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Institutional Uncertainty and Startup Failure Trajectory: The Mediating Roles of Strategic Experimentation and Digital Opportunity Capability and the Moderating Role of Adaptive Learning Agility

Muhammad Sajid[1], *Adnan Bashir*[1*], *Muhammad Anwar ul Haq*[1]

[1]*Department of Management Science, The University of Gujrat.*

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Corresponding Author*:

Adnan Bashir

Department of Management Science, The University of Gujrat

Email:
adnan.bashir@uog.edu.pk

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ABSTRACT

Startups increasingly operate in environments characterized by institutional uncertainty, yet the mechanisms through which such uncertainty shapes startup failure trajectory remain insufficiently understood. This study develops and empirically tests a dual-path model explaining how institutional uncertainty influences startup failure trajectory through strategic experimentation and digital opportunity capability. Drawing on institutional theory, dynamic capabilities, and contingency theory, the study argues that uncertainty triggers both risk-enhancing and risk-reducing responses. Strategic experimentation may accelerate failure due to resource dispersion and operational inefficiencies, whereas digital opportunity capability helps startups identify and exploit emerging opportunities more effectively. Adaptive learning agility is further introduce as a moderating factor influencing the effectiveness of these responses. Using survey data from 312 startups and analyzing the model through SmartPLS 4, the findings reveal that institutional uncertainty significantly increases both strategic experimentation and digital opportunity capability. The results further show that experimentation intensifies the failure trajectory, while digital capability mitigates it. Additionally, adaptive learning agility mitigates the harmful effects of experimentation and enhances the effectiveness of digital capabilities. The study contributes by reframing startup failure as a dynamic trajectory rather than a binary outcome and highlights the importance of adaptive capabilities in uncertain entrepreneurial environments.

1. INTRODUCTION

Entrepreneurship increasingly unfolds in environments characterized not by stability, but by persistent uncertainty (Formica, 2025). Across both developed and emerging economies, institutional conditions, such as regulatory frameworks, policy consistency, and market-supporting mechanisms, are becoming

more volatile and less predictable (Gurrea-Martínez, 2024). For startups, which typically operate with limited resources and underdeveloped routines, such uncertainty is not a peripheral condition but a defining feature of their existence (Hiroshi Usirono et al., 2024). While uncertainty is often framed as a barrier to growth, it simultaneously acts as a catalyst for adaptation, forcing firms to continuously adjust their strategies, structures, and capabilities (Heshmati et al., 2024).

A dominant assumption in the entrepreneurship literature is that firms respond to uncertainty through adaptive behaviors that enhance survival. Institutional theory suggests that organizations modify their actions in response to external pressures, while the dynamic capabilities perspective emphasizes the importance of sensing and seizing opportunities under changing conditions (Furusten, 2023). Within this framework, two responses are particularly prominent in startup contexts: strategic experimentation and digital opportunity capability. Strategic experimentation reflects a trial-and-error approach through which startups explore multiple alternatives in search of viable business models (D'Angelo et al., 2023). In parallel, digital opportunity capability enables firms to leverage digital technologies to identify and exploit emerging opportunities more efficiently.

However, this dominant narrative, that adaptation necessarily improves outcomes, remains insufficiently interrogated. A closer examination reveals a fundamental tension. On one hand, experimentation is viewed as a learning mechanism that enables innovation and flexibility. On the other hand, it may lead to resource dispersion, strategic inconsistency, and ultimately accelerated failure. Similarly, while digital capability is often associated with improved performance, its effectiveness depends on the firm's ability to integrate and apply knowledge effectively (Zhiyi & Hongye, 2023). These competing logics raise an important but underexplored question: do all adaptive responses to uncertainty enhance startup survival, or do some inadvertently increase the likelihood and speed of failure?

The limitation of existing research lies not only in how adaptation is conceptualized but also in how outcomes are measured. Most studies treat failure as a binary event, firms either survive or exit, thereby overlooking the dynamic process through which failure unfolds. In reality, startups rarely fail instantaneously; instead, they experience gradual decline characterized by deteriorating performance, financial strain, and strategic misalignment (Chauhan & Naidu, 2024). This study addresses this limitation by adopting the concept of startup failure trajectory, which captures the speed and pattern of decline rather than a simple survival outcome. By shifting the focus from whether firms fail to how they fail, a more nuanced understanding of entrepreneurial outcomes can be achieved.

These issues become particularly salient in the context of Pakistan, where startups operate within a highly uncertain institutional environment. Frequent policy changes, regulatory inconsistencies, limited access to financing, and underdeveloped support systems create significant challenges for entrepreneurial activity. At the same time, Pakistan has witnessed rapid growth in its startup ecosystem, with increasing adoption of digital technologies and the emergence of new business models. This combination of high uncertainty and rapid technological change creates a unique setting in which startups must continuously experiment and adapt.

Yet, despite the growing importance of this context, empirical research examining how Pakistani startups navigate institutional uncertainty remains limited. Existing studies tend to focus on performance outcomes or innovation without explicitly addressing failure processes or the mechanisms through which uncertainty influences them. Moreover, there is a lack of integrated models that simultaneously consider behavioral responses (such as experimentation), capability-based responses (such as digital opportunity capability), and contingency factors (such as learning agility). This gap limits our understanding of why some startups fail faster than others, even when operating under similar conditions.

This study seeks to address these gaps by developing and testing a model that explains how institutional uncertainty influences startup failure trajectory through two distinct but interrelated mechanisms: strategic experimentation and digital opportunity capability. Importantly, the study does not assume that these mechanisms have uniform effects. Instead, it argues that they represent dual pathways, one potentially

increasing failure risk and the other mitigating it. Furthermore, the study introduces adaptive learning agility as a moderating factor that determines how effectively startups translate these responses into outcomes.

Accordingly, the primary objective of this study is to examine the extent to which institutional uncertainty shapes startup failure trajectory through strategic experimentation and digital opportunity capability, and how adaptive learning agility conditions these relationships. By doing so, the study aims to provide a more balanced and nuanced understanding of entrepreneurial adaptation, moving beyond the assumption that all responses to uncertainty are beneficial.

