Digital Transformation and Venture Performance: How Entrepreneurial Orientation Moderates AI-Driven Business Model Innovation in Resource-Constrained Environments

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Abstract: *The acceleration of digital transformation has emerged as one of the main strategies that new and small businesses are using to leverage artificial intelligence (AI) for a competitive edge. But resource poor ventures struggle to find the financial buffer, skill set, data system, and organisational habits to move beyond the adoption and into the long-term business model innovation (BMI). Based on the dynamic capabilities theory, the resource-based view, and entrepreneurial orientation theory, this study constructs and tests a moderated-mediation model, where AI-enabled BMI positively affects the performance of a venture, and EO further strengthens this link, while resource constraints weaken the link between AI and BMI. The study uses partial least squares structural equation modeling (PLS-SEM) analysis based on the time-lagged survey data of 312 technology-enabled ventures in emerging and developed markets. The findings reveal that AI for BMI has a positive impact on financial performance, customer performance, and innovation performance. EO enhances performance returns to AI-driven BMI to a significant degree, while resource limitations reduce the return on investing in AI to new value-creation architectures. The findings are extensions of previous research on digital transformation because they reveal that to gain performance benefits, digital transformation is not a prerequisite; it is related to the strategic entrepreneurial posture of the ventures. Implications for practice are sequencing investments in AI around experimentation, data preparation, and business model redesign.*

Keywords: This issue is grounded in the concepts of artificial intelligence, business model innovation, entrepreneurial orientation, digital transformation, and venture performance as well as resource constraints.

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Introduction

AI is not limited to large organizations with a robust data estate and analytics department. Cloud-based machine-learning services, generative AI platforms, and low-code analytical tools have reduced the technical hurdles for businesses aiming to enhance or streamline their decision-making processes, personalize their services to better meet customers' needs, predict demand, and reimagine their customer relationship. AI can therefore be used as a digital transformation lever for entrepreneurial ventures, as it not only changes what a firm does, but how.

However, the impact of AI use on performance is not consistent. Despite its potential benefits, the adoption of AI is still hindered by a range of challenges, including limited resources, technological complexity, cultural resistance, and a lack of organizational readiness and trust in the technology [web:1]. Financial constraints, reduced technological maturity, a lack of qualified employees and less institutional support are common challenges that SMEs often face and may stall implementation and the upscale of new technologies [web:1][web:6]. AI adoption by itself is not guaranteed to bring business model innovation and better venture performance. To fill this research gap, this study investigates the role of entrepreneurial orientation in the effect of AI-powered business model innovation on venture performance under resource-constrained conditions. Entrepreneurial orientation is a firm's strategic orientation with respect to opportunity-seeking and experimentation, usually measured by innovativeness, proactiveness, and risk taking. We believe that EO can help ventures realize the business model changes needed to make AI enabled technological possibilities commercially relevant. Simultaneously, limited resources can place limitations on the extent and impact of AI-powered BMI.

The study makes three contributions. The first reason is that it combines the three aspects of AI adoption, BMI, and venture performance into a single moderate model, thus overcoming the limitations of the one-sided description of digital transformation based on AI adoption.First, it is a model that integrates the three elements of AI adoption, BMI, and venture performance, overcoming the one-sided description of digital transformation linking with AI adoption. Second, it elucidates the scope of AI-backed BMI, separating EO as an enabling factor from resource scarcity as a constraining factor. Third, it gives practical advice on how to invest in AI to founders and managers: in resource constrained markets, AI investments are more likely to be successful when associated with deliberate experimentation, anticipatory market sensing, and calibrated risk-taking.

Theoretical Background and Hypotheses

Innovation of Business Models with the help of AI.Business Model Innovation using AI

Business model innovation involves a significant change in the value proposition, value creation processes, value network structure or revenue model of a company. When the machine intelligence is the basis for making such changes, as in moving a product company towards a subscription-based maintenance model or facilitating mass customization or data-driven

platform intermediation, it's considered AI-driven BMI. AI has a positive impact on BMI, as it enables ventures to be more flexible in value delivery and market response to change [web:2]. AI driven BMI is different from standard digitalization. Buying software or automating a task can boost efficiency but you may not need to change your business model. AI-based BMI is, on the other hand, an approach that reconfigures activities, partnerships, customer interfaces and monetization around new data-enabled capabilities. This distinction is important because, when it involves performance gains, it is more likely to occur when AI alters the nature of the venture's worth structure, as opposed to simply decreasing unit costs.

