International Journal of Advanced Research in Engineering Technology & Science ISSN: 2349-2819
Impact Factor: 7.10
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Email: editor@ijarets.org Volume-11, Issue-9 September – 2024 www.ijarets.org

ARTIFICIAL INTELLIGENCE DRIVEN AUTOMATION OF DATA ANALYSIS FOR ENHANCED DECISION MAKING AND PREDICTIVE INSIGHTS

M. Chandrika
Research Scholar
Sabarmati University, Ahmedabad, Gujarat

Dr. Sushma Rani
Associate Professor, Department of Computer Science
Sabarmati University, Ahmedabad, Gujarat

ABSTRACT

Artificial Intelligence (AI) has turned out to be a strong technology for automating data analysis and enhancing organizational choices. Business data is expanding and the complexity has grown, which in turn has made the need for intelligent analytical systems more pressing and urgent, as they produce timely and accurate insights. This research explores how AI-driven data analysis automation can enhance the effectiveness of decision-making, provide predictive insights, improve operational efficiency, and positively influence business performance. A total of 150 decision-makers and professionals were chosen for the study, and data was collected using a structured questionnaire. The research style employed was quantitative descriptive. The descriptive statistics, correlation, regression, and analysis of variance (ANOVA) performed by SPSS were applied to the data. The results demonstrated that analytical systems powered by AI significantly improved data interpretation and analytical efficiency. A correlation analysis between AI automation and decision-making efficacy showed a strong positive relationship ($r = 0.781$), and regression analysis revealed that AI was a significant predictor of predictive insights ($R^2 = 0.646$). Automation with AI improves organizational performance through its ability to provide better data quality for decisions, predictions, and operational efficiency, thus providing a valuable tool for data-driven business growth, according to the study.

Keywords: *Artificial Intelligence, Data Analysis Automation, Decision-Making, Predictive Analytics, Business Intelligence, Organizational Performance, Machine Learning.*

1. INTRODUCTION

Organizations have witnessed huge growth in the volume and complexity of data generated by them, due to the speed of digital technologies. While the traditional data analysis methods find difficulties in efficiently processing big data, they cause problems to the timely and accurate decision making. The need for sophisticated analytical solutions has been rising as data becomes more important to organizations and they are turning to it as a key tool in their strategy. AI has proven to be an extremely powerful technology that can help to automate data analysis and provide actionable insights from large amounts of data.

Machine learning, AI-powered algorithms, predictive analytics, NLP, and other forms of intelligent processing speed up and improve the accuracy of data analysis. These technologies assist to detect patterns, identify anomalies, forecast trends and aid in strategic decision making within an organization. AI systems have the ability to learn from data unlike traditional methods, and offer real-time insights. This has led businesses to become more and more leveraging on AI analytical tools to boost efficiency and build robust decision-making processes.

AI for data analysis has received a lot of attention in many sectors including finance, healthcare, manufacturing, retail, Information Technology, etc. AI-powered analytics is helping to forecast customer behaviour, analyses market trends and trends, manage risk and optimize business performance for organisations. AI-driven predictive insights help decision-makers proactively and knowledgeably navigate opportunities and obstacles, leading to better management practices.

While AI capabilities are increasingly being adopted, it is still essential to understand how AI affects the effectiveness of decision-making processes and its predictive capabilities. The study explores how the automation of data analysis with AI can improve the decision-making process and provide predictive insights. It provides insight into user perception of the AI analytical systems, their impact on operational efficiency and business performance, and bolsters the evolving body of knowledge around AI-enabled analytics.

2. LITERATURE REVIEW

Duan et al. (2019) examined how AI has affected decision-making throughout the big data era. In order to help businesses make better decisions, our research looked at how AI has evolved and how important it is for analyzing large amounts of data. The research found that businesses were able to speed up and improve

the quality of their analytical processes by using AI to make decisions and extract useful information from large databases.

Niu et al. (2021) analyzed the effect of organizational business intelligence on decision making with the aid of big data analytics. Their results revealed that through predictive analytics and intelligent data processing, there were marked improvements in the performance of organizations due to effective decision making. It was shown that with the use of advanced analytics and AI business intelligence systems, there was increased performance because managers could make sense of trends and streamline processes within their organization.

