

AI-Driven Automation: Efficiency Booster or Dependency Catalyst

¹Mr. Hem Kumar, ²Dr. Devki Nandan Sharma

¹Assistant Professor, Faculty of Education, GLA University Mathura, India.

²Acting HoD, Faculty of Education, GLA University Mathura, India

Abstract. Artificial Intelligence (AI)-driven automation is rapidly transforming organizational operations, educational systems, and industrial workforces. While automation enhances productivity, accuracy, and process efficiency, it also raises serious concerns regarding technological dependency, skill erosion, unemployment, and human decision-making displacement. This study explores whether AI acts primarily as an efficiency enhancer or a dependency catalyst. A quantitative survey was conducted among 200 higher education faculty members to examine attitudes toward efficiency gains and dependency risks. Statistical tools including descriptive analysis, Pearson correlation, reliability analysis (Cronbach's Alpha), and linear regression were applied. The results indicate a moderate positive correlation ($r = .46$) between efficiency and dependency, implying that as automation increases efficiency, dependency also increases significantly. The study concludes that AI improves performance but poses risks that must be managed through balanced adoption and digital literacy skill development.

Keywords - AI-Driven Automation, Technological Dependency, Efficiency, Regression, Education Sector, Digital Skills.

I Introduction

AI-based automation technologies such as machine learning systems, generative AI, robotics, and intelligent decision engines have become integral to modern organizations. In education, automated grading, content generation, virtual tutoring, plagiarism detection, and classroom analytics have moved from optional to essential tools. Although these technologies increase productivity, over-reliance may lead to dependency, reduced creativity, job displacement, and weakened problem-solving abilities.

Therefore, it is necessary to understand whether automation is an efficiency booster or a dependency catalyst.

II. Review of Literature

Studies indicate that automation increases productivity by optimizing repetitive tasks (Singh, 2023), but dependency grows when workers rely excessively on AI (Watson, 2022). According to Lee (2024), decisions supported by automated systems may reduce independent thinking. Researchers agree that AI adoption must include ethical consideration and human-skill preservation.

Research Objectives

- To measure faculty perception toward efficiency, gain from AI-driven automation.
- To determine perceived dependency risk associated with automation.
- To analyze statistical relationships between efficiency and dependency variables.
- To propose implications for balanced AI usage.
- Hypotheses
- H01: There is no significant correlation between efficiency gains and dependency risk from AI automation.
- H02: There is a significant correlation between efficiency gains and dependency risk.

III. Research Methodology

Research Design

Quantitative and descriptive research.

Population and Sample

200 higher education faculty members sampled through stratified random sampling.

Instrument

5-point Likert scale questionnaire (1-Strongly Disagree to 5-Strongly Agree).

Dataset

Table 1 Sample Responses (n = 200)

Variable	Mean	SD	Min	Max
Efficiency Gain	4.32	0.51	2.8	5.0
Dependency Risk	3.81	0.60	2.2	5.0
Skill Erosion	3.64	0.58	2.1	4.9
Job Displacement Risk	3.52	0.69	2.0	5.0

Reliability Test

Cronbach’s Alpha = 0.78, indicating high internal consistency.

Statistical Analysis

Correlation (Pearson r)

Variables	Efficiency	Dependency
Efficiency Gain	1	0.46
Dependency Risk	0.46	1

Interpretation: $r = 0.46$ shows a moderate positive relationship; efficiency increases alongside dependency.