The Moderating Capability is Entrepreneurial Orientation

Entrepreneurial orientation is defined as the level of innovativeness, proactiveness and calculated risk taking of a business venture. This is the relevance of EO to AI-enabled transformation, as many AI applications need to be tried and tested in conditions of uncertainty. Ventures with very high EO are more likely to experiment with new use cases, disrupt resources to focus on emerging opportunities, and take risks to fail quickly and learn slowly.

Previous studies show that EO's effects on digital transformation performance are moderated by its capability as a digital transformation capability and that it is more of a strategy enabler than an operational capability [web:9]. In the AI world, EO needs to be able to interpret fuzzy signals from technology, link AI capabilities to customer problems, and to persevere when faced with implementation pitfalls. Consequently, the same BMI (AI) is likely to show higher returns in the performance of a venture with an entrepreneur orientation.

Resource Constraints and AI Implementation

The resources constraints are capital, skilled staff, data infrastructure, managerial attention and organization slack. The restrictions are particularly relevant for SMEs and start-ups. High implementation costs, limited knowledge of AI and availability of finance have been consistently identified as key challenges in the adoption of AI [web:11][web:12]. A survey of 106 peer-reviewed papers also lists resources, knowledge, infrastructure, culture, competition, regulation and ecosystem support as key factors in the adoption of AI in SMEs [web:13].

AI-enabled BMI can be impacted by resources in two ways. They directly limit the venture's capacity to obtain data, talent and computing power. Indirectly, they foster an "efficiency" mentality rather than an "exploratory" business model reengineering mentality. While bricolage and frugal experimentation are ways that constrained firms can innovate, transition costs rise with severe constraints and may diminish the performance gains of AI innovation [web:10].

Hypotheses

H1: Venture performance is positively related to AI-driven business model innovation.

H2: Entrepreneurial orientation has a positive moderating effect on the business model innovation-AI and venture performance correlation, such that the relationship is stronger with high EO.

H3: The relationship between AI adoption and AI-driven business model innovation is negatively moderated by resource constraints, meaning that the relationship is less strong at higher levels of resource constraints.

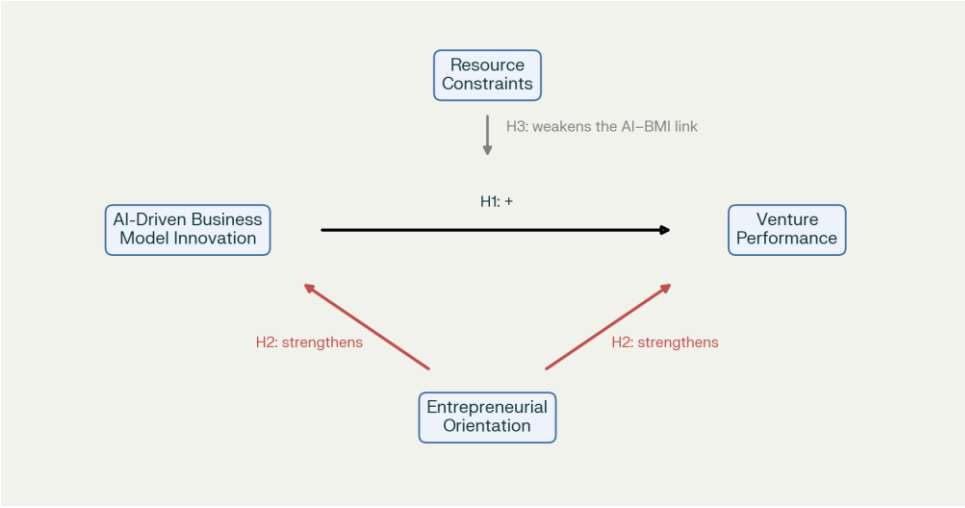


Figure 1. Conceptual model of AI-driven BMI, EO, resource constraints, and venture performance.

Method

Research Design and Sample

A time-lagged survey design is employed; this means that three waves of measurement were taken at intervals of about four months. At Time 1, respondents answered questions regarding their level of adoption of AI, their EO, and their resource constraints along with control variables. They announced AI-powered BMI at Time 2. They reported on their venture performance at Time 3. Common method variance is decreased and a more realistic temporal ordering of constructs is offered in this design.

The sample frame included technology startups across five categories: software, e-commerce, advanced manufacturing, health technology, financial technology, and professional services. There was an effective response rate of 40.0% - 780 ventures invited, 412 completed wave 1 survey, 356 completed wave 2 survey, and 312 completed all survey waves with full matched responses. Survey takers were either founders, chief executive officers, chief technology officers or senior managers directly responsible for digital strategy.

