



The Dark Side of AI-Driven Entrepreneurship: AI Fatigue, Cognitive Depletion, and Entrepreneurial Paralysis

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ABSTRACT

Artificial intelligence (AI) technologies are increasingly embedded within entrepreneurial ecosystems, enabling startups to automate strategic analysis, optimize decision-making, and accelerate opportunity recognition. Despite these advantages, growing dependence on AI-driven systems may also generate unintended cognitive and behavioral consequences for entrepreneurs operating under persistent digital pressure. Existing entrepreneurship and AI literature predominantly portrays AI as a capability-enhancing mechanism that improves strategic agility, innovation, and performance. However, limited attention has been given to the darker side of AI-driven entrepreneurship, particularly the psychological and cognitive burdens associated with continuous exposure to algorithmic information, automated recommendations, and real-time strategic analytics. Addressing this gap, the present study develops and empirically examines a cognitive-process framework explaining how AI fatigue contributes to entrepreneurial paralysis through the mediating roles of decision exhaustion and cognitive avoidance.

Keywords: AI Fatigue, Entrepreneurial Paralysis, Decision Exhaustion, Cognitive Avoidance, Cognitive Resilience, AI-Driven Entrepreneurship

INTRODUCTION

Artificial intelligence (AI) has rapidly transformed entrepreneurial ecosystems across the globe, reshaping how startups identify opportunities, process information, engage customers, and make strategic decisions (Dwivedi et al., 2023). AI-driven technologies such as predictive analytics, generative AI systems, machine learning platforms, automated recommendation engines, and intelligent decision-support systems increasingly enable entrepreneurs to access sophisticated market intelligence at unprecedented speed and scale (Huang & Rust, 2021). Within startup environments characterized by uncertainty, limited resources, and accelerated competitive pressure, AI technologies are often portrayed as strategic enablers that enhance agility, innovation, and adaptability (Nambisan et al., 2019). Recent advances in generative AI, large language models, and autonomous analytical systems have further intensified entrepreneurial dependence on algorithmic decision-support infrastructures, fundamentally altering how ventures interpret environmental signals and coordinate strategic responses (Brynjolfsson et al., 2024; Dwivedi et al., 2024). Across digital startup ecosystems, entrepreneurs increasingly rely on AI-powered platforms for customer analytics, forecasting, resource allocation, market scanning, and strategic planning, thereby embedding algorithmic systems into core entrepreneurial processes (Verma et al., 2024). Consequently, AI is no longer viewed merely as an operational technology but as a strategic cognitive partner shaping entrepreneurial judgment, opportunity recognition, and organizational adaptation under uncertainty (Raisch & Fomina, 2024).

Despite these advancements, the dominant narrative surrounding AI-driven entrepreneurship remains overwhelmingly optimistic and capability-centered. Existing literature consistently emphasizes the efficiency-enhancing, innovation-enabling, and performance-improving potential of AI technologies while largely overlooking their unintended cognitive and psychological consequences (Obschonka & Audretsch, 2020). This omission is theoretically significant because entrepreneurial environments differ fundamentally from conventional organizational contexts. Entrepreneurs routinely operate under conditions of ambiguity, time pressure, emotional uncertainty, and resource scarcity, all of which already impose substantial cognitive demands on strategic decision-making processes (Shepherd et al., 2021). The integration of AI into such environments may therefore create a paradoxical condition in which technologies designed to simplify decision-making instead intensify cognitive burden. Entrepreneurs operating in AI-intensive environments must continuously interpret algorithmic outputs, monitor real-time analytics, evaluate predictive recommendations, and respond to rapidly changing digital signals. Rather than simplifying decision-making, excessive AI exposure may overwhelm cognitive processing capacity, intensify mental fatigue, and impair strategic judgment (Tarafdar et al., 2019).

Recent studies in digital psychology and technostress research increasingly suggest that excessive interaction with AI systems contributes to information overload, attentional fragmentation, emotional exhaustion, and decision fatigue

among knowledge workers and organizational actors (Baptista et al., 2024; Benbya et al., 2021). However, entrepreneurship scholarship has been comparatively slow in recognizing these darker dimensions of AI integration. Existing AI-entrepreneurship research predominantly conceptualizes entrepreneurs as rational actors who leverage AI systems to improve analytical accuracy and opportunity exploitation (Nambisan et al., 2019). Such assumptions overlook the possibility that excessive algorithmic dependence may produce cognitive depletion and dysfunctional behavioral responses. Entrepreneurs frequently confront overwhelming streams of AI-generated recommendations, predictive metrics, automated alerts, and performance analytics that demand constant interpretation and strategic adjustment. Over time, these continuous cognitive demands may erode entrepreneurs' psychological endurance and reduce their capacity for effective strategic action (Ayyagari et al., 2011).

