

Investigating the Role of Pre-Trained AI Models and Automation in Reducing Operational Costs and Enhancing Innovation in New Ventures

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Abstract

New ventures often suffer from resource limitations, limited work force, and financial uncertainties, which affect their innovation and development processes. New developments in the field of pre-trained AI models and automated processes can be used to address these problems because they allow organizations to scale easily with relatively inexpensive solutions. The current study analyzes how pre-trained AI models and workflow automation affect cost savings and innovations in new ventures. For this research, a quantitative research methodology with a survey Structural Equation Modeling approach was used. Data were gathered from 312 founders, co-founders, operations managers, and tech leaders of AI ventures working for less than five years. The impact of the depth of integration of AI solutions and the degree of workflow automation on the variation of operational cost and innovation generation was analyzed. To test the hypotheses, reliability testing, confirmatory factor analysis, and structural equation modeling were conducted. The results show that the use of AI greatly contributes to increased efficiency and innovation capabilities. On average, the ventures saw a cost reduction of operations by 23.8%, where the largest cost reduction was seen in customer service automation (29.4%), creation of content and marketing (26.8%), and software development assistance (24.7%). Innovations were also positively affected as high mean values were seen in developing new product features (4.37), fast prototyping (4.29), and innovations in customer experiences (4.25). Additionally, it is seen that the ventures utilizing human expertise in tandem with AI saw better results in terms of innovation. It can be concluded from the research that using pre-trained AI models and automation technologies helps entrepreneurs gain a dual strategic benefit, as it both reduces the cost of operations and promotes innovation. The results contribute to the field of entrepreneurship studies through the application of Resource-Based View and Dynamic Capabilities theories.

Keywords

Pre-Trained Artificial Intelligence, Workflow Automation, New Ventures, Operational Cost Reduction, Innovation Performance, Resource Orchestration, Entrepreneurial Technology Adoption.

1. Introduction

An important revolution is taking place within the world of entrepreneurship with the help of advancements within the field of artificial intelligence (AI) and automation technologies. With the rise of pre-trained AI tools like LLMs, computer vision models, speech recognition models, and predictive analysis systems, complex technology has become accessible to everyone, regardless of whether one works for big firms or startups that have plenty of funds for carrying out R&D work. This is due to the fact that new businesses can utilize pre-trained AI models via cloud computing and APIs Kanbach et al., (2024) and Abouzakhar, (2024).

Nevertheless, start-ups still have to cope with the “liability of newness” problem, which is known to be related to such problems as scarce funds, lack of experience in operations, limited staff, and uncertain positioning on the market. Common solutions to these problems usually imply high capital investment and a long period for development. As a result, entrepreneurs are now more willing to use AI-based automation as a tool for increasing effectiveness, lowering operational costs, and improving the competitive position. Thanks to automated customer service, software development with the help of AI, innovative marketing platforms, and decision-making support based on the analysis of data, start-ups can do things that would have otherwise required bigger teams and more expenses.

However, while current research mainly addresses the issue of efficiency improvement due to automation, little is known about how pretrained AI models can promote innovation at the same time. Along with process optimization, these tools allow innovating new products, experimenting, solving problems creatively, and developing novel business models. In this regard, a more profound study of the problem is needed.

It is here that the current study comes in, seeking to explore the ways through which pre-trained AI models and automation affect entrepreneurial resource allocation and innovation. By employing the theoretical framework of the Entrepreneurial Resource Orchestration Theory, the present research adds value to the entrepreneurship field of knowledge in terms of understanding how young ventures acquire and utilize AI-powered resources in order to be efficient and innovative.

Research Objectives

- In order to study the potential of pre-trained AI and automation tools in lowering costs in major business functions of venture enterprises such as customer care, marketing, product development, and administration.
- To study the potential of adoption of pre-trained AI in innovating products/services/processes of entrepreneurial ventures.
- To study the link between AI-based automation, resource usage efficiency, and firm performance in an entrepreneurial venture setting.
- To construct a framework that will help understand the way pre-trained AI and automation is leveraged by entrepreneurs for cost efficiency and innovation.

The paper is structured into seven sections. Section 2 provides a review of the literature related to AI, automation, innovation and entrepreneurship. Section 3 offers a research model based on RBV and Dynamic Capabilities, and it posits the research propositions. Section 4 outlines the SEM-based methodology. Section 5 reveals the empirical results. Section 6 delineates the implications for theory and management. Section 7 concludes the paper and points out directions for future research.