Schmitt (2023) examined the use of automated machine learning for business analytics and its role in AI-assisted decision making. It was found that through automation, machine learning became less complex to handle, yet offered more accurate predictions. The author pointed out that companies relying on automated AI systems improved their ability to analyze information and extract useful information. Automated machine learning has proven to be an effective tool for evidence-based business decision making.

Das et al. (2024) investigated the importance of modern business intelligence techniques boosted by AI and analytics. It was revealed that AI-assisted business intelligence solutions enhanced the capabilities of organizations to interpret the data, conduct predictive modeling, and make strategic decisions. According to the authors, the application of AI solutions made it possible for organizations to conduct real-time analysis of their operations and get new insights into customer behaviors and market dynamics. In today's business world, analytics powered by AI have become a key component in driving innovation and gaining a competitive edge.

3. RESEARCH METHODOLOGY

A research methodology is an organized way to conduct the research and achieve the credibility of the results. It defines the ways of collecting, analyzing, and interpreting the data. For this research, a quantitative methodology has been chosen, as it allows looking into the influence of the use of AI-based tools on the efficiency and predictiveness of decisions. The research methodology was aimed at collecting data from professionals who used AI-based data analysis tools.

3.1 Research Design

AI role in automating data analysis procedures and its effects on organisational decision-making and prediction-making are the foci of this quantitative descriptive research study. The objective of the study is to explore what people think about the efficiency, effectiveness, and predictive power of data analysis through AI technology. Finding correlations between variables is the goal of quantitative research, which use numerical data and statistical methods.

3.2 Population and Sample Size

Anyone working in an organization that makes use of AI-driven analysis—managers, business analysts, data scientists, and information technology specialists—are the intended participants in this study. Convenience sampling method has been adopted to select the number of respondents (n = 150) based on its availability and feasibility. Participants were chosen from diverse sectors such as Information Technology, Finance, Health Care, Retail, and Manufacturing.

3.3 Data Collection Method

A structured questionnaire based on information gathered from the AI literature served as the principal data collector, business intelligence, predictive analysis, and decision support systems. The questionnaire comprised two sections:

- **Section A:** Information about demographics (age, gender, occupation, industry, years of experience).
- **Section B:** Measuring statements related to the perceptions of the survey respondents on AI -based data analysis, decision effectiveness, predictive abilities, operational efficiency, and organizational performance.

A five-point Likert scale was used to capture the respondents' levels of agreement. On this scale, 1 was very disagree and 5 was very agree.

3.4 Variables of the Study

To find out how AI-driven data analysis automation affects organisational performance, the experiment will include a number of dependent variables and an independent variable.

- **Independent Variable:** The independent variable under consideration is AI-Driven Automation of Data Analysis, defined by the application of AI technology for the automation of data analysis. This is because it will determine the decisions taken within an organization and performance in analysis.
- **Dependent Variables:** Dependent Variables include Decision-Making Effectiveness, Accuracy of Predictive Insights, Efficiency and Business Performance Improvement. The above variables are among the most important outputs that are expected after adopting AI technology and they will be used to measure the performance of the process of AI driven data analysis.

3.5 Data Analysis Techniques

Statistical Package for the Social Sciences (SPSS) was used for data analysis, which included coding, tabulating, and presentation. For this study, we consulted the following statistical tools:

Table 1: Data Analysis Framework and Statistical Tools Used in the Study

Objective	**Statistical Tool**
Analyze demographic profile of respondents	Frequency and Percentage Analysis
Assess perceptions toward AI-driven data analysis	Mean and Standard Deviation
Analyze how AI automation affects decision making	Correlation Analysis
Analyze the correlation between using AI and getting accurate predictions	Regression Analysis
Test overall research hypotheses	ANOVA and Regression Testing

3.6 Reliability and Validity

The dependability of the study instrument was validated using Cronbach's Alpha. Internal consistency was measured using a dependability index of 0.70 or higher. The content validity of the research instrument was determined through the use of expert review of the questionnaire prepared by academicians and practitioners with expertise in AI and data analytics. In addition to that, the questionnaire questions were based on theoretical concepts and empirical evidences in order to increase accuracy in measuring the research variables.