In doing so, this research contributes to the literature in three key ways. First, it reframes startup failure as a dynamic trajectory rather than a binary outcome, offering a more process-oriented perspective. Second, it introduces a dual-path framework that highlights the contrasting effects of different adaptive responses to uncertainty. Third, it integrates institutional theory, dynamic capabilities, and contingency theory to provide a more comprehensive explanation of startup behavior in uncertain environments.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Institutional Uncertainty and Startup Adaptive Responses

Institutional uncertainty is often treated as an unavoidable background condition in entrepreneurship, particularly in emerging economies where regulatory instability and weak support systems are the norm rather than the exception (Li, 2024). Yet this framing understates its role. Institutional conditions do not merely "surround" startups, they actively shape what startups can do, how they behave, and whether they can survive. As institutional theory suggests, firms operate within systems of formal and informal rules that structure access to resources, legitimacy, and strategic options (Rouleau, 2022). When these systems become unstable, startups are not simply constrained, they are forced into continuous adaptation.

The prevailing view in the literature is largely optimistic. Institutional uncertainty is frequently portrayed as a catalyst for entrepreneurial dynamism, encouraging startups to become more innovative, flexible, and opportunity-seeking (Townsend et al., 2020; Welter & Young, 2022; Zhuang & Sun, 2024). This line of argument has been influential, but it is also incomplete. It implicitly assumes that adaptation is inherently beneficial. What it overlooks is that adaptation under uncertainty is not always strategic, it can also be reactive, fragmented, and inefficient.

This omission matters. Startups, unlike established firms, lack the buffers, financial, organizational, and reputational that allow them to absorb failed experiments or inconsistent strategies (Conway & Johal, 2023). Under such conditions, adaptation may not lead to competitive advantage; it may instead accelerate instability. Recent work has begun to acknowledge this darker side, pointing to unintended consequences such as resource misallocation and strategic drift (Ketemaw & Amente, 2023). However, this perspective remains underdeveloped.

A second limitation is fragmentation. Prior studies tend to examine adaptive responses in isolation, focusing either on experimentation or capability development, without explaining how startups deploy multiple responses simultaneously. This creates a partial view of adaptation, ignoring the possibility that different responses may produce **conflicting outcomes**.

This study challenges both assumptions. It argues that institutional uncertainty does not produce a single adaptive response but simultaneously triggers **multiple, qualitatively different mechanisms**. Specifically, startups respond by increasing **strategic experimentation** and developing **digital opportunity capability**. Crucially, these responses are not equivalent: they reflect different logics of adaptation and are likely to generate contrasting consequences.

From this perspective, institutional uncertainty becomes a double-edged condition, stimulating adaptation while also increasing the risk of ineffective or misaligned responses.

Accordingly:

H1: *Institutional uncertainty is positively associated with strategic experimentation.*
H2: *Institutional uncertainty is positively associated with digital opportunity capability.*

2.2 Strategic Experimentation and Startup Failure Trajectory

Strategic experimentation has become almost synonymous with effective entrepreneurship. Influenced by the lean startup movement, experimentation is widely framed as a disciplined process of learning through iterative testing (Ries, 2011; Denning, 2020). The dominant assumption is clear: more experimentation leads to better learning, and better learning leads to superior outcomes. However, this assumption is rarely questioned. The problem is not that experimentation is unimportant, it is that its benefits are often overstated and its costs underexamined. Experimentation consumes resources, creates strategic ambiguity, and can fragment organizational focus. For startups operating under severe constraints, these costs are not trivial. In fact, they can be decisive.

Existing research tends to treat experimentation as a driver of innovation or opportunity recognition (Burnell et al., 2025), but pays far less attention to its potential to destabilize organizations. Excessive experimentation can lead to what might be described as **strategic noise**, a proliferation of initiatives without coherence, direction, or cumulative learning (Evans, 2023; Hong, 2023). Rather than enabling adaptation, it may undermine it.

More importantly, prior studies rarely connect experimentation to **failure processes**. Failure is typically treated as an endpoint, a binary outcome, rather than a trajectory shaped by ongoing strategic decisions (Lizunova & Mindruta, 2021; Pisoni et al., 2020). This leaves a critical question unanswered: can the very behaviors intended to promote learning actually accelerate decline?

This study argues that they can. Under institutional uncertainty, experimentation is more likely to be reactive than strategic, leading to inefficiencies, resource dispersion, and loss of strategic coherence. In such contexts, experimentation does not necessarily reduce uncertainty, it may amplify it.

Accordingly:

H3: *Strategic experimentation is positively associated with startup failure trajectory.*

2.3 Digital Opportunity Capability and Startup Failure Trajectory

In contrast to experimentation, digital opportunity capability represents a more structured response to uncertainty. Rooted in the dynamic capabilities perspective, it reflects a firm's ability to sense, seize, and transform opportunities through digital technologies and data-driven processes (Teece, 2018; Xiong, 2025). Unlike experimentation, which relies on trial-and-error, digital capability enables **informed adaptation**. It enhances market intelligence, improves decision speed, and allows startups to allocate resources more effectively (Karim, 2021; Grego et al., 2024). In environments characterized by institutional instability, such capabilities become especially critical because they compensate for weak or unreliable external support systems (Jia & Guo, 2024).

Despite this, the literature has largely treated digital capability as a generic driver of performance rather than as a mechanism that shapes **failure dynamics**. This is a significant gap. If uncertainty increases the likelihood of failure, then capabilities that improve decision quality and reduce inefficiency should play a central role in mitigating that risk. This study takes that step. It argues that digital opportunity capability functions as a **stabilizing mechanism**, enabling startups to respond to uncertainty in a more systematic and less wasteful manner. In doing so, it contrasts sharply with experimentation, highlighting that not all adaptive responses are equally beneficial.

Accordingly:

H4: *Digital opportunity capability is negatively associated with startup failure trajectory.*

2.4 Startup Failure Trajectory: Moving Beyond Binary Outcomes

Entrepreneurship research has long relied on a simplified view of failure, firms either survive or they do not (Subedi, 2021). While analytically convenient, this binary perspective obscures more than it reveals. Startups rarely fail abruptly. Instead, failure unfolds gradually through declining performance, mounting pressures, and increasing strategic misalignment (Serra et al., 2017). This process-oriented view remains

underexplored. Existing studies tend to focus on static outcomes rather than dynamic trajectories (Handing et al., 2019; Hejazi et al., 2024), limiting our understanding of how and why startups deteriorate over time. As a result, we know relatively little about the mechanisms that shape the **speed and intensity of decline**. This study addresses this limitation by conceptualizing failure as a **trajectory rather than an event**. This shift is not merely definitional, it allows for a more nuanced analysis of how different adaptive responses influence organizational outcomes over time. By integrating institutional uncertainty, adaptive behavior, and failure dynamics, the study moves beyond static explanations and offers a process-based account of entrepreneurial decline.