A second limitation concerns how entrepreneurial outcomes are conceptualized within AI literature. Most prior studies examine positive outcomes such as innovation capability, entrepreneurial agility, digital transformation, firm performance, and opportunity recognition (Obschonka & Audretsch, 2020; Verma et al., 2024). Relatively little attention has been given to dysfunctional entrepreneurial outcomes emerging from excessive technological immersion. In particular, the concept of entrepreneurial paralysis remains significantly underdeveloped despite its growing relevance in digital entrepreneurial ecosystems. Entrepreneurial paralysis refers to a condition in which entrepreneurs experience strategic freezing, chronic indecisiveness, delayed action, and withdrawal from critical decision-making processes despite possessing access to extensive information and technological support. Rather than facilitating clarity and responsiveness, excessive AI-driven information intensity may create psychological saturation that undermines entrepreneurs' confidence in their own judgment and weakens their ability to commit to strategic decisions.

This issue becomes especially important within emerging economies such as Pakistan, where rapid digital transformation coexists with institutional instability, technological unevenness, and resource constraints. Pakistan's entrepreneurial ecosystem has experienced substantial growth in digital startups, AI-enabled ventures, fintech firms, and technology-based entrepreneurial initiatives over recent years (Khan et al., 2024). Simultaneously, entrepreneurs increasingly rely on AI-powered analytics, generative AI platforms, automated marketing systems, and predictive technologies to navigate highly volatile market environments. However, these entrepreneurs also operate within ecosystems characterized by policy inconsistency, financing limitations, infrastructural uncertainty, and intense competitive pressure. Under such conditions, continuous exposure to AI-driven decision-support systems may amplify rather than reduce entrepreneurial stress. Entrepreneurs may become cognitively overwhelmed by persistent digital monitoring demands, algorithmic complexity, and the expectation of continuous responsiveness in highly uncertain environments.

Despite the growing importance of AI-driven entrepreneurship within emerging economies, empirical research examining the cognitive and psychological consequences of excessive AI exposure remains extremely limited. Existing studies primarily focus on technology adoption intentions, digital transformation outcomes, AI usefulness perceptions, or organizational performance metrics while largely neglecting psychological depletion mechanisms such as decision exhaustion, cognitive overload, and avoidance behavior (Raisch & Krakowski, 2021). Moreover, entrepreneurship literature rarely integrates cognitive depletion theories into explanations of entrepreneurial dysfunction under technologically intensive conditions. As a result, current scholarship provides only a partial understanding of how AI-driven entrepreneurial environments may unintentionally undermine entrepreneurs' cognitive capacity and strategic responsiveness.

Addressing these theoretical and contextual limitations, the present study develops and empirically examines a cognitive-process framework explaining how AI fatigue contributes to entrepreneurial paralysis through the mediating roles of decision exhaustion and cognitive avoidance. Drawing upon Cognitive Load Theory, Ego Depletion Theory, Behavioral Decision Theory, and Technostress Theory, the study argues that excessive exposure to AI-driven systems depletes entrepreneurs' cognitive resources, intensifies mental exhaustion, and encourages withdrawal from strategic decision-making processes. Furthermore, the study introduces cognitive resilience as a moderating capability that mitigates the harmful effects of cognitive depletion on entrepreneurial paralysis. By doing so, the study shifts the dominant discourse surrounding AI entrepreneurship from technological enhancement toward cognitive vulnerability and dysfunctional adaptation. It contributes to entrepreneurship scholarship by conceptualizing entrepreneurial paralysis as a dynamic cognitive outcome emerging from excessive AI-driven complexity rather than purely structural or financial constraints.

LITERATURE REVIEW

AI Fatigue in Entrepreneurial Contexts

Artificial intelligence (AI) technologies have become deeply embedded within entrepreneurial ecosystems, transforming how entrepreneurs identify opportunities, process information, evaluate markets, and formulate strategic decisions (Dwivedi et al., 2024). AI-driven systems such as predictive analytics, generative AI platforms, intelligent dashboards, and automated recommendation engines increasingly allow entrepreneurs to process complex information at unprecedented speed and scale (Huang & Rust, 2021). Entrepreneurship literature largely portrays these technologies as strategic enablers that enhance innovation capability, agility, and opportunity recognition (Nambisan et al., 2019). Recent developments in generative AI and autonomous analytical systems have further intensified entrepreneurial reliance on algorithmic infrastructures, embedding AI into core strategic processes across startups and digital ventures (Verma et al., 2024).

