contributes positively to organizational performance by enhancing strategic decision-making processes. The results indicate that organizations with higher levels of AI adoption tend to achieve greater operational efficiency, improved employee productivity, enhanced innovation capability, and superior business outcomes. These findings support the growing body of literature suggesting that AI technologies are no longer merely operational tools but have evolved into strategic assets that influence long-term organizational competitiveness and sustainability.

A comparative analysis of machine learning models revealed significant differences in predictive performance. While Linear Regression and Decision Tree Regression provided useful baseline insights, their predictive capabilities were comparatively lower than those of ensemble learning methods. Random Forest Regression demonstrated strong predictive accuracy and robustness, highlighting its ability to capture complex relationships within organizational data. However, Gradient Boosting Regression emerged as the best-performing model, achieving the highest coefficient of determination and the lowest prediction errors across all evaluation metrics. The superior performance of Gradient Boosting indicates its effectiveness in identifying intricate interactions among AI adoption, strategic decision-making variables, and organizational performance outcomes.

The feature importance analysis further revealed that AI Adoption Level, Strategic Decision Effectiveness, AI Investment, Employee Productivity, and Innovation Rate are among the most influential factors affecting organizational performance. These findings suggest that the value of Generative AI extends beyond technological implementation alone. Organizations derive the greatest benefits when AI technologies are integrated into strategic planning processes, managerial decision-making frameworks, and innovation initiatives. The results demonstrate that the successful utilization of Generative AI requires a combination of technological investment, organizational readiness, and effective leadership support.

From a managerial perspective, the findings offer important implications for business leaders and decision-makers across U.S. industries. Organizations can leverage predictive analytics and machine learning models to evaluate the potential outcomes of AI investments, identify performance improvement opportunities, and develop data-driven strategic initiatives. The implementation of AI-powered decision-support systems can enable managers to make more informed, timely, and accurate decisions while reducing uncertainty in complex business environments. Industries such as technology, healthcare, finance, manufacturing, and retail can particularly benefit from integrating Generative AI into their operational and strategic processes.

This study also contributes to the academic literature by providing empirical evidence regarding the strategic role of Generative AI in modern organizations. While previous studies have primarily focused on the technical capabilities of AI systems, this research highlights the broader organizational implications of AI adoption and demonstrates how machine learning techniques can be used to evaluate and predict business performance outcomes. The findings reinforce the argument that AI-driven decision-making represents a significant advancement in contemporary management practices.

Despite its contributions, this study has certain limitations. The analysis relies on a single dataset and focuses primarily on organizational performance indicators within the context of U.S. businesses. Future research may expand the scope by incorporating larger and more diverse datasets, examining industry-specific applications of Generative AI, and exploring longitudinal effects of AI adoption over time. Additionally, future studies may investigate the integration of deep learning techniques, large language models, and explainable artificial intelligence frameworks to further enhance predictive performance and managerial interpretability.

In conclusion, this study demonstrates that Generative AI has the potential to fundamentally transform strategic decision-making and organizational performance. The results confirm that organizations adopting AI-driven decision-support systems can achieve substantial improvements in efficiency, innovation, productivity, and competitive advantage. Among the evaluated models, Gradient Boosting Regression emerged as the most effective predictive tool, providing highly accurate insights into organizational performance outcomes. As Generative AI continues to evolve and become more deeply embedded within business operations, organizations that effectively integrate AI into their strategic decision-making processes will be better positioned to navigate uncertainty, capitalize on emerging opportunities, and achieve sustained success in the digital economy.

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