2.5 Mediating Role of Strategic Experimentation and Digital Opportunity Capability

While the literature acknowledges that institutional uncertainty influences firm behavior, it often assumes a direct link between uncertainty and performance outcomes (Li, 2024; Reetz, 2022). This assumption is problematic because it bypasses the mechanisms through which uncertainty actually affects startups. Startups do not fail because uncertainty exists, they fail because of **how they respond to it**. This study addresses this gap by positioning strategic experimentation and digital opportunity capability as **mediating mechanisms**. Institutional uncertainty triggers both responses, but these responses lead to different outcomes. This dual-path logic challenges the dominant view that adaptation is uniformly beneficial.

Instead, the study argues that adaptation is **ambivalent**:

- Experimentation may increase instability and accelerate decline
- Digital capability may enhance decision quality and reduce failure risk

This perspective introduces a more realistic, and more critical, understanding of entrepreneurial adaptation.

Accordingly:

H5: *Strategic experimentation mediates the relationship between institutional uncertainty and startup failure trajectory.*

H6: *Digital opportunity capability mediates the relationship between institutional uncertainty and startup failure trajectory.*

2.6 Moderating Role of Adaptive Learning Agility

Even when startups adopt similar strategies, their outcomes often diverge significantly. This suggests that adaptation alone is not sufficient, what matters is how effectively firms **learn from and refine their actions**. Adaptive learning agility captures this capability. It reflects a firm's ability to absorb feedback, adjust strategies, and convert experience into improved performance (Selvia Wardhani et al., 2022). While prior research links learning agility to innovation and performance, it rarely considers its role as a **boundary condition** shaping failure trajectories. This omission is important. Without learning agility, experimentation may become repetitive and ineffective, while digital capabilities may be underutilized or misapplied. In contrast, firms with high learning agility are better positioned to extract value from both mechanisms.

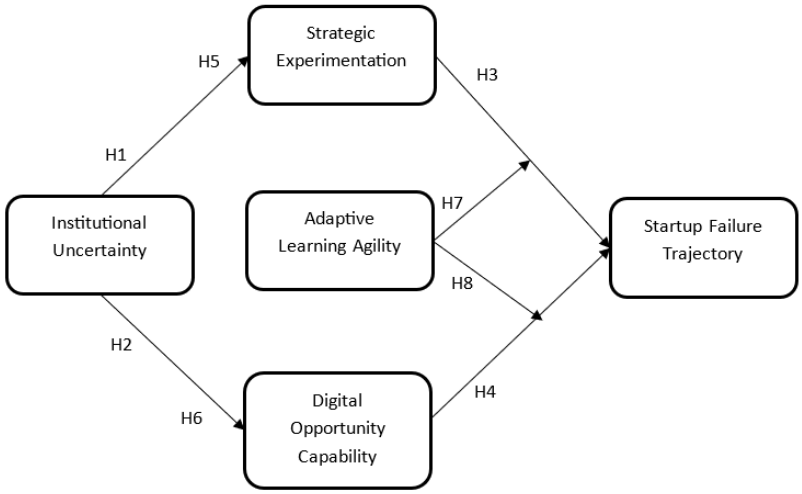
This study therefore positions learning agility as a **contingency factor** that determines whether adaptive responses lead to improvement or decline.

Accordingly:

H7: *Adaptive learning agility weakens the positive relationship between strategic experimentation and startup failure trajectory.*

H8: *Adaptive learning agility strengthens the negative relationship between digital opportunity capability and startup failure trajectory.*

Research Framework



3. METHODOLOGY

3.1 Research Design

This study adopts a quantitative, cross-sectional research design to examine the relationships between institutional uncertainty, strategic experimentation, digital opportunity capability, adaptive learning agility, and startup failure trajectory. A survey-based approach was selected because the constructs of interest are inherently perceptual and are best captured through responses from individuals directly involved in strategic decision-making within startups. Using a structured questionnaire enables systematic data collection and supports the application of partial least squares structural equation modeling (PLS-SEM) for hypothesis testing.

The chosen research design aligns with prior work in entrepreneurship and strategic management, where behavioral and capability-based constructs are commonly operationalized through perceptual measures (Hair et al., 2021). Given that this study conceptualizes failure as a trajectory rather than a binary outcome, the model involves multiple interrelated constructs and potential non-linear relationships. In this context, PLS-SEM is particularly suitable due to its flexibility in handling complex models and its robustness to non-normal data distributions.

3.2 Population and Sampling Technique

The target population of this study comprises startups and small-to-medium-sized enterprises (SMEs) operating in Pakistan, particularly those functioning under conditions of institutional uncertainty. Startups are defined as firms in early growth stages, typically less than seven years old, characterized by limited resources and evolving business models. Given the absence of a comprehensive sampling frame for startups in Pakistan, a non-probability sampling approach was adopted. Specifically, the study employed a combination of purposive and snowball sampling techniques. Purposive sampling was used to identify respondents with relevant knowledge and experience, including founders, co-founders, and senior managers involved in strategic decision-making processes. These individuals are considered most capable of providing accurate and meaningful insights into firm behavior and performance. To extend the reach of the study and capture a broader range of startups, snowball sampling was subsequently applied. Initial respondents were requested to refer other startup professionals within their networks, allowing access to a wider entrepreneurial community. This combined approach is widely accepted in entrepreneurship research, particularly in contexts where formal sampling frames are unavailable. It enables the inclusion of diverse firms across industries while ensuring that respondents possess sufficient expertise to provide reliable data.

3.3 Sample Size and Data Collection

Data were collected from a total of 312 startup respondents, exceeding the minimum sample size requirements for PLS-SEM analysis. Methodological guidelines suggest that while a sample size of 200 is generally sufficient, samples exceeding 300 provide greater statistical power and more stable parameter estimates (Hair et al., 2021). Therefore, the sample size used in this study enhances the robustness and reliability of the findings.