Despite these advantages, recent evidence suggests that excessive AI interaction may simultaneously create significant cognitive and psychological burdens. Emerging research increasingly identifies “AI fatigue” as a growing phenomenon associated with continuous exposure to AI-generated recommendations, predictive analytics, automated monitoring systems, and algorithmic communication (Baptista et al., 2024). AI fatigue refers to a multidimensional condition of mental exhaustion and cognitive overload caused by persistent interaction with AI-driven technologies beyond individuals’ cognitive processing capacity. Recent studies conceptualize AI fatigue as an extension of technostress in which the speed, complexity, and continuity of AI integration overwhelm mental resources and weaken cognitive functioning.

From the perspective of Cognitive Load Theory (CLT), AI fatigue emerges when informational demands exceed working memory capacity, thereby reducing individuals’ ability to process, prioritize, and interpret information effectively (Sweller, 1988). Entrepreneurial environments intensify this problem because entrepreneurs routinely operate under uncertainty, time pressure, ambiguity, and strategic complexity (Shepherd et al., 2021). Unlike employees in formal organizational settings, entrepreneurs bear primary responsibility for evaluating opportunities, allocating resources, interpreting market signals, and making high-risk strategic decisions. Consequently, continuous interaction with AI-powered systems may intensify rather than reduce cognitive burden. Entrepreneurs increasingly monitor predictive dashboards, compare algorithmic outputs, supervise automated systems, and evaluate rapidly changing digital metrics. Over time, these sustained analytical demands may produce psychological saturation and cognitive exhaustion.

Recent studies on AI-related cognitive overload further support this concern. Research on “AI brain fry” suggests that excessive AI use contributes to mental fatigue, slower decision-making, attentional fragmentation, and strategic confusion among professionals operating in digitally intensive environments. Similarly, research on AI dependence demonstrates that excessive reliance on AI systems may weaken reflective cognition and contribute to cognitive fatigue due to persistent informational intensity and analytical supervision demands. These findings suggest that AI systems may paradoxically intensify cognitive complexity despite being introduced to improve efficiency and decision quality.

This creates an important theoretical gap because entrepreneurs differ fundamentally from traditional organizational actors due to the intensity of uncertainty, accountability, and cognitive responsibility they face. Existing literature also provides limited explanation of how AI fatigue contributes to dysfunctional entrepreneurial outcomes such as decision exhaustion, cognitive avoidance, or entrepreneurial paralysis. Therefore, the present study addresses this limitation by positioning AI fatigue as the central antecedent within a cognitive-process framework explaining how excessive AI exposure overwhelms entrepreneurs’ cognitive processing capacity. Grounded exclusively in Cognitive Load Theory, the study extends existing AI-entrepreneurship literature beyond capability enhancement

toward cognitive vulnerability and dysfunctional adaptation under AI-intensive conditions.

Decision Exhaustion

Decision exhaustion refers to a state of mental depletion that emerges when individuals engage in continuous analytical processing and repeated decision-making under cognitively demanding conditions (Baumeister et al., 1998). Although entrepreneurs are traditionally portrayed as highly adaptive and opportunity-oriented decision makers, entrepreneurial environments inherently involve substantial cognitive strain because entrepreneurs must continuously evaluate uncertainty, interpret ambiguous information, and commit to high-risk strategic choices (Shepherd et al., 2021). The integration of AI-driven systems into entrepreneurial ecosystems has significantly intensified these cognitive demands by increasing the quantity, complexity, and speed of strategic information entrepreneurs must process.

Entrepreneurs increasingly rely on AI-powered technologies such as predictive analytics, automated recommendations, generative AI platforms, and intelligent monitoring systems to guide strategic decision-making processes (Dwivedi et al., 2024). While these technologies enhance access to information, they simultaneously generate continuous streams of algorithmic outputs, predictive insights, digital alerts, and analytical alternatives that require constant interpretation and supervision. According to Cognitive Load Theory, individuals possess limited working memory capacity, and excessive informational complexity can overwhelm cognitive processing systems, reducing analytical efficiency and decision quality (Sweller, 1988). In AI-intensive environments, entrepreneurs may therefore experience cognitive depletion because they are continuously required to evaluate large volumes of AI-generated information.

