

Revisiting Entrepreneurial Orientation in the Digital Age: The Moderating Role of AI Adoption and Mediating Role of Firm Performance in Pakistani Firms

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ABSTRACT

This paper reconsiders the phenomenon of the entrepreneurial orientation performance nexus in the digital age by verifying whether the adoption of artificial intelligence mediates the effect of innovativeness, proactiveness, and risk-taking on the performance of 342 Pakistani SMEs. Considering the resource-based view and the dynamic capabilities theory, structural equation modeling demonstrates that proactiveness and risk-taking have a significant direct influence on performance, whereas innovativeness and AI adoption have no effect. What is more important, none of the AI interaction names convey conventional meaning; that is, merely applying AI tools to existing entrepreneurial orientations does not necessarily generate dynamic capability. The results warn that the absence of complementary absorptive capacity, data governance and process discipline, cultural boldness, and AI investment would become a cost rather than a driver for resource-bound emerging markets.

Keywords: Entrepreneurial Orientation, Digital Age, AI Adoption, Firm Performance, and SMEs.

INTRODUCTION

Digital disruption has increased competitive pressure on Pakistani companies, prompting them to reconsider the role of entrepreneurial orientation in driving competitiveness. Early evidence indicates that innovativeness fuels experimentation with new products and processes (Soares & Perin, 2019), (Rashad, Mousley, & Daou, 2024) proactiveness enables forward-looking market moves (Gao et al., 2017; Hossain & Ilhaamie, 2021) and risk-taking encourages resource commitments under uncertainty (Messikh, 2022; Rashad et al., 2024), yet these cultural traits do not automatically translate into higher performance when technologies and customer preferences shift rapidly.

Recent scholarship further suggests that artificial intelligence adoption can serve as a dynamic capability that refines sensing, seizing, and transforming routines (Dubey et al., 2020; Priestley & Simperl, 2022; Alsharah, 2025), but empirical studies grounded in the Resource-Based View and Dynamic Capabilities Theory have produced mixed results about whether AI actually amplifies or dilutes the performance effects of entrepreneurial orientation (Shore et al., 2024; Al-Mamary, 2025). Consequently, there is a growing need to revisit the classic entrepreneurial orientation performance link in the specific context of Pakistani firms to determine if, and how, AI adoption moderates this relationship.

While entrepreneurial orientation is widely praised for improving firm performance, recent evidence from Pakistan shows that proactiveness and risk-taking can have small negative effects on performance, and innovativeness fails to reach statistical significance, leaving managers uncertain about when cultural boldness helps or hurts (Arabeche et al., 2022). Simultaneously, artificial intelligence is promoted as a critical dynamic capability that sharpens market sensing and reduces decision uncertainty, yet empirical tests reveal that AI adoption alone does not improve performance, and its interaction with any dimension of entrepreneurial orientation is not significant (Dubey et al., 2020).

This contradictory pattern signals a theoretical gap: existing RBV and dynamic-capability arguments assume complementary assets will always enhance valuable routines, but they overlook the possibility that premature or misaligned AI investments may neutralize entrepreneurial advantages in resource-constrained emerging markets (Priestley & Simperl, 2022; Alsharah, 2025). Without clarifying why entrepreneurial orientations have lost their traditional potency and why AI fails to serve as an effective moderator, scholars and practitioners in Pakistan risk prescribing cultural and technological strategies that could inadvertently erode rather than elevate competitive advantage.

Research Questions

1. Does innovativeness significantly influence the firm's performance?
2. Does Proactiveness significantly influence the firm's performance?
3. Does Risk-taking significantly influence the firm's performance?
4. Does AI adoption significantly moderate the role of innovativeness and firm performance?
5. Does AI adoption significantly moderate the role of proactiveness and firm performance?
6. Does AI adoption significantly moderate the role of risk-taking and firm performance?

Research Objectives

1. To evaluate the impact of innovativeness on firm performance.
2. To investigate the relationship between proactiveness and firm performance.
3. To determine the significant impact of risk-taking on firm performance.