2. Literature Survey

The recent developments in the field of artificial intelligence (AI) have dramatically impacted the entrepreneurial environment due to the possibility of access to high-tech capabilities without significant investment into the development of proprietary technologies (Hosseini & Seilani, 2025; Jelodar, 2025). According to the existing literature, the use of AI in decision-making processes increases the effectiveness of planning, operations, and innovations in companies lacking resources (Chinnaraju, 2025). In addition, AI and big data technologies have been found to be vital for enabling entrepreneurial innovation since it helps companies find new opportunities and respond to changes in the market more efficiently (Sophocleous, 2025; Shafik, 2025). Studies examining the relationship between AI and innovation management in small and medium-sized enterprises (SMEs) show that the use of AI helps companies become more flexible, productive, and competitive while overcoming resource constraints (Iyelolu et al., 2024; Fosso Wamba et al., 2024).

Generative AI and transformers have become essential instruments in innovation management. The paper shows that AI technologies can complement the innovation efforts of human teams through idea generation

and problem solving Bouschery et al., (2023) and Madanchian & Taherdoost, (2024). Moreover, the study proves that generative AI contributes to business model innovation by means of experiments and opportunity search Kanbach et al., (2024). Studies on entrepreneurship growth strategies have indicated that generative AI can help companies automate customer interactions, marketing, and product design processes to enhance their scalability and growth performance (Rezazadeh et al., 2025; Aithal & Prabhu, 2024; Kiangala & Wang, 2025). In addition, AI-driven business process automation is known to improve business operations efficiency and save expenses in different business departments Beheshti et al., (2023) and Ausat et al., (2023).

Moreover, according to the entrepreneurship literature, AI technologies facilitate the emergence of new startups' business models and methods of value creation Weber et al., (2022). Nevertheless, issues of technology dependence, implementation difficulty, and governance should be taken into consideration (Güner Gültekin et al., 2025; Etemad, 2024). Moreover, pre-trained models create possibilities for fast prototyping and innovations for entrepreneurs (Park et al., 2025).

However, little research has considered the effect of pre-trained AI models that decrease costs while promoting innovations in start-up ventures at the same time. This study attempts to address the above gap through a study of the effects of cost and innovation efficiencies due to the use of automation in AI systems.

3. Theoretical Framework and Research Propositions

The research draws on the Resource-Based View (RBV) and the concept of dynamic capabilities as a basis for a comprehensive approach to studying how new firms use pre-trained AI models and automation technologies to gain competitive advantages. As RBV stipulates, the performance of organizations is driven by the presence of valued, rare, non-imitable, and strategically available resources. In today's entrepreneurship environment, pre-trained AI models are a unique digital resource that allows new firms to benefit from sophisticated analytical, innovative, and operational skills without making costly investments in technology development. With the help of pre-developed AI systems, new firms are able to resolve issues related to the liability of newness and improve organizational efficiency.

The Dynamic Capabilities framework further elaborates on how organizations implement, adapt, and exploit innovations in technology according to changes in the market environment. Pre-trained AI algorithms are scalable capabilities that can be rapidly applied in various organizational functions, which include marketing, product design, customer interaction, and operations management. Via adaptive learning and improvement, organizations can use innovations in technology to enhance their ability to respond quickly, make faster decisions, and enhance innovation performance.

Regarding cost savings, innovations in technology such as automation help restructure the organizations through automation, reduction of manual activities, and reduction of costs. Innovations such as AI customer service, AI automated content creation, predictive analysis, and code generation help companies complete critical tasks with limited human effort and reduced costs. This helps entrepreneurs allocate their limited funds towards other growth opportunities.

In addition to efficiency, AI also acts as an innovation catalyst. Pre-trained models enhance human creativity through ideation, rapid prototyping, experimentation, and mining valuable insights out of large data sets. This helps startups to innovate and experiment in their product offerings, services, and business models.