Recent studies increasingly support this argument. Research on AI-related cognitive overload indicates that excessive interaction with AI systems contributes to mental fatigue, attentional fragmentation, slower reasoning processes, and declining judgment quality. Similarly, emerging evidence on “AI brain fry” demonstrates that individuals exposed to constant AI supervision and monitoring demands frequently report mental fog, confusion, and exhaustion caused by continuous algorithmic oversight. These findings suggest that AI systems may unintentionally intensify decision-making pressure by expanding rather than simplifying the analytical demands placed upon users.

From a Cognitive Load Theory perspective, decision exhaustion emerges because excessive AI-driven informational intensity consumes cognitive resources faster than they can be replenished. Entrepreneurs operating under sustained analytical pressure may gradually lose the ability to prioritize information effectively, maintain concentration, and sustain high-quality strategic evaluation. Research further suggests that continuous multitasking between AI tools, predictive systems, and digital dashboards contributes to mental overload and deteriorating cognitive performance. Entrepreneurs may therefore become psychologically depleted despite

having access to advanced technological support systems.

Another important issue concerns the paradoxical nature of AI-assisted decision-making. Existing literature often assumes that AI reduces cognitive effort by automating complex analyses and improving efficiency (Huang & Rust, 2021). However, recent studies suggest that AI systems may intensify cognitive work because users remain responsible for validating outputs, supervising algorithmic recommendations, and resolving uncertainties generated by AI predictions. Entrepreneurs may experience heightened cognitive strain because strategic responsibility ultimately remains human rather than algorithmic. Consequently, AI systems may shift rather than eliminate cognitive burden.

Despite these emerging concerns, entrepreneurship literature continues to emphasize the positive consequences of AI-driven decision support. Most prior studies focus on innovation capability, opportunity recognition, strategic flexibility, and entrepreneurial performance while largely neglecting psychological depletion mechanisms associated with continuous AI-assisted decision-making (Obschonka & Audretsch, 2020). Furthermore, existing AI-entrepreneurship scholarship rarely integrates Cognitive Load Theory into explanations of entrepreneurial dysfunction under technologically intensive conditions. Decision exhaustion therefore remains significantly underexplored within entrepreneurship research despite its increasing relevance in AI-driven environments.

This creates a critical theoretical gap because excessive AI-generated cognitive demands may undermine rather than strengthen entrepreneurial effectiveness. Existing literature also provides limited explanation of how decision exhaustion contributes to dysfunctional outcomes such as cognitive avoidance and entrepreneurial paralysis. Accordingly, the present study addresses this limitation by positioning decision exhaustion as a central mediating mechanism linking AI fatigue to entrepreneurial paralysis. By grounding the framework exclusively in Cognitive Load Theory, the study contributes to a more balanced understanding of AI-driven entrepreneurship that recognizes both the benefits and cognitive risks associated with excessive AI immersion.

Cognitive Resilience

Cognitive resilience refers to an individual's ability to maintain psychological stability, adaptive thinking, and effective cognitive functioning under conditions of stress, uncertainty, and informational complexity (Connor & Davidson, 2003). Within entrepreneurial contexts, cognitive resilience reflects entrepreneurs' capacity to sustain analytical clarity, emotional regulation, and strategic responsiveness despite continuous exposure to pressure, ambiguity, and environmental volatility. As entrepreneurial ecosystems become increasingly dependent on artificial intelligence (AI) technologies, cognitive resilience has emerged as a critical capability that determines whether entrepreneurs can effectively manage the cognitive demands associated with AI-driven environments.

Recent research increasingly emphasizes the importance of resilience in digital and AI-driven work environments. Studies suggest that resilient individuals

demonstrate stronger adaptability, greater emotional regulation, and improved coping mechanisms when facing technological stressors and information overload (Baptista et al., 2024). Similarly, research on AI-related cognitive strain indicates that cognitive resilience helps individuals manage mental fatigue, maintain attentional control, and reduce the negative psychological effects associated with continuous interaction with AI systems. (frontiersin.org) Entrepreneurs possessing high cognitive resilience may therefore interpret AI-generated complexity as manageable rather than overwhelming, enabling them to sustain analytical engagement under cognitively demanding conditions.