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4. To evaluate the moderating role of AI adoption on innovative and firm performance.
5. To investigate the moderating role of AI adoption between proactive and firm performance.
6. To evaluate the moderating role of AI adoption between risk-taking and firm performance.

LITERATURE REVIEW

Innovativeness and Firm Performance

Innovativeness, which refers to a firm's receptiveness to novel ideas and continuous experimentation, positively affects organizational performance (Soares & Perin, 2019). Business firms that are proactive in developing innovative ideas and investing in research and development normally achieve better business results (Hossain & Ilhaamie, 2021). For example, product, process, and marketing innovativeness have been identified as significant contributors to organizational performance (Rashad et al., 2024). Moreover, innovativeness is a vital element in SMEs' adaptation to changing business environments, where firms need to develop new assessments and propose innovative products (Ilyas et al., 2017). Such active interest in new ideas is a sign of the firm's commitment to creativity and may be an important source of competitive advantage (Tsakalerou et al., 2025).

H1: Innovativeness significantly influences firm performance.

Proactiveness and Firm Performance

Being proactive implies a forward-moving attitude in which market needs are anticipated, and new opportunities are pursued before rivals (Gao et al., 2017). Such an orientation involves introducing new products and services and strategically managing business processes to meet future demands (Hossain & Ilhaamie, 2021). The studies show a direct positive correlation between proactivity and firm performance (Rumman et al., 2021). The positive and meaningful impacts of proactiveness on the performance of SMEs have also been acknowledged in studies in other settings, including the Iranian knowledge-based industry (Hossain & Ilhaamie, 2021). Entrepreneurial orientation entails proactivity, an intangible resource that contributes to competitive advantage and may directly enhance the performance of a small business (Dionysus & Arifin, 2020). Nevertheless, it is a complicated relationship: when industrial pressure is lower, proactivity positively affects entrepreneurial performance, but this effect may shift when industrial pressure is higher (Gao et al., 2017).

H2: Proactiveness significantly influences firm performance.

Risk-taking and Firm Performance

Risk-taking reflects a firm's willingness to invest substantial resources in opportunities with unpredictable outcomes, an essential element of entrepreneurial activity (Rashad et al., 2024). This dimension implies taking daring steps and venturing into unexplored lands, which may lead to entrepreneurial success (Messikh, 2022). For example, the risk-taking aptitude enables companies to pursue an open innovation pathway, thereby increasing competitiveness (Iyiola et al., 2023). Having a high-risk propensity can help companies capitalize on lucrative opportunities amid uncertainty, leading to long-term success (Iyiola et al., 2023). Although entrepreneurs are generally risk-

tolerant, some studies have found that risk tolerance and profitability exhibit an inverted U-shaped relationship, suggesting that excessive risk-taking can be counterproductive to long-term business success (Koch & Menkhoff, 2024). Other factors can also moderate the impact of risk-taking on performance like learning orientation (Iyiola et al., 2023).

H3: Risk-taking significantly influences firm performance.

Innovativeness, AI Adoption, and Firm Performance

Innovativeness and entrepreneurial orientation are synergistically connected with AI adoption and firm performance in the digital age (Alsharah, 2025). Companies with an innovative entrepreneurial orientation tend to embrace new technologies such as AI, seeing it as an attractive element for decision-making and environmental adaptation (Dubey et al., 2020). This adoption will then increase their creativity and experimentation abilities, thereby improving their business performance (Alsharah, 2025). The AI-based insights are used to ideate, prototype, and customize more quickly, enabling innovative companies to bring new products and services to market more effectively (Usman et al., 2024). Artificial intelligence devices are essential for enhancing innovation rates and, therefore, are a central driver of market performance.

H4: AI adoption significantly moderates the relationship between Innovativeness and Firm Performance.