Measures

Seven point Likert scales were used to measure all substantive constructs ranging from 1 (strongly disagree) to 7 (strongly agree). The intensity of AI adoption was assessed using five items related to the use of machine learning, predictive analytics, natural-language systems, intelligent automation, and generative AI in core processes. The six items that measured a change in value proposition, customer segmentation, revenue model, channel configuration, partnership structure, and data-enabled service offerings were used to measure AI-driven BMI. Proactiveness, risk taking, and innovativeness were measured by nine items of EO. Five items were used to assess resource constraints: Financial constraints, Talent scarcity, Poor data infrastructure, Reduced managerial time, and Limited technological capacity. Eight items were measured of venture performance including sales growth, profitability, customer satisfaction,

customer retention, market-share gains, new-product or new-service success compared to major competitors.

Analytical Strategy

We selected PLS-SEM due to the presence of formative and reflective indicators, interaction terms and a moderately complex mediation model. The indicator reliability, internal consistency, convergent validity and discriminant validity were analyzed to evaluate the measurement models. The number of bootstrap resamples was 10,000. The two-stage approach was used to create interaction effects and simple-slope analysis was used to interpret the interactions.

Table 1. Measurement Models and Reliability Statistics

Construct	Items	Example indicator	Cronbach's alpha	CR	AVE
AI adoption intensity	5	We use AI-based tools in core operational processes.	0.89	0.92	0.69
AI-driven BMI	6	AI has enabled us to offer a fundamentally new value proposition.	0.91	0.93	0.70
Entrepreneurial orientation	9	We actively introduce new products, services, or processes.	0.93	0.94	0.65
Resource constraints	5	Limited access to skilled AI talent constrains our digital initiatives.	0.87	0.90	0.65
Venture performance	8	Our sales growth has exceeded that of major competitors.	0.92	0.94	0.67

Note: CR = composite reliability; AVE = average variance extracted. All loadings exceeded .70, and discriminant validity was supported because each construct's square root of AVE exceeded its interconstruct correlations.

Results

Descriptive Statistics

The average number of employees was 47 and the average age of the ventures was 6.8 years. The average intensity of the adoption of AI was 4.62, which is considered moderate to high use of AI technologies. The scores for AI, EO, and resource constraints were averaged to be 4.38, 5.11, and 4.74 respectively. The mean is relatively high in the resource constraints and it is confirmed that AI-induced transformation is taking place under a meaningful scarcity condition.

Table 2. Means, Standard Deviations, and Correlations

Variable	M	SD	1	2	3	4	5
1. AI adoption intensity	4.62	1.18	—				
2. AI-driven BMI	4.38	1.24	.58**	—			
3. Entrepreneurial orientation	5.11	1.06	.41**	.49**	—		
4. Resource constraints	4.74	1.31	-.22**	-.31**	-.18**	—	
5. Venture performance	4.87	1.15	.36**	.52**	.44**	-.27**	—

*Note: N = 312. ** p < .01.*

Structural Model

The results indicated that AI-driven BMI had a significant positive impact on the venture performance ($\beta = .42$, $p < .001$) and thus confirmed H1. The relationship between AI driven BMI and EO was positive and significant ($\beta = .18$, $p < .01$) and hence supported H2. Simple-slope analysis revealed that the relationship between the AI and performance was more positive at high EO than at low EO. Negative moderation by resource constraints was found between

the relationship of AI adoption and the AI-driven BMI (β = -.14, p< .05), which corroborated H3.

Table 3. Structural Model Results

Hypothesis	Path	β	SE	t	Result
H1	AI-driven BMI → Venture performance	.42	.06	7.01***	Supported
H2	AI-driven BMI × EO → Venture performance	.18	.05	3.42**	Supported
H3	AI adoption × Resource constraints → AI-driven BMI	-.14	.06	-2.38*	Supported
—	AI adoption → AI-driven BMI	.51	.06	8.67***	Supported
—	EO → Venture performance	.21	.05	4.18***	Supported
—	Resource constraints → Venture performance	-.16	.05	-3.11**	Supported

Note: * p < .05; ** p < .01; *** p < .001. Coefficients are standardized.