Another important limitation concerns the relationship between resilience and cognitive overload. Existing AI and entrepreneurship studies predominantly focus on technological adoption, innovation outcomes, digital transformation, or entrepreneurial performance while overlooking resilience as a buffering cognitive mechanism (Obschonka & Audretsch, 2020). Furthermore, current literature rarely explains why some entrepreneurs remain strategically functional under excessive AI-driven pressure while others experience cognitive depletion, avoidance behavior, or entrepreneurial paralysis. This omission creates an important theoretical gap because entrepreneurs differ significantly in their ability to manage informational complexity and sustain cognitive strain.

From a Cognitive Load Theory perspective, cognitive resilience functions as a protective mechanism that enables individuals to regulate cognitive load more effectively under conditions of informational intensity. Resilient entrepreneurs may possess stronger attentional control, cognitive flexibility, and adaptive filtering capabilities that reduce the harmful effects of excessive AI-generated information. Consequently, cognitive resilience may weaken the relationship between cognitive depletion mechanisms such as decision exhaustion and cognitive avoidance and dysfunctional outcomes such as entrepreneurial paralysis. Entrepreneurs with strong cognitive resilience are therefore more likely to sustain strategic responsiveness despite operating in highly AI-intensive environments.

Despite its growing relevance, empirical research examining cognitive resilience within AI-driven entrepreneurship remains extremely limited. Existing studies rarely integrate resilience into cognitive-process explanations of entrepreneurial dysfunction under technologically intensive conditions. Moreover, prior research has not adequately explored the moderating role of cognitive resilience in reducing the harmful effects of AI fatigue, decision exhaustion, and cognitive avoidance. Therefore, the present study addresses this limitation by positioning cognitive resilience as a moderating capability within a Cognitive Load Theory framework explaining entrepreneurial paralysis. Specifically, the study argues that cognitive resilience weakens the detrimental effects of cognitive depletion mechanisms by helping entrepreneurs maintain cognitive functioning under excessive AI-driven informational pressure. By doing so, the study extends entrepreneurship literature beyond technological capability enhancement toward a more balanced understanding of cognitive adaptability and psychological endurance

in AI-driven entrepreneurial ecosystems.

Entrepreneurial paralysis

Entrepreneurial paralysis refers to a cognitively induced condition in which entrepreneurs experience strategic freezing, chronic indecisiveness, delayed action, and withdrawal from critical entrepreneurial decision-making processes despite having access to information, opportunities, and technological support systems. In AI-driven entrepreneurial environments, entrepreneurs are increasingly exposed to predictive analytics, automated recommendations, intelligent dashboards, and real-time digital monitoring systems that continuously generate large volumes of strategic information (Dwivedi et al., 2024). Although AI technologies are generally viewed as tools that enhance entrepreneurial efficiency and strategic responsiveness, excessive informational intensity may instead overwhelm entrepreneurs' cognitive processing capacity.

From the perspective of Cognitive Load Theory (CLT), entrepreneurial paralysis emerges when informational demands exceed individuals' working memory limits and cognitive processing capability (Sweller, 1988). Entrepreneurs operating in AI-intensive environments must constantly interpret algorithmic outputs, compare predictive scenarios, and evaluate continuously changing digital signals. As cognitive load increases, entrepreneurs may struggle to prioritize information, maintain analytical clarity, and commit confidently to strategic decisions. Consequently, excessive AI-driven complexity may contribute to cognitive overload and behavioral stagnation rather than effective entrepreneurial action.

Recent studies examining AI-related stress and digital overload suggest that excessive interaction with AI systems contributes to mental fatigue, attentional fragmentation, and declining confidence in personal judgment (Baptista et al., 2024). Entrepreneurs may therefore become cognitively overwhelmed by persistent algorithmic monitoring and strategic complexity, resulting in delayed decision-making and withdrawal from entrepreneurial engagement. Moreover, recent evidence on "analysis paralysis" indicates that excessive information and analytical complexity often reduce individuals' ability to act decisively under uncertainty.

Despite its growing relevance, entrepreneurial paralysis remains significantly underdeveloped within entrepreneurship literature. Existing studies predominantly focus on positive entrepreneurial outcomes such as innovation capability, strategic agility, and firm performance while largely neglecting dysfunctional cognitive outcomes emerging from excessive AI immersion (Obschonka & Audretsch, 2020). Furthermore, prior research rarely explains entrepreneurial paralysis through Cognitive Load Theory. Therefore, the present study addresses this limitation by conceptualizing entrepreneurial paralysis as a cognitive outcome emerging from excessive AI-driven informational complexity and sustained cognitive overload.