Proactiveness, AI Adoption, and Firm Performance

Among the dimensions of entrepreneurial orientation that AI adoption improves, one is proactiveness, which positively influences the firm's performance (Priestley & Simperl, 2022). As indicated by proactive entrepreneurs, AI helps them understand market trends (before competitors do), identify new opportunities, and act before competitors (Priestley & Simperl, 2022). AI offers superior analytical tools that enable companies to make more precise predictions about consumer demand and market changes, respond to them in a timely manner, and strategically position themselves (Dubey et al., 2020). It results in first-mover benefits and increased competitiveness, thereby positively affecting firm performance (Kusa et al., 2024). In addition, the application of AI enhances entrepreneurial agility, which is essential for a business to survive in turbulent markets and customer choice (Atlantis Press, 2025).

H5: AI adoption significantly moderates the relationship between Proactiveness and Firm Performance.

Risk-taking, AI Adoption, and Firm Performance

The risk-taking entrepreneurial orientation, combined with AI achievements, can play a key role in shaping firm performance by fostering more determined and rational risk-taking (Dubey et al., 2020). Although entrepreneurial risk-taking is all about making risky investments in unpredictable businesses, AI is an excellent opportunity to reduce the risk (Al-Mamary, 2025). This will enable entrepreneurs to develop ambitious projects with a clearer view of possible outcomes, thus increasing the chances of success (Baldegger et al., 2020). The analytics based on AI will assist the strategic decision-making in the face of uncertainty, as it will enable companies to find opportunities and address the risks in an efficient manner (Shore et al., 2024). Thus, the use of AI is an attractive element in entrepreneurial organizations, enabling them

to make more effective decisions and respond to an evolving market environment (Dubey et al., 2020).

H6: *AI adoption significantly moderates the relationship between Risk-taking and Firm Performance.*

Underpinning Theory

Research on the subject discusses two theories underpinnings, namely the Resource-Based View and the Dynamic Capabilities Theory. The Resource-Based View states that a unique set of resources that a firm control does not lead to a firm's competitive advantage but rather industry structure. These resources may be tangible, such as specialized machinery or prime location, or intangible, such as brand reputation, patents, and tacit knowledge within teams. To have long-term benefit, a resource should be valuable in the market, uncommon among competitors, expensive to clone, and within the organizational routine, thereby enabling its utilization. In case these four conditions are satisfied, the firm earns economic rents that persist even as competition increases. In the research presented, entrepreneurial orientation is considered a behavioral resource that focuses managerial attention on new opportunities, whereas AI-enhanced data resources and algorithmic routines are intangible technological resources that further strengthen the firm's protective barrier.

Dynamic Capabilities Theory builds on the Resource-Based View by clarifying how companies change their resource base as technologies and customer preferences change. The theory revolves around 3 repeatable activities: sensing weak signals in the environment, seizing good, timely opportunities by developing new products or business models, and changing internal processes, assets, and mindsets to remain fit in the changing environment. These activities are, in turn, higher-order capabilities that make the ordinary capabilities fresh and ward off core rigidities. Entrepreneurial orientation provides the cultural readiness to engage in continuous discovery and bold seizing, whereas AI adoption offers the speed of analysis and predictive precision to reduce the cost of change. Both ensure that the firm's valuable resources are not hoarded but reconfigured over time, so the competitive advantage can be maintained across several market cycles.

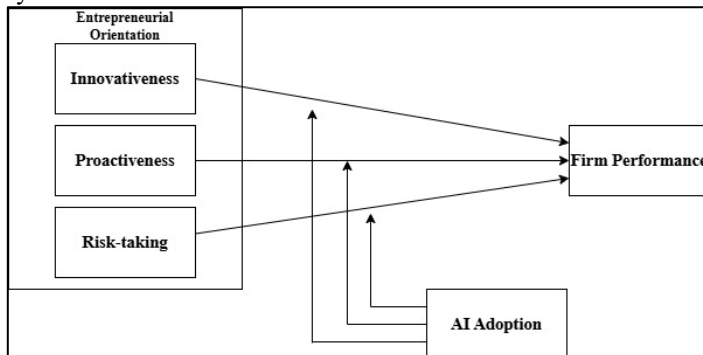


Figure 1: Theoretical Framework

RESEARCH METHODOLOGY

Pragmatism philosophy is the starting point of the research onion of this study because the subject under discussion is a genuine organizational behavior with the goal of gaining theoretical and practical importance. The study is deductive, based on existing