4. RESULTS AND DISCUSSION

This section deals with the interpretation and analysis of data pertaining to the usage of AI technology in data analysis that was collected from 150 respondents. The data is examined by considering how the respondents perceive AI's impact on decision making, prediction, and performance. The SPSS software has been utilised for statistical analysis, including descriptive statistics, correlation, and regression.

Table 2 displays the demographic profile of the participants. As you can see from Figure 1, the responder sample population is graphically represented by gender, age group, and industry categories.

Table 2: Demographic Characteristics of Respondents

Demographic Variable	**Category**	**Frequency**	**Percentage (%)**
Gender	M	92	61.3
	F	58	38.7
Age	21–30 Years	48	32.0
	31–40 Years	56	37.3
	41–50 Years	31	20.7
	Above 50 Years	15	10.0
Industry	IT	52	34.7
	Finance	33	22.0
	Healthcare	25	16.7
	Retail	21	14.0
	Manufacturing	19	12.6

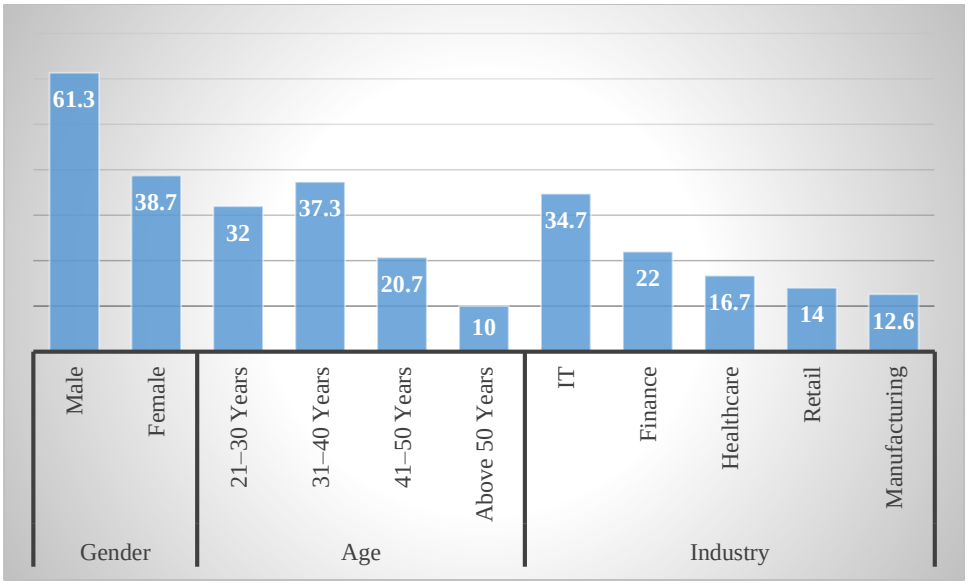

Figure 1: Visual Representation of Demographic Characteristics of Respondents

As evident from Table 2 and Figure 1, most respondents were males, comprising 61.3%, whereas 38.7% were females. Respondents aged between 31–40 years constituted 37.3%. The IT sector was the leading sector among respondents, representing 34.7%. Therefore, higher adoption rates of AI could be expected in organizations that fall in the IT sector category. Figure 1 also confirms the predominance of IT sector respondents and the 31–40 years age bracket.

Table 3 and Figure 2 show the graphical representation of the respondents' views on the effects of AI-enabled data analytics on several analytical domains.