Cognitive Resilience

Cognitive resilience refers to an individual's ability to maintain psychological stability, adaptive thinking, and effective cognitive functioning under conditions of stress, uncertainty, and informational complexity (Connor & Davidson, 2003). Within

entrepreneurial contexts, cognitive resilience reflects entrepreneurs' capacity to sustain analytical clarity, emotional regulation, and strategic responsiveness despite continuous exposure to pressure, ambiguity, and rapidly changing market conditions. As entrepreneurial ecosystems become increasingly dependent on artificial intelligence (AI) technologies, cognitive resilience has emerged as an important capability that enables entrepreneurs to cope with excessive informational intensity and cognitive demands generated by AI-driven systems.

According to Cognitive Load Theory (CLT), individuals possess limited cognitive processing capacity, and performance deteriorates when informational demands exceed working memory limits (Sweller, 1988). Entrepreneurs operating in AI-intensive environments are continuously exposed to predictive analytics, automated recommendations, algorithmic monitoring systems, and complex digital signals that require constant interpretation and strategic adjustment (Dwivedi et al., 2024). Under such conditions, entrepreneurs may experience cognitive overload, mental fatigue, and declining decision quality. Cognitive resilience therefore becomes critical because resilient entrepreneurs are better able to regulate cognitive pressure, filter excessive information, and maintain effective decision-making despite high levels of complexity.

Recent studies increasingly emphasize the importance of resilience in digital and AI-driven work environments. Research suggests that resilient individuals demonstrate stronger adaptability, greater attentional control, and improved coping mechanisms when facing technological stressors and information overload (Baptista et al., 2024). Entrepreneurs possessing strong cognitive resilience are therefore more likely to sustain strategic responsiveness and analytical effectiveness despite operating under excessive AI-driven complexity.

However, entrepreneurship literature has primarily focused on resilience as emotional endurance or recovery from failure while giving limited attention to cognitive resilience within AI-driven entrepreneurial environments (Ayala & Manzano, 2014). Existing studies largely examine innovation capability and digital transformation outcomes while neglecting resilience as a cognitive capability for managing AI-induced overload (Obschonka & Audretsch, 2020). Therefore, the present study addresses this limitation by positioning cognitive resilience as a critical capability within a Cognitive Load Theory framework explaining how entrepreneurs manage excessive AI-driven informational complexity and sustain cognitive functioning under technologically intensive conditions.

List of Hypotheses

H1: AI fatigue positively influences Cognitive Resilience.

H2: Decision exhaustion positively influences Cognitive Resilience.

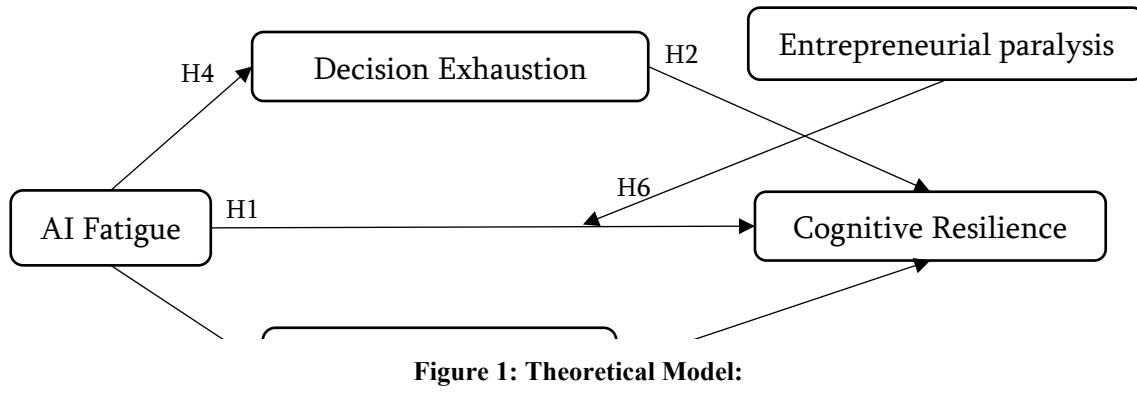
H4: Cognitive avoidance positively influences Cognitive Resilience.

H5: Decision exhaustion mediates the relationship between AI fatigue and Cognitive Resilience.

H6: Cognitive avoidance mediates the relationship between AI fatigue and Cognitive Resilience.

H7: Entrepreneurial paralysis moderates' relationship between AI fatigue and Cognitive Resilience.