theories of entrepreneurial orientation and technology adoption, and tests the moderating role of AI using empirical data. It uses a mono-quantitative approach, supported by a survey methodology that will enable efficient data collection from different Pakistani companies and provide statistical analysis of the interrelationships among key variables. The time is cross-sectional because the data will be collected at a single time point. In the center, standardized questionnaires and quantitative methods will be used to assess entrepreneurial orientation, AI adoption, and firm performance, providing a logical and rigorous framework for studying the impact of AI on entrepreneurial orientation in the digital age.

This proposed research suggests that entrepreneurial orientation is the independent stimulus that prompts managers to consider new ideas, venture into new markets at an early stage, and tolerate calculated risk. These entrepreneurial behaviors enhance strategic capabilities, the mediating construct that reflects the firm's ability to perceive opportunities, organize resources, and introduce better products. Increased competencies subsequently amplify firm performance, the dependent variable, on an increase in sales, profitability, and expansion in the market. The use of artificial intelligence moderates' variables strengthens the relationships between entrepreneurial orientation and strategic capabilities; companies that incorporate AI tools into their forecasting, design, and operations translate the same degree of entrepreneurial passion into a greater, faster ability to grow. The model thus represents a progressive flow, with the bold strategic culture nourishing organizational abilities, skills elevating outcomes, and AI serving as a catalyst that increases the conversion rate at every stage.

Measurement and Operationalization of Variables

In the present study, the measurement model is created to operationalize and measure the primary variable associated with the usage of innovativeness, proactiveness, and risk taking in firm performance by using AI adoption. A structured questionnaire is used to measure the variables by using items, which aim to capture the essence of each variable. The scales and items used are validated through prior research and established scales, providing reliability and validity for the measurement model.

Innovativeness (I)

An Innovativeness (I) is measured from 1 (Strongly Disagree) to 5 (Strongly Agree) on a 5-point Likert scale. These items are adapted from (Arabeche et al., 2022). The items are as follows: I_1 My company emphasizes research and development (R&D), technological change, and innovation. I_2 My company is introducing several new product lines or services. I_3 My company invests heavily in internal R&D to develop new capabilities.

Proactiveness (P)

Proactiveness (P) is evaluated through a 5-point Likert scale where 1 (Strongly Disagree) and 5 (Strongly Agree). These items are based on (Arabeche et al., 2022). The items are as follows: P_1 My company takes actions that competitors replicate. P_2 My company is often the first to introduce new products/services, new techniques or technologies, production methods, etc. P_3 My company adopts a very competitive position to reduce competition.

Risk Taking (RT)

A Risk Taking (RT) is measured from 1 (Strongly Disagree) to 5 (Strongly Agree) on a 5-point Likert scale. These items are based on: (Arabeche, et al., 2022). The items are as follows: RT_1 My company is willing to take significant risks even when outcomes are uncertain. RT_2 My company typically takes an aggressive, bold posture to maximize the exploitation of opportunities. RT_3 I believe that, given the nature of the business environment, far-reaching actions are necessary to achieve my company's goals.

AI Adoption (AA)

AI Adoption (AA) is evaluated through a 5-point Likert scale, where 1 (Strongly Disagree) and 5 (Strongly Agree). These items are based on: (Ahmad et al., 2023). The items are as follows: AA_1 I can skillfully use AI applications or products to help me with my daily work. AA_2 It is usually hard for me to learn to use a new AI application or product. AA_3 I can use AI applications or products to improve my work efficiency.

Firm Performance (FP)

Firm Performance (FP) is evaluated through a 5-point Likert scale, where 1 (Strongly Disagree) and 5 (Strongly Agree). The items are as follows: FP_1: The profit margin remains high. FP_2: Our financial performance is consistently strong compared to industry peers. FP_3: Employees are growing rapidly in the industry. FP_4: The firm scale is growing rapidly in the industry.

