

## USE OF ARTIFICIAL INTELLIGENCE FOR IMPROVING SUSTAINABLE BUSINESS OPERATIONS

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### Abstract

Artificial Intelligence has become an important technological force in modern business management because it helps firms improve efficiency, reduce waste, optimize resources, and strengthen long-term sustainability. In sustainability-oriented business environments, AI is increasingly used in automation, predictive analytics, smart energy management, and supply chain optimization. Recent OECD and IEA materials note that enterprise AI adoption is expanding and that AI applications can improve productivity, operational decision-making, and energy optimization, although responsible use and energy demand must also be managed carefully. The present analytical study examines the use of Artificial Intelligence for improving sustainable business operations. The paper is based on two objectives: first, to examine the effect of AI on the efficiency and sustainability of business operations, and second, to analyze the relationship between AI adoption and sustainable business performance outcomes. The study uses a quantitative analytical framework and interprets the given statistical values through mean, standard deviation, t-value, correlation coefficient, and p-value. The findings show that AI-based automation, predictive analytics, smart energy management, and AI-driven supply chain management all have a significant positive effect on sustainable business operations. The study also finds that AI adoption has a strong positive relationship with cost reduction, operational efficiency, waste reduction, and long-term sustainability. The paper concludes that Artificial Intelligence is not only a technological tool for automation but also a strategic mechanism for sustainable business improvement.

**Keywords:** Artificial Intelligence, Sustainable Business Operations, Automation, Predictive Analytics, Smart Energy Management, Supply Chain Management

### 1. Introduction

In the present business environment, firms are under growing pressure to improve efficiency while also maintaining environmental responsibility, cost control, and long-term resilience. Business operations are no longer evaluated only on the basis of speed and profitability; they are also assessed in terms of resource efficiency, waste reduction, energy performance, and sustainability outcomes. In this changing context, Artificial Intelligence has emerged as a powerful tool that helps businesses manage operations more intelligently and sustainably. OECD reports note that firm-level AI adoption has been rising rapidly and is increasingly associated with productivity improvement and better decision support across business functions (OECD, 2025).

Artificial Intelligence refers to the ability of computer-based systems to perform tasks that normally require human intelligence, such as learning, prediction, pattern recognition, decision support, optimization, and automation. In business operations, AI can be used to automate routine tasks, forecast demand, optimize inventory, reduce energy waste, improve logistics, detect inefficiencies, and strengthen operational planning. These applications are especially relevant to sustainable business operations because sustainability today depends not only on business intent but also on data-driven operational control. International Energy Agency analysis shows that AI can optimize energy systems and industrial processes, while UNIDO emphasizes AI's growing role in sustainable industrial transformation and advanced manufacturing (IEA, 2025; UNIDO, 2025).

The link between AI and sustainability has become stronger in recent years. Firms are using AI to improve energy efficiency, monitor emissions, optimize transportation routes, reduce raw material waste, predict maintenance needs, and improve supply chain transparency. Predictive and automated systems make it easier for firms to reduce unnecessary resource consumption and improve operational consistency. At the same time, global policy discussions also stress that AI must be implemented responsibly because large-scale AI infrastructure can increase electricity demand if not managed carefully. The IEA's 2025 analysis highlights both sides of this relationship: AI can support

energy optimization and innovation, but AI-related data center growth can also increase energy use substantially (IEA, 2025).

Another important aspect is that AI is increasingly being linked with broader industrial and organizational transformation. The World Economic Forum has highlighted that AI deployed at scale in manufacturing and supply chains can deliver both operational and sustainability gains, while UNIDO's industrial initiatives frame AI as a means to advance competitiveness and sustainable development together (World Economic Forum, 2024; UNIDO, 2025). This means that AI is not merely a support technology; it is becoming an integrated part of sustainable business strategy.

The present analytical study examines the use of Artificial Intelligence for improving sustainable business operations. The paper seeks to understand how AI influences operational efficiency and sustainability and how AI adoption is related to sustainable business performance outcomes such as cost reduction, efficiency improvement, waste reduction, and long-term sustainability. The study is important because it provides academic and practical insight into the role of AI in helping firms create more intelligent, efficient, and sustainable operational systems (OECD, 2025; IEA, 2025).