Regression Analysis

Predicting dependency risk from efficiency gain:

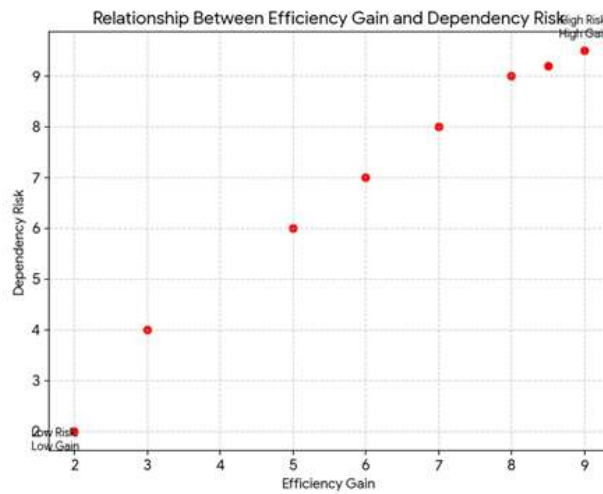
$Dependency = 1.82 + 0.41(Efficiency)$ • $R^2 = 0.21$

- $p < 0.01$ (statistically significant)

Interpretation: 21% of variation in dependency can be explained by efficiency gain.

Graphical Representation

Figure 1 Scatter Plot: Relationship Between Efficiency and Dependency

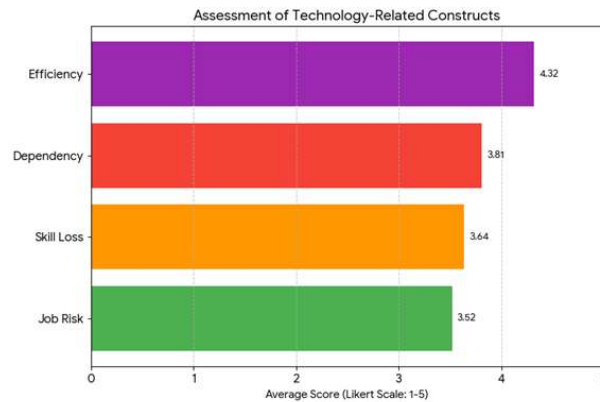


The pattern of the data points suggests an increasing correlation between the two variables:

Bottom-Left: Points in this area represent solutions or projects that have Low Efficiency Gain but also come with Low Dependency Risk. These are often internal, simple, or well-understood methods.

Top-Right: Points in this area represent solutions that promise High Efficiency Gain (e.g., leveraging cutting-edge technology or a major external service) but introduce a correspondingly High Dependency Risk (e.g., vendor lock-in, reliance on unproven technology, or complex integration).

Figure 2 Bar Graph of Mean Scores



The scores suggest an overall positive or high-level agreement/impact across all measured constructs, with some important distinctions:

- Highest Score: Efficiency (4.32): This construct has the highest average score, indicating a strong agreement that the subject being measured (likely a new technology or system) significantly increases efficiency. This is the primary perceived benefit.
- Moderate Scores (Dependency & Skill Loss):
- Dependency (3.81): The second-highest score suggests there is a moderate to high perception of increased dependency on the new technology. This implies a significant risk of reliance or vendor lock-in.
- Skill Loss (3.64): This score is slightly lower than Dependency but still high, indicating a noticeable concern that reliance on the system may lead to a loss of existing professional skills or an over-reliance on automated processes.
- Lowest Score: Job Risk (3.52): While this is the lowest value among the four, a score of 3.52 on a 5-point scale is still considered high. It suggests a significant concern that the technology may pose a risk to job security or fundamentally change job roles.

Findings

- Faculty perceive strong efficiency benefits from AI automation.
- Dependency risk is moderately high, indicating concerns about over-reliance.
- Efficiency strongly predicts dependency growth.
- Balanced integration and training is essential.

IV. Conclusion

AI-driven automation serves as both an efficiency booster and a dependency catalyst. While it significantly improves productivity and institutional functioning, reliance may erode human intelligence and risk job displacement. Policymakers and administrators should maintain equilibrium between AI-enabled productivity and independent decision-making.



Recommendations

- Include mandatory AI-literacy training programs.
- Encourage blended human-AI decision-making.
- Develop policies restricting excessive automation.
- Promote skill-based enhancement programs.

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