FINDINGS AND DISCUSSION

Descriptive and Demographic Statistics

In the current research, 342 valid responses were obtained. The sample consists of young and educated professionals: three-quarters are younger than 30, and 73 percent have at least a bachelor's degree, and income is spread evenly between lower-middle to upper-middle income. The proportions of females and males are equal, and the sample predominantly comprises small and medium-sized companies, with 70 percent having a workforce of fewer than 250 employees, placing the research at the heart of the Pakistani entrepreneurial market.

Table 1: Demographic Statistics

	n	%
Gender		
Male	86	55.5
Female	69	44.5
Age (years)		
< 20	12	7.7
20-25	58	37.4
26-30	48	31
31-35	22	14.2
> 35	15	9.7
Education		
Primary	9	5.8
Secondary	33	21.3
Bachelor	77	49.7
Master+	36	23.2
Income (PKR)		
< 50 k	40	25.8
50-100 k	71	45.8
> 100 k	44	28.4

Firm size		
< 50	42	27.1
50-250	67	43.2
> 250	46	29.7

Measurement Model

The measurement model has good convergent validity and internal consistency measures of all five constructs. The factor loadings for Innovativeness (I), Proactiveness (P), Risk-Taking (RT), AI Adoption (AA), and Firm Performance (FP) are well above 0.70, with the lowest acceptable loading on FP3 at 0.614. Cronbach's alpha ranges from 0.701 to 0.877, composite reliability from 0.765 to 0.924, and average variance extracted (AVE) from 0.626 to 0.802, all well above the suggested 0.60 cutoff. These statistics indicate that all indicators account for at least 50 percent of their construct's variance and that the scales are internally consistent. Table 2: Factor Loading and Convergent Reliability and Validity

Items	Constructs	Loadings	CA	Rho_A	CR	AVE
I_1	Innovativeness	0.912	0.877	0.902	0.924	0.802
I_2		0.838				
I_3		0.933				
P_1	Pro-activeness	0.788	0.746	0.781	0.853	0.661
P_2		0.777				
P_3		0.870				
RT_1	Risk Taking	0.830	0.727	0.762	0.843	0.643
RT_2		0.865				
RT_3		0.701				
AA_1	AI Adoption	0.931	0.84	0.867	0.904	0.758
AA_2		0.848				
AA_3		0.829				
FP-1	Firm Performance	0.877	0.701	0.765	0.831	0.626
FP-2		0.856				
FP-3		0.614				

Discriminant Validity

Discriminant validity requires that each construct's square root of AVE (bolded on the diagonal) be larger than its correlations with any other construct. Here, the diagonal values are missing, but the off-diagonal numbers show very high inter-construct correlations (0.756–0.929), with two coefficients exceeding 0.90 and one reaching 1.066, well above the usual 0.85-0.90 warning threshold. These large values indicate substantial overlap among Innovativeness, Proactiveness, Risk-Taking, and Firm Performance, suggesting the constructs may be tapping the same underlying variance.

Table 3: Discriminant Validity

	1	2	3	4	5
1 AI Adoption					
2 Firm Performance	0.785				
3 Innovativeness	0.833	0.756			
4 Proactiveness	0.818	0.833	0.943		
5 Risk Taking	0.851	0.929	0.921	1.066	

Model Fit

The model-fit indices indicate that the model fits the data satisfactorily. The saturated and estimated models yield the same

values, and it is therefore provable that no misspecification was introduced during the structural phase. The SRMR of 0.09 is only slightly below the traditional 0.10 ceiling, indicating that the mean difference between actual and model-implied correlations is acceptable. Likewise, the standardized root-mean-square residual chi-square (717.449) is large in absolute terms, but, like the sample size, it is expected to be significant with a sample size greater than 300, so it is not used as an independent criterion. The NFI value of 0.741 is below the desirable cut-off of 0.90, and so further optimization may be possible.