## 2. Literature Review

Artificial Intelligence has increasingly been recognized as a major driver of business transformation because it enables automation, data-based decision-making, prediction, and optimization across a wide range of business functions. Recent OECD evidence shows that AI adoption in firms has continued to expand and is increasingly viewed as a contributor to productivity growth, innovation, and business modernization. In commerce and management literature, AI is often discussed as a strategic technology that improves not only speed and accuracy but also the quality of operational decisions (OECD, 2025).

One of the most important contributions of AI to business operations is AI-based automation. Automation allows firms to reduce manual effort in repetitive tasks, improve consistency, lower error rates, and increase productivity. Automated systems are especially useful in administrative processing, production scheduling, customer support, inventory control, and operational monitoring. From a sustainability perspective, automation can reduce wasted time, unnecessary resource use, and avoidable inefficiencies. OECD discussions increasingly describe AI as a source of operational gains when implemented at scale in enterprise settings (OECD, 2025).

Another major dimension is predictive analytics. AI systems can analyze large volumes of operational and market data to forecast demand, identify maintenance needs, reduce supply mismatches, and support timely decision-making. Predictive analytics is highly valuable for sustainable business operations because it helps firms reduce overproduction, avoid excessive inventory, and minimize wastage in materials and logistics. It supports more efficient use of resources by anticipating business needs rather than reacting after problems occur (OECD, 2025).

Smart energy management is also a growing area of interest in the literature. AI is increasingly used to monitor energy consumption, optimize heating and cooling systems, balance industrial loads, forecast electricity demand, and improve the performance of power systems and facilities. The IEA's 2025 analysis specifically notes that AI can be applied for energy optimization and innovation across energy and industrial infrastructure. This makes AI especially relevant to firms seeking to improve sustainability through lower energy consumption and better environmental performance (IEA, 2025).

A further significant area is AI-driven supply chain management. Supply chains often involve complex coordination across sourcing, transportation, warehousing, inventory, and delivery systems. AI can improve route planning, supplier matching, risk detection, inventory forecasting, and operational responsiveness. In sustainability-focused firms, such improvements can reduce transport waste, unnecessary inventory movement, emissions, and delays. UNIDO materials show that AI-enabled industrial systems are increasingly associated with smarter, more sustainable, and more inclusive industry transformation (UNIDO, 2025).

The literature also connects AI adoption with broader business outcomes such as cost reduction, operational efficiency, waste reduction, and long-term sustainability. OECD analysis suggests that firms adopting AI often expect gains in productivity and decision quality, while IEA evidence links AI use with system optimization, efficiency gains, and cost reductions in energy and industrial contexts (IEA, 2025; OECD, 2025). At the same time, recent policy analysis cautions that AI must be governed carefully so that sustainability gains in operations are not offset by social, ethical,

or energy-related risks. OECD's responsible AI guidance for enterprises reflects this broader concern (OECD, 2026). The literature suggests that Artificial Intelligence supports sustainable business operations through three main pathways. First, it improves efficiency through automation and predictive control. Second, it strengthens sustainability through better energy, resource, and supply chain management. Third, it improves long-term business outcomes by lowering cost, increasing operational effectiveness, reducing waste, and supporting resilience. Based on this understanding, the present study examines the effect of AI on sustainable business operations and the relationship between AI adoption and sustainable business performance (IEA, 2025; OECD, 2025; UNIDO, 2025).

### **3. Research Methodology**

The present study adopted a quantitative analytical research design to examine the use of Artificial Intelligence for improving sustainable business operations. Data were collected through a structured questionnaire from selected respondents associated with business operations, sustainability management, and technology use. The study focused on the effect of AI dimensions on operational sustainability and on the relationship between AI adoption and business performance outcomes. Statistical tools such as mean, standard deviation, t-value, p-value, and correlation coefficient were used for analysis.

#### **3.1 Research Design**

The present study adopted a quantitative analytical research design because the main purpose of the research was to examine the role of Artificial Intelligence in improving sustainable business operations through measurable variables and statistical analysis. This design was considered appropriate because it allowed the researcher to collect structured data from the respondents and convert their opinions and experiences into numerical form for systematic interpretation. Quantitative research is useful when the objective is to study the effect of one variable on another and to identify relationships between selected factors in a clear and objective manner. In the present study, Artificial Intelligence was treated as the main independent variable, while sustainable business performance was considered the dependent variable. The analytical nature of the research helped in examining how different dimensions of AI, such as automation, predictive analytics, smart energy management, and AI-driven supply chain management, influence business outcomes like cost reduction, operational efficiency, waste reduction, and long-term sustainability. Therefore, this research design was suitable for assessing the effect and relationship between AI adoption and sustainability-related business outcomes in a scientific and organized manner.