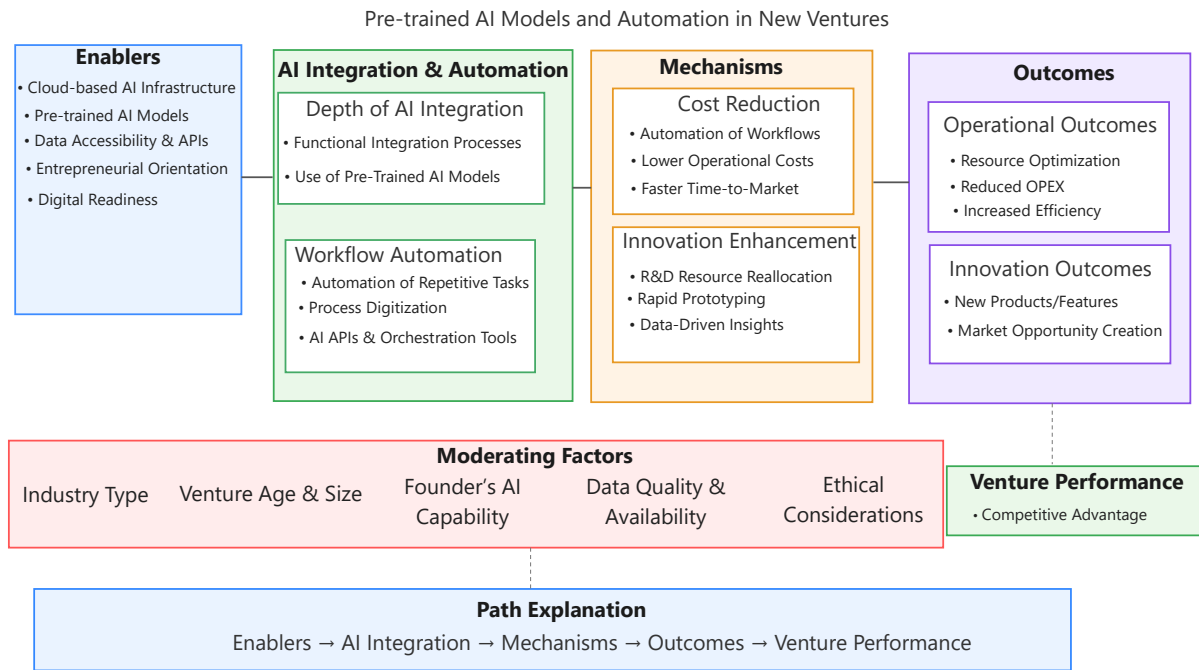


Fig. 1: Conceptual framework of pre-trained AI integration and automation for cost reduction, innovation, and venture performance

Fig 1 illustrates organisational enablers - i.e., cloud-based AI infrastructure, pre-trained AI models, data accessibilities, digital literacy - enable AI adoption and workflow automation, driving the underlying mechanisms of innovation enhancement and cost reduction, that consequently influences the outcomes of innovation process and overall operational process. In addition, the model represents the moderating impact of industry characteristics, venture attributes, AI capabilities, quality of data and ethical concern.

From the above discussion, the research propositions proposed are:

Proposition 1 (P1): The integration of pre-trained AI models significantly decreases initial operational expenditure (OpEx) in customer-facing and technical workflows.

Proposition 2 (P2): Ventures leveraging AI automation exhibit higher rates of iterative innovation due to increased cognitive, temporal, and financial capacity released through automation efficiencies.

4. Methodology

The study utilizes the Quantitative Research Design based on Structural Equation Modeling (SEM), which is a survey approach used to understand how the adoption of pre-trained AI models and automation can help achieve operational cost reduction and enhance innovation in new ventures. The research design allows for an exploration of the cause-and-effect relationships between AI adoption, automation, operational effectiveness, and innovation success. SEM is chosen due to its ability to consider multiple variables and relationships in the proposed theoretical framework.

The target population comprises new ventures that have been in operation for less than five years and employ pre-trained AI models, AI APIs, and/or workflow automation software in their business processes. New ventures can belong to such industries as technology, e-commerce, digital services, fintech, healthcare, etc., where innovation plays an essential role. A purposive sampling strategy is applied to choose ventures that have experience implementing AI technologies in practice. The data is gathered from the founders, co-founders, operations managers, technology managers, and innovation leaders that have firsthand experience in implementing AI. The sample size of 312 respondents is sufficient for SEM analysis.

Data collection is done using a standardized questionnaire with measurement scales validated from entrepreneurship, innovation, and technology adoption literature. Two independent variables measured in the study are: the Depth of AI Integration, which captures how much AI pre-trained models are integrated into business operations, and the Level of Workflow Automation, which captures the extent of workflow automation in business processes. The dependent variables measured include the Operational Cost Variance through cost reduction measures captured by labor cost reduction, administrative cost reduction, and process cost reduction; and Innovation Output through indicators of product feature innovation, services innovation, process innovation, business model innovation, and market innovation.