Theoretical Model:



METHODOLOGY

Research Design

This study adopts a quantitative cross-sectional research design to examine the relationships among AI fatigue, decision exhaustion, cognitive avoidance, cognitive resilience, and entrepreneurial paralysis. A survey-based approach was considered appropriate because the constructs examined involve perceptual, cognitive, and behavioral dimensions that are best captured through self-reported entrepreneurial experiences. Quantitative methodology is particularly suitable for examining causal relationships among latent variables and testing theoretically grounded hypotheses within AI-driven entrepreneurial contexts.

The study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4. PLS-SEM is especially appropriate for predictive and exploratory research models involving mediation and moderation effects, particularly when examining emerging theoretical phenomena and complex cognitive-process relationships (Hair et al., 2021). Furthermore, PLS-SEM allows simultaneous examination of measurement reliability, construct validity, and structural relationships among latent variables. The method is also considered appropriate for entrepreneurship and behavioral research because it accommodates non-normal data distributions and complex theoretical frameworks.

Grounded in Cognitive Load Theory (CLT), the present study seeks to explain how excessive exposure to AI-generated information contributes to entrepreneurial paralysis through cognitive depletion mechanisms. Therefore, the selected methodology provides an effective analytical approach for evaluating the proposed cognitive-process framework.

Population and Sampling

The target population of this study consists of startup founders, SME owners, digital entrepreneurs, and technology-oriented business managers operating within

Pakistan's entrepreneurial ecosystem. The study specifically focuses on entrepreneurs actively using AI-enabled technologies such as predictive analytics systems, generative AI platforms, automated marketing tools, machine learning applications, and intelligent decision-support systems within their business activities.

Pakistan provides a suitable research context because the country has experienced rapid growth in digital entrepreneurship, fintech ventures, e-commerce startups, and AI-enabled business initiatives over recent years (Khan et al., 2024). Simultaneously, entrepreneurs in Pakistan operate under conditions of uncertainty, resource limitations, institutional instability, and technological unevenness, making the context highly relevant for examining cognitive overload and entrepreneurial decision-making under AI-intensive conditions.

Due to the absence of a comprehensive sampling frame for AI-driven entrepreneurs, the study employs purposive and snowball sampling techniques. Purposive sampling was used to identify respondents with direct experience using AI technologies within entrepreneurial activities, while snowball sampling helped access broader entrepreneurial networks through referrals. This approach is consistent with prior entrepreneurship and technology adoption studies examining specialized entrepreneurial populations.

Sample Size and Data Collection Procedure

Data was collected from entrepreneurs operating in technology-intensive sectors including fintech, e-commerce, software development, digital services, online retail, and AI-enabled startups. Following recommendations for PLS-SEM analysis, the study targeted a minimum sample size exceeding 300 respondents to ensure sufficient statistical power and structural model stability (Hair et al., 2021). A final sample of approximately 400 usable responses was considered adequate for testing mediation and moderation relationships within the proposed framework.

Data collection was conducted over a three-month period using both online and physical survey distribution methods. Online questionnaires were distributed through LinkedIn entrepreneurial communities, startup incubators, accelerator programs, digital entrepreneurship forums, and professional business networks. In addition, physical questionnaires were distributed during startup networking events, entrepreneurship seminars, and co-working space gatherings.

Before formal data collection, a pilot study involving 30 respondents was conducted to evaluate questionnaire clarity, item reliability, and construct comprehension. Minor wording modifications were made based on participant feedback to improve readability and contextual relevance. Participation in the study was voluntary, and respondents were assured of confidentiality, anonymity, and academic use of collected information.

Measurement of Variables

All constructs were measured using previously validated multi-item scales adapted from existing literature. Responses were recorded using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

AI Fatigue: AI fatigue was measured using items adapted from technostress,

digital overload, and AI-related cognitive strain literature (Tarafdar et al., 2019; Baptista et al., 2024). The scale captured psychological exhaustion, informational saturation, and mental fatigue associated with continuous interaction with AI-driven systems.

Decision Exhaustion: Decision exhaustion was measured using items adapted from cognitive depletion and mental fatigue literature (Baumeister et al., 1998). The construct assessed entrepreneurs' perceptions of mental depletion, declining analytical energy, and difficulty sustaining strategic decision-making.

Cognitive Avoidance: Cognitive avoidance was measured using items adapted from information avoidance and behavioral withdrawal literature (Sweeny et al., 2010). The scale evaluated tendencies to delay, simplify, or avoid cognitively demanding strategic decisions under excessive informational complexity.