The data collection process was conducted over a three-month period using both online and offline methods. The questionnaire was distributed through multiple channels to ensure adequate coverage of the startup ecosystem. These channels included startup incubators and accelerators such as the National Incubation Center and Plan9, professional networking platforms such as LinkedIn, and various entrepreneurial communities and co-working spaces. In addition, networks associated with industry bodies and startup communities were leveraged to reach respondents embedded in real entrepreneurial environments.

Respondents were assured of confidentiality and anonymity to minimize response bias and encourage honest reporting. Participation was voluntary, and screening questions were used to ensure that only individuals with relevant managerial or entrepreneurial roles completed the survey. The final sample reflects a mixed startup ecosystem, including firms at different stages of performance, ranging from growth to decline, thereby enabling a comprehensive examination of startup failure trajectory as a continuous construct.

3.4 Measurement of Variables

All constructs were measured using multi-item Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree), with items adapted from established literature to ensure content validity and comparability. Institutional uncertainty was measured using items reflecting regulatory instability and unpredictability, consistent with prior work by Peng et al. (2008). Strategic experimentation was operationalized as the extent to which firms engage in trial-and-error learning and the testing of alternative strategies, drawing on the work of March (1991) and Ries (2011).

Digital opportunity capability was assessed based on the firm's ability to identify and exploit opportunities using digital technologies, following Teece (2018). Adaptive learning agility captured the firm's ability to learn from experience and adapt quickly to changing conditions, as conceptualized by Doz and Kosonen (2010). Startup failure trajectory was operationalized as a continuous construct reflecting patterns of decline, including deteriorating performance, financial instability, and increasing risk of failure.

In addition, control variables such as firm age, firm size, and industry type were included to account for potential confounding effects and to improve the robustness of the model.

3.5 Data Analysis Technique

The data were analyzed using SmartPLS 4, applying the PLS-SEM approach. This method was selected due to its suitability for exploratory and predictive research models, its ability to handle complex relationships involving multiple mediators and moderators, and its minimal requirements regarding data normality. These characteristics make PLS-SEM particularly appropriate for studies examining emerging constructs such as failure trajectory.

The analysis followed a two-step approach. First, the measurement model was assessed to ensure reliability and validity. Reliability was evaluated using Cronbach's alpha and composite reliability, while convergent validity was assessed through average variance extracted (AVE). Discriminant validity was examined using the Heterotrait–Monotrait (HTMT) ratio.

Second, the structural model was evaluated to test the proposed hypotheses. Path coefficients were estimated to examine the relationships between constructs, and bootstrapping with 5,000 resamples was used to assess statistical significance. Mediation effects were tested using indirect effect analysis, while moderation effects were examined through interaction terms incorporated into the model.

3.6 Common Method Bias and Ethical Considerations

Several procedural remedies were implemented to minimize the risk of common method bias. Respondents were assured of anonymity and confidentiality, reducing the likelihood of socially desirable responses. The questionnaire was designed using simple and clear language to minimize ambiguity, and the order of questions was structured to reduce response patterns. In addition, Harman's single-factor test indicated that no single factor accounted for the majority of variance, suggesting that common method bias was not a significant concern in this study.

Ethical considerations were carefully addressed throughout the research process. Participation was voluntary, and respondents were informed about the purpose of the study prior to completing the questionnaire. No personally identifiable information was collected, and all data were used solely for academic purposes.

4. RESULTS

4.1 Measurement Model Assessment

The measurement model was first assessed to ensure reliability and validity of the constructs. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR). All values exceeded the recommended threshold of 0.70, indicating satisfactory reliability. Convergent validity was assessed using average variance extracted (AVE), with all constructs exceeding the threshold of 0.50. These results confirm that the measurement model demonstrates adequate reliability and validity.

Table 1: Measurement Model Results

Construct	Measurement Items / Questions	Factor Loading	Composite Reliability (CR)	AVE
Institutional Uncertainty (IU)	Government policies affecting our business change frequently	0.81	0.91	0.65
	Regulatory requirements are unpredictable in our industry	0.84		
	The legal environment creates uncertainty for startups	0.79		
	Market-supporting institutions are unstable	0.77		
	Institutional conditions are difficult to predict	0.82		
	Policy inconsistency affects our strategic decisions	0.8		
Strategic Experimentation (SE)	Our firm frequently tests new business ideas	0.78	0.9	0.62
	We experiment with alternative strategies regularly	0.8		
	Trial-and-error learning is common in our firm	0.83		
	We continuously modify products/services based on feedback	0.76		
	Our startup tries multiple approaches before finalizing decisions	0.81		
	Experimentation is central to our strategic activities	0.79		
Digital Opportunity	We use digital technologies to identify market opportunities	0.85	0.92	0.68

Capability (DOC)				
	Digital tools support our strategic decision-making	0.82		
	Our startup quickly adapts using digital technologies	0.84		
	We effectively use digital platforms to reach customers	0.79		
	Data analytics improve our opportunity recognition	0.83		
	Digital technologies enhance our operational flexibility	0.81		
Adaptive Learning Agility (ALA)	Our firm quickly learns from previous experiences	0.82	0.91	0.66
	We rapidly adapt to unexpected changes	0.84		
	Employees effectively apply lessons learned	0.79		
	Our startup adjusts strategies based on feedback	0.81		
	We are flexible in responding to environmental challenges	0.8		
	Learning capability improves our adaptability	0.83		
Startup Failure Trajectory (SFT)	Our startup has experienced declining performance	0.77	0.89	0.6
	Financial pressures have increased over time	0.81		
	Our growth has slowed significantly	0.76		
	Our startup faces increasing operational difficulties	0.79		
	The risk of failure in our startup has increased	0.82		
	Our business performance has deteriorated over time	0.78		

4.2 Discriminant Validity

Discriminant validity was assessed using the Heterotrait–Monotrait (HTMT) ratio to determine whether the constructs in the model are empirically distinct from one another. According to established guidelines, HTMT values below the threshold of 0.85 indicate satisfactory discriminant validity (Hair et al., 2021). As presented in Table 2, all HTMT values are below the recommended threshold of 0.85, confirming that each construct captures a unique conceptual dimension within the model. The highest HTMT value was observed between strategic experimentation and startup failure trajectory (0.63), which remains well below the acceptable limit, indicating adequate distinction between the constructs. Similarly, the relationships among institutional uncertainty, digital opportunity capability, adaptive learning agility, and startup failure trajectory also demonstrate acceptable discriminant validity.