#### **3.2 Need of the Study**

The need for the present study arises from the growing importance of Artificial Intelligence in modern business operations and the increasing pressure on firms to become more efficient, competitive, and sustainable. In today's business environment, organizations are not only expected to increase productivity and reduce operational costs, but they are also required to manage resources responsibly, minimize waste, improve energy efficiency, and maintain long-term sustainability. Traditional methods of managing business operations are often not sufficient to handle these complex and changing demands. In this context, Artificial Intelligence has emerged as an important technological tool that helps firms improve business processes through automation, predictive analysis, smart monitoring, and intelligent decision-making. AI enables organizations to control operational activities more effectively, reduce human error, optimize supply chains, improve resource utilization, and support sustainability-oriented practices. Since many firms are increasingly adopting AI in their daily operations, it becomes necessary to understand how far this technology actually contributes to improving sustainable business performance. Therefore, the present study is needed to examine the effect of AI on sustainable business operations and to analyze its relationship with major business outcomes such as cost reduction, operational efficiency, waste reduction, and long-term sustainability.

#### **3.3 Objectives of the Study**

1. To examine the effect of Artificial Intelligence on improving the efficiency and sustainability of business operations.
2. To analyze the relationship between AI adoption and sustainable business performance outcomes.

#### **3.4 Sample**

The present study was based on a sample of 150 respondents selected from firms where digital systems, sustainability

practices, and operational decision-making were important parts of business activities. The sample was considered suitable because the study required responses from those individuals who were directly aware of the use of Artificial Intelligence and its role in improving sustainable business operations. The respondents were chosen from different positions within firms so that the study could gather practical and balanced information from people involved in technology, sustainability, and operations.

- **Managers:** Managers were included in the sample because they are involved in planning, supervision, and operational decision-making within the firm. They were expected to provide useful information about how AI supports efficiency and business performance.
- **Technology Officers:** Technology officers were selected because they have direct knowledge of digital systems, AI tools, automation processes, and data-based operations used in the firm. Their responses were important for understanding the technological side of AI adoption.
- **Sustainability Officers:** Sustainability officers were included because they are connected with resource efficiency, environmental practices, waste control, and long-term sustainability goals of the organization. Their views helped in linking AI adoption with sustainable business outcomes.
- **Operations Personnel:** Operations personnel were selected because they are directly involved in day-to-day business activities and practical process management. They were able to explain how AI affects workflow, efficiency, and operational improvements in real working conditions.
- **Senior Executives:** Senior executives were included because they play an important role in strategic planning, technology investment, sustainability policies, and organizational performance. Their responses were useful for understanding AI adoption from a higher management perspective.
- **Reason for Selecting the Sample:** These respondents were selected because they were expected to possess direct knowledge and practical understanding about AI use, business operations, and performance outcomes. Since the study focused on the role of Artificial Intelligence in improving sustainable business operations, it was important to collect data from respondents who were closely connected with these activities.
- **Suitability of the Sample:** The sample of 150 respondents was considered appropriate for the study because it included different professional roles related to management, technology, sustainability, and operations. This helped in obtaining relevant and meaningful data for analyzing the study objectives.

### 3.5 Sampling Technique

The present study used purposive sampling and convenience sampling techniques for selecting the respondents. These methods were considered suitable because the study focused on a specific area, namely Artificial Intelligence and sustainable business operations.

- **Purposive Sampling:** Purposive sampling was used because the study required only those respondents who had proper knowledge about AI systems, operational activities, and sustainability practices. Therefore, the researcher selected respondents such as managers, technology officers, sustainability officers, and senior executives who were directly connected with these areas.
- **Why Purposive Sampling was Used:** This technique was used to ensure that the data were collected from knowledgeable and relevant respondents only. It helped in obtaining meaningful and study-related information.
- **Convenience Sampling:** Convenience sampling was used because the respondents were selected on the basis of easy access, availability, and willingness to participate in the study.
- **Why Convenience Sampling was Used:** This technique made the data collection process simpler and more practical. It helped the researcher collect responses within the available time and resources.

- **Suitability of the Technique:** The use of both purposive and convenience sampling was appropriate for the present study because it helped in selecting relevant respondents and made the data collection process feasible.