Table 3: Descriptive Statistics of AI-Driven Data Analysis Variables

Statement	Mean	Standard Deviation
AI reduces the time required for data analysis	4.36	0.68
AI improves the accuracy of data interpretation	4.28	0.72
AI helps identify hidden patterns in data	4.31	0.65
AI supports real-time decision making	4.22	0.74
AI enhances overall analytical efficiency	4.40	0.61

Overall Mean	**4.31**	**0.68**

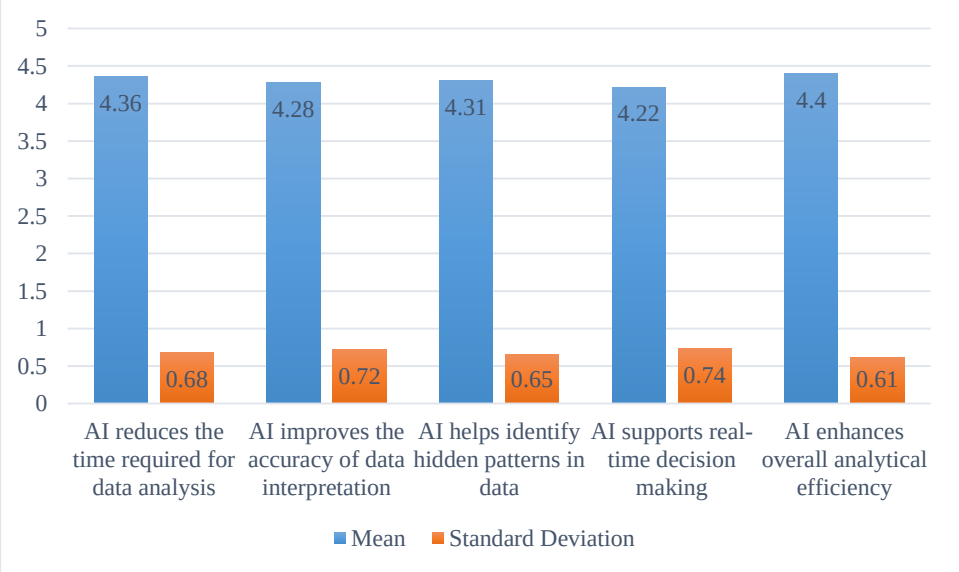

Figure 2: Visual Representation of Descriptive Statistics of AI-Driven Data Analysis Variables

Results from Table 3 and Figure 2 indicate that respondents generally believe that AI-driven automation is beneficial when it comes to data analysis, with an overall mean score of 4.31. The highest mean value was found for analytical efficiency enhancement (4.40), indicating that AI can have a profound impact on productivity and streamline analytical workflows. The consistently high mean scores across all variables further demonstrate that respondents have a positive attitude on the use of AI for analytical capabilities, as shown in the graphical representation in Figure 2.

Table 4 displays the findings of a correlation analysis that was performed to investigate the relationship between AI automation and the efficacy of decision-making.

Table 4: Correlation Analysis Between AI Automation and Decision-Making Effectiveness

Variables	AI Automation	Decision-Making Effectiveness
AI Automation	1	0.781**
Decision-Making Effectiveness	0.781**	1

Note: Correlation is significant at the 0.01 level.

The utilization of AI-driven automation is closely related to successful decision-making, as indicated by the r = 0.781. The discovery indicates that companies that are using analytical tools powered by AI are better equipped to make informed, timely and accurate decisions.

To investigate the connection between AI-powered automation and foresightful insights, regression analysis was employed. Table 5 gives information about the strength of the regression model as well as its explanatory power.

Table 5: Model Summary for Regression Analysis

Model Summary	**Value**
R	0.804
R^2	0.646
Adjusted R^2	0.641
Standard Error	0.432

Table 5 shows that the association between AI-driven automation and predictive insights is robust, with an R-value of 0.804. Automation of data analysis led by AI accounts for approximately 64.6% of the variance in data analysis insights, according to the coefficient of determination ($R^2 = 0.646$). In addition to the tiny standard error of 0.432 and the strong modified R^2 value of 0.641, the model appears to be an excellent fit for the data. The results indicated that AI analytical systems are crucial to support predictive systems in organizations.

To determine if the regression model was statistically significant as a whole, an ANOVA was employed. To find out if the regression model provides a statistically significant explanation for the relationship between AI-driven automation and predictive insights, we may look at the test findings in Table 6.