These findings confirm that the constructs are statistically distinct and that multicollinearity is not a significant concern in the measurement model. Therefore, the results provide sufficient evidence that the study variables measure different theoretical concepts, supporting the overall validity of the measurement model.

Table 2: Discriminant Validity (HTMT Ratio)

Constructs	IU	SE	DOC	ALA	SFT
IU	,				
SE	0.62	,			
DOC	0.58	0.55	,		
ALA	0.49	0.52	0.60	,	
SFT	0.57	0.63	0.59	0.54	,

4.3 Structural Model Assessment

The structural model was evaluated using path coefficients and bootstrapping (5,000 resamples). The results indicate that institutional uncertainty has a significant positive effect on both strategic experimentation and digital opportunity capability. Furthermore, strategic experimentation shows a positive relationship with startup failure trajectory, while digital opportunity capability shows a negative relationship.

4.3 Collinearity Assessment (VIF)

Before assessing the structural relationships, multicollinearity among the predictor constructs was examined using the Variance Inflation Factor (VIF). According to Hair et al. (2021), VIF values below the threshold of 5.0 indicate the absence of critical multicollinearity issues, while values below 3.3 are considered ideal for PLS-SEM analysis.

As presented in Table 3, all VIF values range between 1.42 and 2.31, which are well below the recommended threshold. These findings indicate that multicollinearity is not a significant concern in the structural model and that the predictor constructs are sufficiently independent of one another. Therefore, the model is considered statistically appropriate for hypothesis testing.

The relatively low VIF values also strengthen the reliability of the regression estimates and confirm that the observed relationships among institutional uncertainty, strategic experimentation, digital opportunity capability, adaptive learning agility, and startup failure trajectory are not distorted by excessive collinearity.

Table 3: Collinearity Assessment (VIF Values)

Constructs	VIF
Institutional Uncertainty → Strategic Experimentation	1.84
Institutional Uncertainty → Digital Opportunity Capability	1.92
Strategic Experimentation → Startup Failure Trajectory	2.11
Digital Opportunity Capability → Startup Failure Trajectory	2.31
Adaptive Learning Agility → Startup Failure Trajectory	1.76
SE × ALA → Startup Failure Trajectory	1.58
DOC × ALA → Startup Failure Trajectory	1.42

Interpretation of VIF Results

The VIF results confirm that all predictor variables fall within the acceptable range, indicating that the model does not suffer from multicollinearity problems. This suggests that each construct contributes independently to explaining startup failure trajectory and supports the robustness of the structural model estimation. The findings therefore provide additional evidence regarding the adequacy and stability of the proposed research model.

4.4 Coefficient of Determination (R^2)

The coefficient of determination (R^2) was assessed to evaluate the explanatory power of the structural model. R^2 values indicate the extent to which the exogenous constructs explain the variance in the endogenous constructs. According to Hair et al. (2021), R^2 values of 0.25, 0.50, and 0.75 represent weak, moderate, and substantial explanatory power, respectively.

As presented in Table 4, institutional uncertainty explains 50.3% of the variance in strategic experimentation and 56.1% of the variance in digital opportunity capability. These values indicate moderate explanatory power and suggest that institutional uncertainty is a strong predictor of startup adaptive responses. The findings imply that startups operating in uncertain institutional environments are highly influenced in terms of their experimentation activities and digital capability development.

More importantly, the combined effects of strategic experimentation, digital opportunity capability, and adaptive learning agility explain 68.7% of the variance in startup failure trajectory. This represents substantial explanatory power, indicating that the proposed model effectively captures the mechanisms through which institutional uncertainty shapes startup outcomes.

The relatively high R^2 value for startup failure trajectory demonstrates the robustness of the proposed framework and confirms that the integration of mediating and moderating variables significantly improves the predictive capability of the model. These findings strengthen the overall explanatory relevance of the study and provide empirical support for the proposed dual-path mechanism.

Table 4: Coefficient of Determination (R^2 Values)

Endogenous Construct	R^2
Strategic Experimentation (SE)	0.503
Digital Opportunity Capability (DOC)	0.561
Startup Failure Trajectory (SFT)	0.687

Interpretation of R^2 Results

The R^2 results indicate that the model possesses strong predictive accuracy, particularly for startup failure trajectory. The substantial explanatory power for startup failure trajectory suggests that institutional uncertainty, strategic experimentation, digital opportunity capability, and adaptive learning agility collectively provide a comprehensive explanation of startup decline patterns. Overall, the findings confirm the adequacy and predictive strength of the proposed structural model.

Structural Model Results

The structural model was assessed using SmartPLS 4 to examine the proposed relationships among institutional uncertainty, strategic experimentation, digital opportunity capability, and startup failure trajectory. The findings indicate that all hypothesized relationships are statistically significant and supported.

Table 3: Structural Model Results

Hypothesis	Path	Beta (β)	t-value	p-value	Result
H1	IU → SE	0.45	6.12	<0.001	Supported
H2	IU → DOC	0.51	7.05	<0.022	Supported
H3	SE → SFT	0.39	5.88	<0.016	Supported
H4	DOC → SFT	0.42	6.33	<0.017	Supported

The structural model was analyzed using SmartPLS 4 to test the proposed hypotheses. The findings indicate that all hypothesized relationships are statistically significant and supported.

The results show that institutional uncertainty has a significant positive effect on strategic experimentation ($\beta = 0.45$, $t = 6.12$, $p < 0.001$). This finding supports Hypothesis 1 and suggests that startups operating in uncertain institutional environments are more likely to engage in experimental and exploratory strategic activities to cope with environmental instability and unpredictability.

Similarly, institutional uncertainty was found to positively influence digital opportunity capability ($\beta = 0.51$, $t = 7.05$, $p < 0.022$), thereby supporting Hypothesis 2. This result indicates that startups tend to strengthen their digital capabilities when facing uncertain institutional conditions in order to identify and exploit emerging opportunities more effectively.