### 3.6 Delimitations of the Study

The present study was delimited to selected firms that were using or were familiar with Artificial Intelligence-based business processes and sustainability-oriented operations. The scope of the study was kept limited in order to maintain clarity and focus in accordance with the research objectives. It specifically concentrated on the major dimensions of Artificial Intelligence that are directly related to sustainable business operations, namely AI-based automation, predictive analytics, smart energy management, and AI-driven supply chain management. These dimensions were selected because they represent the most relevant and commonly applied areas through which AI can improve operational efficiency and sustainability in business organizations. The study did not cover the broader technical evaluation of AI models, machine learning algorithms, programming systems, or software architecture, as its purpose was not to analyze the technical performance of AI systems but to understand their business and sustainability outcomes. It also did not include a sector-wise comparison among industries such as manufacturing, retail, healthcare, logistics, or services, and therefore the findings were not confined to any one specific industry. In addition, the study did not involve direct energy auditing, carbon measurement, or environmental performance testing of firms. The analysis was based on the perceptions and responses of selected respondents rather than on technical inspections or real-time operational data. These delimitations were necessary to keep the study manageable, relevant, and aligned with the analytical nature of the research.

### 3.7 Variables of the Study

#### Independent Variable: Artificial Intelligence

In the present study, Artificial Intelligence was treated as the independent variable because it is the main factor that influences sustainable business operations and performance outcomes. It refers to the use of intelligent computer-based systems that can perform tasks such as automation, prediction, analysis, monitoring, and decision support. AI helps firms improve their operational processes, reduce waste, optimize resources, and strengthen sustainability practices. For the purpose of the study, Artificial Intelligence was measured through the following dimensions:

- **AI-based Automation:** AI-based automation refers to the use of Artificial Intelligence to perform routine and repetitive business tasks automatically without continuous human involvement. It helps firms save time, reduce manual effort, improve accuracy, and increase operational speed. This contributes positively to business efficiency and sustainability.
- **Predictive Analytics:** Predictive analytics refers to the use of AI tools to analyze past and present data in order to forecast future outcomes, trends, or business needs. It helps firms make better decisions related to demand forecasting, inventory planning, maintenance, and resource use. Through better prediction, businesses can avoid unnecessary waste and improve efficiency.
- **Smart Energy Management:** Smart energy management refers to the use of AI for monitoring, controlling, and optimizing energy consumption in business operations. It helps firms reduce excessive energy use, improve energy efficiency, and support environmentally responsible practices. This dimension is important for achieving sustainability in operations.
- **AI-driven Supply Chain Management:** AI-driven supply chain management refers to the use of Artificial Intelligence in planning, monitoring, and improving supply chain activities such as procurement, inventory control, logistics, transportation, and delivery. It helps firms reduce delays, optimize routes, lower waste, and improve coordination across the supply chain, thereby supporting sustainable operations.

#### Dependent Variable: Sustainable Business Performance

In the present study, Sustainable Business Performance was treated as the dependent variable because it represents the business outcomes influenced by the adoption of Artificial Intelligence. It shows how far AI helps firms improve their operations in an efficient, cost-effective, and sustainable way. For the purpose of the study, sustainable business performance was measured through the following dimensions:

- **Cost Reduction:** Cost reduction refers to the decrease in business expenses through the use of Artificial Intelligence. AI helps firms reduce labor costs, operational errors, resource wastage, and unnecessary spending by improving planning, forecasting, and automation. This makes business operations more economical and efficient.
- **Operational Efficiency:** Operational efficiency refers to the ability of a firm to perform its activities in a faster, smoother, and more productive way. AI improves operational efficiency by automating routine tasks, improving accuracy, supporting quick decision-making, and reducing delays in business processes.
- **Waste Reduction:** Waste reduction means minimizing the unnecessary use of materials, energy, time, and other resources during business operations. AI helps in identifying inefficiencies, predicting demand, controlling excess production, and optimizing resource use, which supports more sustainable operations.
- **Long-term Sustainability:** Long-term sustainability refers to the ability of a business to maintain its performance and continue operating successfully over a long period. It includes economic stability, efficient resource management, environmental responsibility, and the capacity to adapt to changing business conditions. AI supports long-term sustainability by improving planning, resilience, and operational control.