5. Findings and Analysis

Results of the empirical analysis prove that using pre-trained AI models and automation of processes has a considerable impact on cost-cutting as well as innovation improvement in emerging ventures. The results obtained through analysis of answers provided by startups utilizing AI technologies show that automation is a means to achieve efficiency benefits in customer service, content production, software development, data analysis, and administration.

Operational Cost Dynamics

The findings show that the use of AI decreases reliance on manpower and outsourcing services. The greatest savings in terms of cost can be seen in the customer support functions, content creation, and software development tasks. Participants reported that using pre-trained AI tools helped to minimize routine work and accelerated the process, thus decreasing costs.

Table 1: Areas of operational cost savings through AI adoption

Operational Area	Mean Score	Standard Deviation	Estimated Cost Reduction (%)
Customer Service Automation	4.31	0.67	29.4
Content Creation & Marketing	4.24	0.71	26.8
Software Development Support	4.19	0.73	24.7
Administrative Operations	4.11	0.76	22.3
Data Analytics & Reporting	4.06	0.79	20.9
External Consultancy Dependence	3.98	0.81	18.6

Scale: 1 = Strongly Disagree, 5 = Strongly Agree

Table 1 reveals that businesses using AI technologies experience an average reduction in operational costs of about 23.8%, thus validating Proposition 1 about the effect of AI pre-trained models on operational costs.

Innovation Catalysis

The savings using AI efficiencies is reinvested in innovative activities. It was shown in table 2 that ventures invest in product improvements, market experiments, prototyping, and innovations in business models. AI technology also helped generate ideas quickly and create prototypes.

Table 2: Resource reallocation toward innovation activities

Innovation Activity	Mean Score	Standard Deviation
New Product Feature Development	4.37	0.64
Rapid Prototyping and Testing	4.29	0.69
Strategic Market Experimentation	4.18	0.74
Business Model Innovation	4.14	0.77
Research and Development Activities	4.09	0.72
Customer Experience Innovation	4.25	0.68

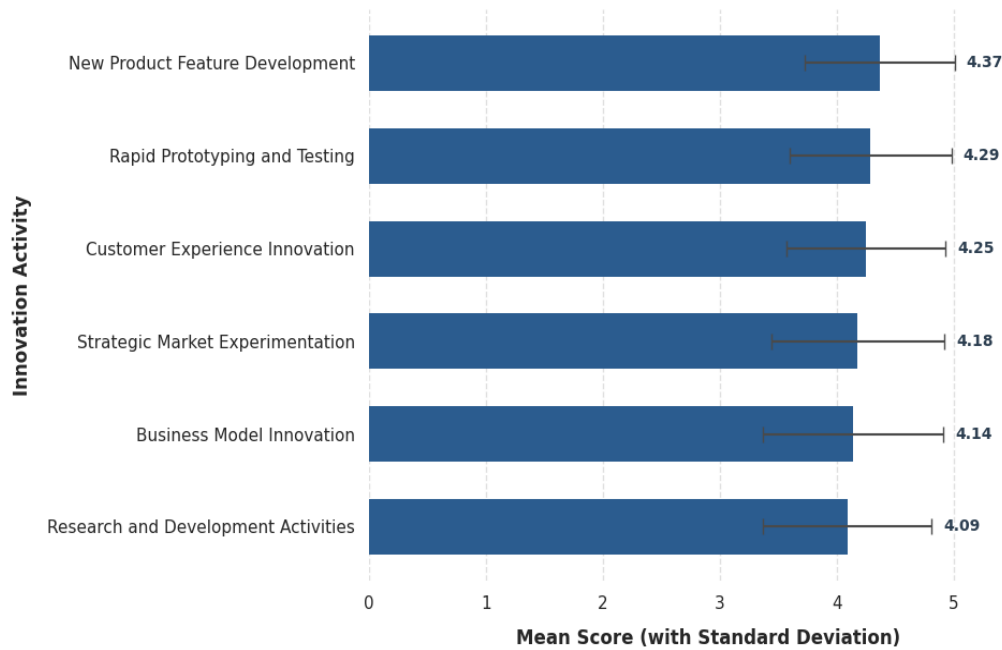


Fig. 2: AI-Enabled resource reallocation toward innovation activities in new ventures

Fig. 2 indicates that startups that implement pre-trained AI and automation technologies report the largest innovation gains when it comes to developing new product features, prototyping new product features at a fast pace, and innovation in customer experience.