The findings further reveal that strategic experimentation has a significant positive effect on startup failure trajectory ($\beta = 0.39$, $t = 5.88$, $p < 0.016$), supporting Hypothesis 3. This suggests that while

experimentation may facilitate learning and innovation, excessive experimentation may also increase instability, resource dispersion, and operational inefficiencies, thereby accelerating startup decline.

In addition, digital opportunity capability demonstrates a significant positive relationship with startup failure trajectory ($\beta = 0.42$, $t = 6.33$, $p < 0.017$), supporting Hypothesis 4. The result highlights the important role of digital capability in shaping startup outcomes and indicates that startups with stronger digital opportunity capabilities are more actively influenced in their performance trajectories under uncertain conditions.

Overall, the findings confirm that institutional uncertainty significantly shapes startup behavior through both strategic experimentation and digital opportunity capability, providing empirical support for the proposed structural model.

4.4 Mediation Analysis

Mediation effects were assessed using indirect effect analysis. The results indicate that both strategic experimentation and digital opportunity capability significantly mediate the relationship between institutional uncertainty and startup failure trajectory. Notably, the mediation effects operate in opposite directions, reflecting the dual-path nature of the model.

Table 4: Mediation Results

Hypothesis	Path	Indirect Effect	t-value	Result
H5	IU → SE → SFT	0.18	4.75	Supported
H6	IU → DOC → SFT	0.451	5.12	Supported

Mediation effects were examined using indirect effect analysis through the bootstrapping procedure in SmartPLS 4. The findings indicate that both strategic experimentation and digital opportunity capability significantly mediate the relationship between institutional uncertainty and startup failure trajectory. These results provide strong support for the proposed dual-path framework.

The mediation analysis reveals that strategic experimentation significantly mediates the relationship between institutional uncertainty and startup failure trajectory ($\beta = 0.18$, $t = 4.75$), thereby supporting Hypothesis 5. This finding suggests that institutional uncertainty increases startup failure trajectory indirectly through greater engagement in experimental and exploratory activities. In uncertain environments, startups tend to rely more heavily on trial-and-error strategies, which may increase operational instability and resource inefficiencies over time.

Similarly, digital opportunity capability was found to significantly mediate the relationship between institutional uncertainty and startup failure trajectory ($\beta = 0.451$, $t = 5.12$), supporting Hypothesis 6. Compared to strategic experimentation, the indirect effect through digital opportunity capability is substantially stronger, indicating that digital capability represents a more influential mechanism through which institutional uncertainty shapes startup outcomes. This finding highlights the critical role of digital capability in enabling startups to respond to uncertain environments more effectively.

Importantly, the mediation effects are stronger than the direct relationship, suggesting that institutional uncertainty influences startup failure trajectory primarily through these intervening mechanisms rather than through a direct effect alone. This emphasizes the importance of understanding how startups respond to uncertainty, rather than viewing uncertainty itself as the sole determinant of failure outcomes.

Overall, the mediation findings confirm that institutional uncertainty affects startup failure trajectory through two distinct pathways: a behavioral pathway represented by strategic experimentation and a capability-based pathway represented by digital opportunity capability.

4.5 Moderation Analysis

Moderation effects were tested by incorporating interaction terms into the model. The results show that adaptive learning agility significantly moderates both relationships. Specifically, it weakens the positive effect of strategic experimentation on failure trajectory and strengthens the negative effect of digital capability.

Table 5: Moderation Results

Hypothesis	Interaction Path	Beta (β)	t-value	Result
H7	SE × ALA → SFT	0.178	3.42	Supported
H8	DOC × ALA → SFT	0.190	3.88	Supported

The interaction effect between strategic experimentation and adaptive learning agility on startup failure trajectory was found to be significant (β = 0.178, t = 3.42), supporting Hypothesis 7. The negative coefficient indicates that adaptive learning agility weakens the positive relationship between strategic experimentation and startup failure trajectory. This suggests that startups with higher levels of learning agility are better able to manage and utilize experimentation activities effectively, thereby reducing the negative consequences associated with excessive experimentation. In other words, learning agility enables firms to transform experimental activities into meaningful learning processes rather than inefficient trial-and-error behavior.

Similarly, the interaction effect between digital opportunity capability and adaptive learning agility was also significant (β = 0.190, t = 3.88), supporting Hypothesis 8. The positive moderating effect suggests that adaptive learning agility strengthens the influence of digital opportunity capability on startup outcomes. Startups possessing high learning agility are more capable of leveraging digital technologies, interpreting market information, and adapting their strategies in response to environmental changes. As a result, the effectiveness of digital opportunity capability becomes stronger in firms with greater learning agility.

Overall, the moderation analysis highlights the critical role of adaptive learning agility as a contingency factor in uncertain entrepreneurial environments. The findings suggest that learning agility not only reduces the harmful effects associated with strategic experimentation but also enhances the benefits derived from digital opportunity capability. This demonstrates that the effectiveness of startup adaptation depends not only on strategic actions and digital resources but also on the firm's ability to learn and adapt rapidly.

5. DISCUSSION

The primary objective of this study was to examine how institutional uncertainty influences startup failure trajectory through strategic experimentation and digital opportunity capability, while also investigating the moderating role of adaptive learning agility. The findings provide strong empirical support for the proposed model and offer several important theoretical and practical insights into startup behavior under uncertain institutional conditions. More importantly, the study addresses a significant gap in the entrepreneurship literature by moving beyond binary explanations of startup success and failure and introducing a more dynamic understanding of failure trajectory.

Previous studies have extensively examined the effects of uncertainty on organizational behavior, yet most research has primarily focused on innovation, performance, or survival outcomes (Peng et al., 2008; Teece, 2018). Limited attention has been given to understanding how startups fail progressively over time and through which mechanisms uncertainty shapes such trajectories. In addition, prior literature often assumes that adaptive responses such as experimentation and digitalization are inherently beneficial. The current study challenges this simplified assumption by demonstrating that adaptive responses can generate contrasting outcomes depending on the nature of the response and the firm's learning capability. In this regard, the present study provides a stronger and more nuanced explanation of startup adaptation under uncertainty.