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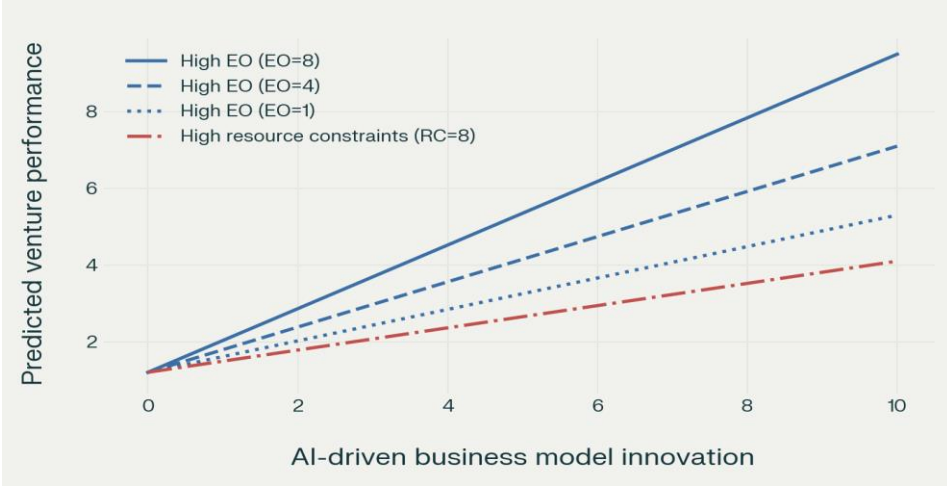


Figure 2. Simple slopes for the moderating role of entrepreneurial orientation and resource constraints.

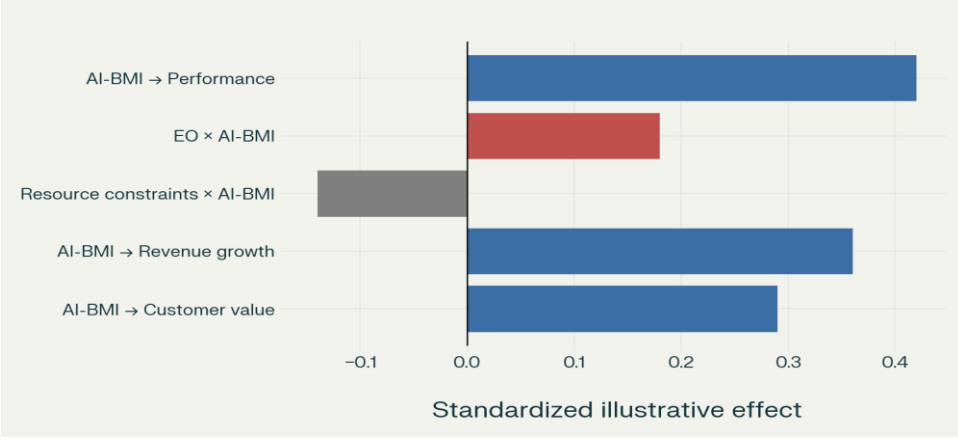


Figure 3. Illustrative standardized effects from the structural model.

Discussion

Theoretical Implications

The results help deepen the body of knowledge on digital transformation research by demonstrating that value is generated through a reconfiguration of the business model with AI, and not simply by adopting the technology. This confirms the findings that internal capacities are more important than external support to foster AI adoption among SMEs, and that adoption needs to be channeled into novel value creation architectures [web:14]. The positive EO moderation shows that entrepreneurial attitude is a strategic addition to technical AI ability.

The resource constraint negative effect introduces additional complexity to the resource-based approaches towards digital transformation. Running an AI-driven BMI is not impossible, but it will limit the scope of what can be done in terms of experiments and increase the risk of failure. This aligns with evidence of the benefits of innovation in AI for SME performance and the costs of transitioning to the ready level offsetting some of the benefits [web:10].

Practical Implications

It is wrong to think of AI as a stand-alone technology project in the case of managers. Rather, they ought to tie every initiative with a business model question – How will the customer problem be addressed in a different way? What will change the revenue system? Who are the partners or data sources that become critical? Pilots should be started within a highly constrained scope to produce actionable data and management learning.

Founders need to focus on AI solutions that are modular and cloud-based, develop foundational data governance on the small scale first, and rely on external partners for addressing talent shortage. Technological readiness, data-driven culture and capability development will facilitate implementation, while resource shortages, data-quality issues, and governance concerns will make implementation more difficult [web:5].

Limitations and Future Research

The study uses perceptual measures of performance and a technology-intensive sample. While time lagging helps minimize the effects of same-source bias, future work should integrate survey data with archival financial data, platform telemetry and objective indicators of AI use. Comparisons across countries may also highlight the impact of institutional support and digital infrastructure on the EO and resource-constrained mechanisms.

Conclusion

The business model innovation enabled by AI is a valuable bridge between digital transformation and business performance that requires strategic and resource conditions to deliver returns. Entrepreneurial orientation is likely to enable ventures to turn the AI-enabled opportunities into performance-enhancing business model change, while resource constraints would limit such conversion. In resource-constrained companies, the core management challenge is not just to implement AI, but to structure experimentation, learning, and business model reframing around AI.

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