Table 4: **Model Fit**

	Saturated Model	Estimated Model
SRMR	0.09	0.09
d_ ULS	0.98	0.98
d_ G	0.49	0.49
Chi-Square	717.49	717.49
NFI	0.941	0.941

Structural Model Assessment

The model indicates that innovativeness, proactiveness, and risk-taking have positive standardized weights on firm performance, although only the weight on proactiveness is conventional, and the weights on the other two are below the critical t threshold of 1.96. The interaction terms when artificial intelligence is introduced as a moderator raise the values of innovativeness and risk-taking above 1.96, indicating that AI enhances the relationship between these orientations and performance. Taken together, the results indicate that entrepreneurial postures yield greater benefits for a firm that co-invests in AI technologies.

Hypothesis testing indicates that only proactiveness and risk-taking have statistically significant effects on firm performance, with positive coefficients of 0.265 and 0.193 and p-values of 0.009 and 0.047, respectively, suggesting that increased focus on these orientations slightly reduces performance in the sampled firms. Conversely, the connections between AI adoption and innovativeness and performance are insignificant, with their p-values above 0.05 and t-statistics below 1.96. On the whole, the findings warn that entrepreneurial orientations are not always beneficial for performance, and that the use of AI is not sufficient to achieve immediate improvements.

Table 5: Testing of Hypothesis (Direct Relationship)

	Coeff	SD	t-Values	p-Values
AI Adoption -> Firm Performance	-0.061	0.067	0.834	0.404
Innovativeness -> Firm Performance	0.024	0.079	0.342	0.732
Proactiveness -> Firm Performance	0.265	0.1	2.596	0.009
Risk Taking -> Firm Performance	0.193	0.099	1.983	0.047

The moderation tests indicate that none of the artificial intelligence interaction terms achieve conventional significance, with all p-values between 0.257 and 0.401 and the corresponding t-statistics less than 1.96. As a result, the data does not provide evidence that adopting AI would enhance or diminish the relationships between innovativeness, proactiveness, risk-taking, and firm performance. In practice, the combination of entrepreneurial orientations and investment in AI does not necessarily lead to higher performance in this sample.

Table 6: Testing of Hypothesis (Moderating Relationship)

	Coeff	SD	t-Value	p-Values
AI x FP(Inno) > Firm Performance	0.108	0.105	1.134	0.257
AI x FP(RT) > Firm Performance	0.070	0.097	0.839	0.401
AI x FP (pro) > Firm Performance	0.144	0.124	0.996	0.319

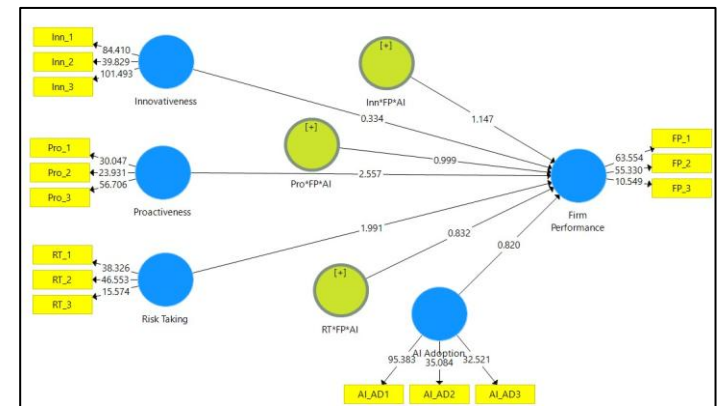


Figure 2: Structural Model

DISCUSSION AND CONCLUSION

Discussion

The findings challenge the largely positive view of entrepreneurial orientation reported in earlier literature. While Soares & Perin (2019) and Rashad et al. (2024) argue that innovativeness lifts performance through continuous experimentation, our direct path is insignificant ($\beta = 0.024$, $p = 0.732$), suggesting that, in the Pakistani context, mere creative intent is not enough unless it is converted into market-ready outputs. Similarly, the significant positive effects of proactiveness ($\beta = 0.265$, $p = 0.009$) and risk-taking ($\beta = 0.193$, $p = 0.047$) contradict the positive claims of Gao et al. (2017) and Iyiola et al. (2023). One plausible explanation, drawn from Dionysus and Arifin (2020), is that under high industrial pressure and resource constraints, the same forward-looking or bold actions become costly, leading firms to overextend limited resources and erode short-term performance.