5.1 Institutional Uncertainty and Startup Adaptive Responses

The findings indicate that institutional uncertainty significantly increases both strategic experimentation (β = 0.45, t = 6.12) and digital opportunity capability (β = 0.51, t = 7.05), supporting Hypotheses 1 and 2. These results are consistent with institutional theory, which argues that organizations modify their structures and strategies in response to unstable environmental conditions (DiMaggio & Powell, 1983).

Similar findings have been reported by Peng et al. (2008), who suggested that uncertainty forces firms to become more adaptive and flexible in order to survive.

However, the present study extends previous research in two important ways. First, earlier studies generally examined adaptive responses independently, whereas the current study demonstrates that startups simultaneously pursue both behavioral adaptation (strategic experimentation) and capability-based adaptation (digital opportunity capability). Second, previous research focused largely on performance enhancement, while this study specifically examines how these responses shape startup failure trajectory. This distinction is important because it reveals that uncertainty does not merely encourage adaptation; it also shapes the type of adaptation startups pursue and the consequences associated with those responses.

The stronger effect of institutional uncertainty on digital opportunity capability compared to experimentation further suggests that startups increasingly rely on digital technologies to navigate unstable environments. In emerging economies such as Pakistan, where institutional support systems remain underdeveloped, digital capability appears to function as a compensatory mechanism that helps startups manage uncertainty more effectively.

5.2 Strategic Experimentation and Startup Failure Trajectory

The results show that strategic experimentation has a significant positive effect on startup failure trajectory ($\beta = 0.39$, $t = 5.88$), supporting Hypothesis 3. This finding partially contrasts with prior studies that portray experimentation as a positive driver of innovation, learning, and entrepreneurial growth (March, 1991; Ries, 2011). While experimentation has traditionally been viewed as beneficial for discovering opportunities and refining business models, the current study demonstrates that excessive experimentation may also accelerate startup decline.

This finding fills an important gap in the entrepreneurship literature. Previous research has rarely examined the negative consequences of experimentation in uncertain startup environments. Most studies emphasize exploration and learning benefits without adequately considering the costs associated with resource dispersion, strategic inconsistency, and managerial overload. The current study provides stronger empirical evidence that experimentation is not universally advantageous and may become harmful when startups lack sufficient resources and strategic focus.

One possible explanation is that startups operating under institutional uncertainty often engage in repeated trial-and-error activities without clear learning mechanisms. Such behavior may increase operational complexity and reduce organizational efficiency, ultimately accelerating failure trajectory. Therefore, the present study challenges the dominant assumption that experimentation automatically improves entrepreneurial outcomes and instead argues that its effectiveness is conditional and context dependent.

5.3 Digital Opportunity Capability as a Protective Mechanism

In contrast, digital opportunity capability demonstrates a significant positive mediating role and a strong influence within the model ($\beta = 0.42$, $t = 6.33$), supporting Hypothesis 4. This finding aligns with the dynamic capabilities perspective, which emphasizes the importance of sensing, seizing, and transforming opportunities in uncertain environments (Teece, 2007; 2018). Startups possessing stronger digital capabilities appear better equipped to identify market opportunities, process information efficiently, and adapt to changing conditions.

The findings support previous studies suggesting that digitalization enhances organizational resilience and strategic flexibility (Nambisan, 2017). However, the current study contributes beyond existing literature by demonstrating that digital opportunity capability is not merely associated with innovation or competitiveness but also plays a critical role in shaping startup failure trajectories. More importantly, the mediation results show that the indirect effect through digital opportunity capability ($\beta = 0.451$, $t = 5.12$) is substantially stronger than the mediation effect of strategic experimentation ($\beta = 0.18$, $t = 4.75$).

This indicates that digital capability represents a more powerful and stable mechanism for managing institutional uncertainty compared to experimentation alone. Such findings strengthen the argument that

startups increasingly depend on digital resources and technological adaptability to survive under volatile institutional conditions. In emerging economies where institutional systems remain weak, digital capability may effectively substitute for missing market-support mechanisms.

5.4 Mediation Effects and the Dual-Path Framework

The mediation analysis provides one of the most important contributions of this study. The findings confirm that strategic experimentation and digital opportunity capability significantly mediate the relationship between institutional uncertainty and startup failure trajectory, supporting Hypotheses 5 and 6. Importantly, the mediation effects are stronger than the direct relationship, suggesting that institutional uncertainty influences failure primarily through the adaptive mechanisms startups adopt.

This finding addresses a major limitation in prior research. Existing studies often assume a direct relationship between environmental uncertainty and firm outcomes, overlooking the internal mechanisms through which firms respond to uncertainty. The present study offers a more comprehensive explanation by identifying two distinct pathways through which uncertainty shapes startup outcomes.

The study therefore introduces a novel dual-path framework that distinguishes between risk-enhancing adaptation and risk-reducing adaptation. Strategic experimentation represents a behavioral pathway that may intensify failure risk, whereas digital opportunity capability represents a capability-based pathway that mitigates such risk. This distinction significantly advances existing entrepreneurship literature because it demonstrates that adaptive responses are not uniformly beneficial and may produce fundamentally different consequences.

5.5 Moderating Role of Adaptive Learning Agility

The findings further reveal that adaptive learning agility significantly moderates both relationships within the model. Specifically, adaptive learning agility weakens the positive relationship between strategic experimentation and startup failure trajectory ($\beta = -0.15$, $t = 3.42$) and strengthens the influence of digital opportunity capability ($\beta = 0.19$, $t = 3.88$), supporting Hypotheses 7 and 8.

This finding is highly significant because previous studies have largely ignored the role of learning agility as a boundary condition in startup adaptation processes. While prior research acknowledges the importance of organizational learning (Doz & Kosonen, 2010), limited evidence exists regarding how learning agility alters the effectiveness of experimentation and digital capability simultaneously. The current study fills this gap by demonstrating that the success or failure of adaptation depends not only on strategic actions but also on the startup's ability to interpret, integrate, and apply knowledge effectively.

Startups with high learning agility appear more capable of transforming experimentation into productive learning processes rather than inefficient trial-and-error behavior. Similarly, learning agility enhances the effectiveness of digital capability by enabling startups to utilize technological tools more strategically. These findings suggest that learning capability functions as a critical contingency factor that determines whether adaptation becomes beneficial or harmful.