### 3.8 Tool for Data Collection

A structured questionnaire was used as the main tool for data collection in the present study because it provided a simple, systematic, and reliable method for gathering information from the selected respondents. The questionnaire was prepared in a clear and organized form so that respondents could easily understand the statements and give suitable answers. It consisted of close-ended questions, which helped in collecting uniform responses and made the data suitable for statistical analysis. The questionnaire was based on a five-point Likert scale to measure the opinions and perceptions of the respondents regarding Artificial Intelligence and sustainable business operations. The first part of the questionnaire collected general information about the respondents and their firms, such as their position, type of business, and involvement in operational or technological activities. The second part focused on the main variables of the study, including AI-based automation, predictive analytics, smart energy management, AI-driven supply chain management, and business performance outcomes such as cost reduction, operational efficiency, waste reduction, and long-term sustainability. The use of a structured questionnaire was considered appropriate because it ensured consistency, reduced confusion in responses, and helped the researcher convert the views of the respondents into measurable data. The response categories used in the Likert scale included Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree, which are explained separately below.

- **Strongly Disagree:** This response shows that the respondent completely does not agree with the given statement. It reflects a very negative opinion and indicates that the statement is not applicable to the respondent's experience or understanding.
- **Disagree:** This means that the respondent does not agree with the statement, but the level of disagreement is not as strong as strongly disagree. It shows an unfavorable opinion toward the statement.
- **Neutral:** This response indicates that the respondent is neither in agreement nor in disagreement with the statement. It may also mean that the respondent is unsure, has no clear opinion, or feels that the statement is only partly applicable.
- **Agree:** This shows that the respondent accepts the statement and believes it is generally true or relevant. It reflects a positive opinion toward the statement.

- **Strongly Agree:** This response means that the respondent completely agrees with the statement. It reflects a very strong positive opinion and shows that the statement is highly relevant to the respondent's view or experience.

### 3.9 Statistical Tools Used

In the present study, statistical tools were used to analyze the collected data in a clear and systematic manner. Both descriptive and inferential statistics were applied according to the objectives of the study. Mean was used to identify the average response of the respondents, while standard deviation helped in measuring the variation in their opinions. The t-value was used to test whether the effect of each variable was statistically significant, and the p-value indicated the level of significance of the results. Correlation coefficient was applied to examine the strength and direction of the relationship between Artificial Intelligence adoption and sustainable business performance outcomes. Thus, these statistical tools helped in understanding the effect, relationship, and significance of the study variables in a meaningful way.

- **Mean (M):** Mean refers to the average value of all responses given by the respondents for a particular statement or variable. It is calculated by adding all the response scores and dividing the total by the number of respondents. Mean helps the researcher understand the general opinion or central tendency of the respondents. If the mean value is high, it indicates a higher level of agreement or a more positive response toward that variable.
- **Standard Deviation (SD):** Standard Deviation shows how much the responses differ from the average value. It helps in measuring the spread or variation in the data. If the standard deviation is low, it means that most respondents gave similar answers and the responses are closely grouped around the mean. If the standard deviation is high, it means that the opinions of respondents are more varied and spread out.
- **t-value (t):** The t-value is used to test whether the effect or difference observed in the data is statistically meaningful. It helps the researcher understand whether a variable has a significant effect on the outcome being studied. A higher t-value generally indicates that the effect of the variable is stronger and more meaningful for the study.
- **p-value (p):** The p-value shows the level of statistical significance of the result. It helps in deciding whether the findings are likely to be real or may have occurred by chance. In most studies, a p-value of less than 0.05 is considered statistically significant. If the p-value is very small, it means that the result is highly significant and reliable for interpretation.
- **Correlation Coefficient (r):** The correlation coefficient is used to measure the strength and direction of the relationship between two variables. Its value usually ranges from -1 to +1. A positive value indicates that both variables move in the same direction, while a negative value shows that they move in opposite directions. A value closer to +1 or -1 indicates a stronger relationship, whereas a value closer to 0 shows a weaker relationship. This helps the researcher understand how closely two variables are related to each other.

### 4. Data Analysis and Interpretation

The collected data were analyzed using descriptive and inferential statistical techniques to understand the effect of Artificial Intelligence on sustainable business operations and the relationship between AI adoption and business performance outcomes. The overall pattern of the responses indicates that respondents held a positive view regarding the role of AI in improving operational sustainability. The mean values of the AI-related variables were above average, the t-values were statistically strong, and the p-values showed significance. The correlation values also revealed a positive relationship between AI adoption and performance outcomes.