Table 6: ANOVA Results for Regression Model

Source	**Sum of Squares**	**df**	**F-value**	**Sig.**
Regression	51.324	1	137.62	0.000
Residual	28.731	148	–	–

Total	80.055	149	–	–

With a F value of 137.62 and a significance level of 0.000 ($p < 0.001$), the regression model is found to be statistically significant according to the ANOVA results shown in Table 6. What this means is that this model successfully explains the connection between AI-powered automation and predictive insights. The big F-statistic proves that the impact of AI-driven automation on predictive capacities is not insignificant and has a statistically meaningful impact. Thus, the regression model can be deemed appropriate for forecasting the gains in predictive insights from implementing AI.

The respondents were asked to measure several performance indicators to determine the effects of the use of AI-based data analysis on the performance of organizations. Table 7 and the graphical representation in figure 3 show how respondents feel about the role of AI technologies in improving business performance.

Table 7: Respondents' Perception of Business Performance Improvement

Performance Indicator	Mean	SD
Faster Decision Making	4.35	0.69
Increased Operational Efficiency	4.41	0.63
Improved Strategic Planning	4.26	0.71
Better Customer Insights	4.30	0.67
Enhanced Competitive Advantage	4.18	0.75
Overall Mean	**4.30**	**0.69**

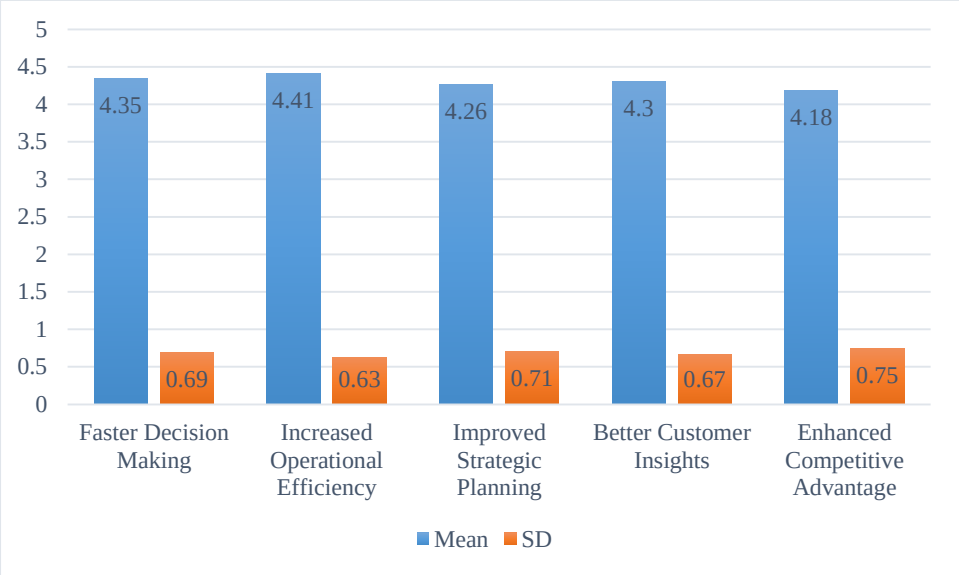

Figure 3: Visual Representation of Respondents' Perception of Business Performance Improvement

Respondents are certain that AI improves business results, as seen in Table 7 and Figure 3. The highest mean score was for increased operational efficiency (4.41), followed by faster decision making (4.35), highlighting the ability of AI-powered analytics to improve workflow efficiency, resource utilization, and organizational productivity. Figure 3's visual portrayal further confirms the favorable influence of AI on business performance by showing a clear trend of high ratings for all performance indicators.

5. CONCLUSION

Organisational decision-making, predictive insights, and overall company performance can be greatly enhanced with AI-powered data analysis automation, according to this study's conclusions. There was a strong consensus among respondents that AI has the potential to improve analytical efficiency, shorten processing times, reveal important patterns, and guide decision-making. Both the correlation and regression analyses verified that AI significantly affects the efficiency of decision-making and the capacity to foretell outcomes. Moreover, respondents recognized the benefits of AI in operational efficiency, strategic decision-making, and gaining a competitive edge. Based on the findings, it is concluded that the implementation of analytical systems powered by AI has proven valuable to the improvement of conventional data analysis procedures to intelligent and data-driven decision support systems, which helps organisations in sustainable business growth and improved performance.

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