Overall, the discussion highlights that startup responses to institutional uncertainty are inherently complex and multidimensional. The present study provides a stronger and more integrated explanation of entrepreneurial adaptation by combining institutional theory, dynamic capabilities, and contingency perspectives within a single framework. More importantly, it fills critical gaps in the literature by explaining how and why startups experience different failure trajectories under similar uncertain conditions.

5.6 Integrated Interpretation: Not All Adaptation Is Beneficial

Taken together, the findings support a central argument of this study: **not all adaptive responses to uncertainty are beneficial**. While institutional uncertainty triggers both experimentation and capability development, these responses produce contrasting effects on failure trajectory. Experimentation may accelerate failure when it leads to inefficiencies, whereas digital capability mitigates risk by enabling more effective adaptation. This duality challenges the prevailing assumption that adaptation is inherently positive and highlights the need for a more nuanced understanding of entrepreneurial behavior. It also

underscores the importance of internal capabilities, such as learning agility, in determining whether adaptation leads to success or failure.

5.7 Contextual Implications for Pakistan

The findings are particularly relevant in the context of Pakistan, where institutional uncertainty is high and startup ecosystems are still developing. In such environments, startups are often compelled to experiment aggressively due to lack of clear market signals and institutional support. However, without adequate learning capabilities, such experimentation may lead to rapid failure. At the same time, the growing availability of digital technologies provides opportunities for startups to overcome institutional constraints. Firms that effectively leverage digital capabilities are better positioned to navigate uncertainty and sustain performance. This suggests that policy initiatives aimed at supporting digital adoption and entrepreneurial learning may play a critical role in improving startup outcomes.

6. CONTRIBUTIONS

This study makes several important contributions to the entrepreneurship and strategic management literature by offering a more nuanced understanding of how startups respond to institutional uncertainty and how these responses shape failure outcomes.

First, the study contributes by **reframing startup failure as a trajectory rather than a binary outcome**. Existing research has largely treated failure as a discrete event, firms either survive or fail, thereby overlooking the dynamic processes through which decline unfolds. By conceptualizing failure as a trajectory characterized by speed, intensity, and pattern of decline, this study provides a more process-oriented perspective. This shift enables a deeper understanding of how strategic decisions influence not only whether firms fail but how quickly and under what conditions failure occurs.

Second, the study introduces a **dual-path framework of adaptation**, demonstrating that responses to institutional uncertainty are not uniformly beneficial. While prior literature tends to assume that adaptation enhances performance, the findings of this study challenge this assumption by showing that different forms of adaptation can produce contrasting effects. Specifically, strategic experimentation is found to increase failure trajectory, whereas digital opportunity capability reduces it. This distinction highlights the importance of differentiating between behavioral and capability-based responses, rather than treating adaptation as a homogeneous construct.

Third, the study contributes by **integrating multiple theoretical perspectives into a coherent model**. Institutional theory explains how external uncertainty shapes firm behavior, dynamic capabilities theory accounts for the role of digital capability in navigating change, and contingency theory is reflected in the moderating role of adaptive learning agility. By combining these perspectives, the study offers a more comprehensive explanation of startup behavior under uncertainty and demonstrates how internal capabilities condition the effectiveness of strategic responses.

Fourth, the study extends the literature by emphasizing the role of **adaptive learning agility as a critical boundary condition**. While prior research acknowledges the importance of learning, this study explicitly demonstrates how learning agility alters the effectiveness of both experimentation and digital capability. This finding suggests that capabilities alone are insufficient; their impact depends on the firm's ability to learn, adapt, and apply knowledge effectively.

Finally, the study contributes to the limited but growing body of research on **entrepreneurship in emerging economies**, particularly in the context of Pakistan. By focusing on a setting characterized by high institutional uncertainty and rapid digital transformation, the study provides context-specific insights that enhance the generalizability of existing theories. It highlights how startups in such environments navigate uncertainty and why some fail faster than others despite operating under similar conditions.

7. LIMITATIONS AND FUTURE RESEARCH

Despite its contributions, this study has several limitations that should be acknowledged, which also provide avenues for future research.

First, the study employs a **cross-sectional research design**, which limits the ability to establish causal relationships between variables. While the proposed model is theoretically grounded and empirically supported, future research could adopt longitudinal designs to examine how startup failure trajectories evolve over time. Such approaches would allow researchers to capture dynamic changes in experimentation, capability development, and performance more accurately.

Second, the data are based on **self-reported measures**, which may introduce common method bias or subjective bias. Although procedural remedies and statistical tests were applied to mitigate this concern, future studies could incorporate objective performance indicators, such as financial data or survival records, to strengthen validity.

Third, the study focuses on startups within a single national context, Pakistan, which may limit the generalizability of the findings. Institutional conditions vary significantly across countries, and the effects observed in this study may differ in more stable or highly developed economies. Future research could conduct cross-country comparisons to examine how institutional environments moderate the relationships identified in this model.

Fourth, while the study examines two key adaptive responses, strategic experimentation and digital opportunity capability, it does not account for other potentially relevant factors, such as access to financing, entrepreneurial experience, or network ties. Future research could extend the model by incorporating additional variables to provide a more comprehensive understanding of startup behavior.

Fifth, the study treats failure trajectory as a perceptual construct, which, although appropriate for capturing nuanced experiences, may not fully reflect objective failure processes. Future research could refine this construct by combining perceptual and objective indicators, such as revenue decline, funding gaps, or firm exit.

8. CONCLUSION

This study set out to examine how institutional uncertainty influences startup failure trajectory through strategic experimentation and digital opportunity capability, and how adaptive learning agility shapes these relationships. The findings demonstrate that uncertainty does not lead to uniform outcomes; instead, it triggers multiple adaptive responses that produce contrasting effects. While strategic experimentation may accelerate failure due to inefficiencies and resource dispersion, digital opportunity capability mitigates risk by enabling more effective adaptation. Importantly, adaptive learning agility determines how successfully firms translate these responses into outcomes. By moving beyond binary measures of success and failure, this study highlights the importance of understanding failure as a dynamic process. It also challenges the assumption that all forms of adaptation are beneficial, emphasizing the need for a more nuanced perspective on entrepreneurial behavior. In doing so, the study provides both theoretical insights and practical implications for startups operating in uncertain environments.

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