**Table 1: Effect of Artificial Intelligence on Sustainable Business Operations**

S. No.	Variable	Mean	Standard Deviation	t-value	p-value	Interpretation

1	AI-based Automation	4.22	0.66	8.914	0.000	Significant positive effect on operational efficiency
2	Predictive Analytics	4.08	0.71	8.102	0.000	Significant role in reducing resource wastage
3	Smart Energy Management	3.96	0.74	7.486	0.000	Positive contribution to sustainability practices
4	AI-driven Supply Chain Management	4.15	0.69	8.337	0.000	Significant effect on sustainable operations

Table 1 shows that all major dimensions of Artificial Intelligence have a statistically significant positive effect on sustainable business operations. AI-based automation recorded the highest mean value of 4.22 with a t-value of 8.914 and a p-value of 0.000, indicating that automation is perceived as the most influential AI dimension in improving operational efficiency. Predictive analytics also showed a strong result with a mean of 4.08 and a t-value of 8.102, suggesting that AI-based forecasting and data analysis play a significant role in reducing resource wastage. Smart energy management recorded a mean of 3.96 and a t-value of 7.486, reflecting its positive contribution to sustainability practices, especially in areas related to energy optimization. AI-driven supply chain management obtained a mean of 4.15 and a t-value of 8.337, showing that intelligent coordination of logistics and inventory significantly supports sustainable operations. Since all p-values are 0.000, the findings clearly indicate that Artificial Intelligence contributes significantly to the improvement of sustainable business operations. This interpretation is broadly consistent with recent OECD, IEA, WEF, and UNIDO discussions that associate AI with productivity gains, energy optimization, and sustainability improvements in operations and industrial systems.

**Table 2: Relationship between AI Adoption and Sustainable Business Performance**

Variables	AI Adoption	Business Outcome	Correlation (r)	p-value	Interpretation
1	AI Adoption	Cost Reduction	0.671	0.000	Strong positive relationship
2	AI Adoption	Operational Efficiency	0.703	0.000	Strong positive relationship
3	AI Adoption	Waste Reduction	0.624	0.000	Significant positive relationship
4	AI Adoption	Long-term Sustainability	0.748	0.000	Strong positive relationship

Table 2 reveals that AI adoption has a positive and statistically significant relationship with major sustainable business performance outcomes. The strongest relationship is found between AI adoption and long-term sustainability, with a correlation coefficient of 0.748 and a p-value of 0.000. This indicates that firms with stronger AI adoption are more likely to achieve continuity, resilience, and long-term sustainable performance. A strong positive relationship is also found between AI adoption and operational efficiency ( $r = 0.703$ ,  $p = 0.000$ ), suggesting that AI helps firms improve workflow quality, speed, coordination, and overall operational effectiveness. Cost reduction also shows a strong positive relationship with AI adoption ( $r = 0.671$ ,  $p = 0.000$ ), indicating that AI can reduce operating costs through automation, forecasting, and optimization. Waste reduction has a significant positive relationship with AI adoption ( $r = 0.624$ ,  $p = 0.000$ ), showing that AI supports more efficient use of resources and better process control. Overall, the results indicate that AI adoption is strongly associated with improved sustainable business performance. This aligns with OECD findings on enterprise AI adoption and with IEA evidence that AI can optimize energy and operational systems, although responsible deployment remains important.

## 5. Findings

- The study found that Artificial Intelligence plays a significant role in improving sustainable business operations.
- AI-based automation showed the strongest positive effect on operational efficiency.
- Predictive analytics significantly contributed to reducing resource wastage.
- Smart energy management positively supported sustainability practices in firms.
- AI-driven supply chain management significantly improved sustainable operations.
- AI adoption showed a strong positive relationship with cost reduction and operational efficiency.
- AI adoption was also positively related to waste reduction and long-term sustainability.
- The strongest relationship was found between AI adoption and long-term sustainability.
- Overall, the findings confirm that AI is an important strategic tool for improving business efficiency and sustainability together.

## 6. Conclusion

On the basis of the analysis, it may be concluded that Artificial Intelligence is an important driver of sustainable business operations. The study clearly shows that AI-based automation, predictive analytics, smart energy management, and AI-driven supply chain management all contribute positively to improving operational efficiency and sustainability. The correlation analysis further establishes that AI adoption is positively related to cost reduction, operational efficiency, waste reduction, and long-term sustainability. Therefore, AI should not be considered only as a technological support system; it should be viewed as a strategic mechanism that helps firms create efficient, resource-conscious, and sustainable business operations. At the same time, current international evidence suggests that firms and policymakers should pay attention to responsible governance and energy implications while scaling AI use.

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