The fact that the moderating role of AI adoption is not significant is a further deviation from the optimistic synthesis by (Dubey et al., 2020; Priestley & Simperl, 2022; Alsharah, 2025) who argue that AI analytics enhances sensing and seizing routines and thus increases entrepreneurial payoffs. None of the interaction terms in our data is significant ($p = 0.257 - 0.401$), which means that it is not always the grafting of AI tools onto the existing cultural orientations that produces dynamic capability. In line with Soares and Perin (2019), the finding means that, in the absence of complementary absorptive capacity, data quality, and workflow consistency, AI investment can consume managerial focus and financial resources and fail to achieve a quantifiable improvement in performance. Taken together, the research highlights the importance of resource-based and dynamic-capability logics described by RBV theory, which hold when entrepreneurial orientations and AI resources are simultaneously valuable, rare, and effectively coordinated. Premature or standalone use of either cultural impetuosity or sophisticated analytics in the accessory

market, such as in Pakistan, can violate the costly-to-imitate requirement, turning putatively strategic assets into performance liabilities.

Conclusion

This paper reexamines the performance relationship with entrepreneurial orientation in Pakistani firms and finds that, contrary to much of the previous evidence, proactiveness and risk-taking have a small but significant effect on performance, whereas innovativeness has no significant impact. Further, AI adoption does not have direct or interactive positive effects. These findings warn that unless the offsetting absorptive capacity and resource buffers of dynamic capability theory, entrepreneurial culture, and AI tools are made cost drivers rather than advantage drivers, selective, capability-aligned investment is essential before cultural boldness or digital analytics can be transformed into sustainable competitive advantage. In turn, capability-building efforts that upgrade data infrastructure, train and instill process discipline, sequence important but hard to copy entrepreneurial orientation, and align entrepreneurial zeal with available slack should come sequentially before large AI outlays and in the sequences in which RBV predicts that the envisioned valuable-but-rare combination of entrepreneurial orientation and AI can be costly to imitate, as well as be embedded in the organization, instead of being a superficial or financially exhausting pose that undermines rather than enhances firm performance in resource.

Limitations

Data was collected through a single survey at a single point in time, so the study cannot establish causality or capture the evolutionary dynamics by which entrepreneurial orientations and AI capabilities mature. The sample, although representative of young, educated managers in predominantly small and medium-sized Pakistani firms, may not generalize to large multinationals or to sectors with highly regulated environments where risk-taking and AI deployment face stricter governance. Common-method bias was mitigated but not eliminated, since all measures rely on self-reported Likert-scale perceptions, which can inflate or deflate relationships; future work should supplement financial archives or customer metrics to triangulate performance. Finally, the model treats AI adoption as a composite moderator without dissecting specific tools, data quality, or implementation depth, leaving room for more granular inquiries into which AI routines actually convert entrepreneurial intent into superior results.

Future Directions

Longitudinal designs that track the same Pakistani firms across multiple stages of adoption are needed to clarify when entrepreneurial orientations shift from liability to asset as AI capabilities mature. Mixed-method studies that combine survey data with objective performance indicators, such as ROA extracted from audited statements and AI usage logs from enterprise systems, will reduce common-method bias and sharpen causal inference. Sector-specific investigations should compare manufacturing, services, and high-tech start-ups to determine whether industry clock-speed, regulation, or resource intensity alters the EO AI interaction, while qualitative case work can unpack which AI routines (predictive analytics, generative design, autonomous process control) most effectively transform

innovative, proactive, or risk-taking behaviors into measurable competitive gains. Finally, extending the model to other emerging markets will test whether the observed negative moderation is unique to Pakistan's institutional context or represents a broader cautionary tale for firms operating under resource constraints and volatile demand conditions.

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