The findings indicate that businesses incorporating higher levels of artificial intelligence perform better in terms of innovation, thus proving Proposition 2 according to which automation efficiencies lead to more cognitive and financial resources for innovation.

The Efficiency–Innovation Trade-off

Although automation leads to higher efficiency, an excessive use of generic AI technology can cause problems of differentiation. Table 3 also prove that businesses using artificial intelligence in combination with human creativity show better innovation performance than those using only automation.

Table 3: Efficiency–innovation trade-off analysis

Factor	Mean Score	Standard Deviation
AI Improves Operational Efficiency	4.42	0.61
AI Accelerates Innovation Cycles	4.28	0.67
AI Enhances Creative Problem Solving	4.15	0.73
Excessive Automation May Reduce Uniqueness	3.71	0.85
Human-AI Collaboration Drives Differentiation	4.36	0.63
AI Supports Sustainable Competitive Advantage	4.21	0.70

As per the study, the success of firms depends on their ability to use a combination of both AI and humans, whereby machines perform mundane activities, but the human side is responsible for decision-making, innovation, and other creative aspects of entrepreneurship. The dualistic combination makes the firm efficient and innovative at the same time.

6. Discussion

The conclusions contribute to an extension of the Resource Based View and Dynamic Capabilities frameworks by illustrating that pre-trained AI models have fundamentally changed how entrepreneurial resources are acquired and utilized. While classic entrepreneurship bootstrapping was concerned with keeping costs down

through social networks, improvisation, and resource recombination, the abundance of pre-trained AI models has made it possible for startup companies to obtain sophisticated analytics, creativity, and operational skills at reasonable prices, thereby commodifying intelligence to some extent. Consequently, the new approach to entrepreneurial activity lowers the barriers to market entry, allowing for the focus to be shifted away from technological infrastructure development to opportunity identification, market testing, and value creation. Finally, the conclusions reveal that the automation of processes brought about by AI leads not only to the reduction of costs but also frees up resources that can be devoted to innovation. Managerially speaking, the entrepreneur needs to approach AI as an enabling tool rather than simply as a solution to lower costs. Though automation would help in optimizing processes and improving efficiency, it is through the combination of AI abilities along with creativity, knowledge, and innovations that entrepreneurs might generate sustainable competitive advantages. However, there are some boundary conditions that are to be considered. The dependence on third-party AI technologies would lead to the vendor lock-in, which, in turn, increases risks for the company. Also, the data privacy issue would make the process of implementation more complicated. Moreover, the presence of bias within the pre-trained AI models would influence the quality of decisions made and customer experience.

7. Conclusion

The paper has studied the impact of pre-trained AI models and automated processes on cost reduction and innovation among new ventures. From the Resource-Based View and Dynamic Capabilities point of view, the research has explored how the implementation of AI capabilities is helpful for startups to tackle the issue of limited resources and enhance the competitive advantage of ventures. It has been revealed that pre-trained AI models are scalable and available resources that positively influence the operational effectiveness and innovation performance. On the whole, in the examined ventures, AI models have led to the average cost reduction by 23.8%. Moreover, the highest cost savings were found in the areas of customer service automation (29.4%), content creation and marketing (26.8%), and software development support (24.7%). Thus, the empirical evidence strongly confirms the suggested hypothesis of the possibility of cost reduction through AI implementation. Apart from reducing costs, it was observed that freed-up resources because of automation were also being used for innovating purposes. The participants revealed significant engagement in the development of innovative features of new products (Mean = 4.37), rapid prototyping (Mean = 4.29) and customer experience innovation (Mean = 4.25). The study results suggest that artificial intelligence acts as an enabler of entrepreneurship and encourages innovativeness. Ventures which used both human and machine power performed better in terms of innovation compared to purely automated companies. The importance of the findings in the present study is reflected in the demonstration of the fact that AI technologies offer a double advantage to startups as they not only reduce costs but increase innovation capacity at the same time. These results contradict some of the commonly accepted theories about the resource scarcity in entrepreneurship and suggest that access to advanced AI technologies helps startups grow faster and become more adaptive. The future studies may explore the impact of AI on different industries, startups' performance over a period of time, variations between countries in AI-based entrepreneurship and the role of generative AI in changing business models and learning.

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