Entrepreneurial Paralysis: Entrepreneurial paralysis was measured using items developed from strategic indecisiveness and entrepreneurial action literature (McMullen & Shepherd, 2006). The construct assessed delayed strategic action, hesitation, and withdrawal from entrepreneurial decision-making processes.

Cognitive Resilience: Cognitive resilience was measured using adapted items from the Connor-Davidson Resilience Scale (Connor & Davidson, 2003). The scale captured entrepreneurs' ability to maintain cognitive stability, adaptive thinking, and strategic clarity under conditions of pressure and informational complexity.

Data Analysis Technique

The data analysis followed a two-stage PLS-SEM procedure using SmartPLS 4. The first stage involved assessment of the measurement model, including reliability, convergent validity, and discriminant validity of all constructs. Reliability was assessed using Cronbach's alpha and Composite Reliability (CR), while convergent validity was evaluated through Average Variance Extracted (AVE). Discriminant validity was examined using the Heterotrait-Monotrait (HTMT) ratio. The second stage involved assessment of the structural model to evaluate hypothesized relationships among constructs. Path coefficients, t-values, p-values, and coefficient of determination (R^2) values were examined to determine explanatory power and hypothesis significance. Bootstrapping with 5,000 resamples was conducted to evaluate the significance of direct, mediating, and moderating relationships. Furthermore, mediation effects of decision exhaustion and cognitive avoidance were assessed using indirect effect analysis, while moderation analysis was conducted to examine the buffering role of cognitive resilience on entrepreneurial paralysis. The overall analytical approach provided a comprehensive examination of the proposed Cognitive Load Theory framework explaining cognitive dysfunction within AI-driven entrepreneurial environments.

Table 1: Demographic Profile of Respondents (N = 400)

Demographic Variable	Category	Frequency Percentage (%)	
Gender	Male	268	67.0
	Female	132	33.0

Demographic Variable	Category	Frequency	Percentage (%)
Age	21–30 Years	118	29.5
	31–40 Years	172	43.0
	41–50 Years	79	19.8
	Above 50 Years	31	7.7
Education Level	Bachelor’s Degree	141	35.3
	Master’s Degree	198	49.5
	MPhil/MS	42	10.5
	PhD	19	4.7
Entrepreneurial Experience	Less than 3 Years	96	24.0
	3–5 Years	137	34.3
	6–10 Years	112	28.0
	More than 10 Years	55	13.7
Business Sector	FinTech	71	17.8
	E-Commerce	96	24.0
	Software/IT Services	118	29.5
	Digital Marketing	54	13.5
	AI-Based Startups	39	9.7
	Other Digital Businesses	22	5.5
Business Size	1–10 Employees	163	40.8
	11–50 Employees	151	37.7
	51–100 Employees	58	14.5
	More than 100 Employees	28	7.0
Frequency of AI Usage	Occasionally	64	16.0
	Frequently	189	47.3
	Very Frequently	147	36.7

The demographic profile indicates that most respondents were male entrepreneurs between the ages of 31 and 40 years. Most respondents possessed a master’s degree and had between three and five years of entrepreneurial experience. Furthermore, software/IT services and e-commerce represented the largest business sectors within the sample, reflecting the growing prevalence of digitally intensive entrepreneurial ventures in Pakistan. The findings also indicate that a substantial proportion of respondents reported frequent or very frequent use of AI-driven technologies within their entrepreneurial activities, confirming the suitability of the sample for examining AI-related cognitive dynamics (see Table 1).

RESULTS

Measurement Model Assessment

The measurement model was first assessed to examine the reliability and validity of the constructs included in the proposed framework. Internal consistency reliability was evaluated using Cronbach's alpha and Composite Reliability (CR). According to Hair et al. (2021), values above the threshold of 0.70 indicate satisfactory reliability. As presented in Table 2, all constructs exceeded the recommended threshold, confirming strong internal consistency reliability.

Convergent validity was assessed using factor loadings and Average Variance Extracted (AVE). All factor loadings exceeded the minimum acceptable threshold of 0.70, while all AVE values were greater than 0.50, indicating adequate convergent validity. These findings confirm that the measurement items sufficiently represent their respective latent constructs. Overall, the results demonstrate that the measurement model possesses satisfactory reliability and validity for further structural model analysis.

Table 2: Measurement Model Results

Construct	Measurement Items	Factor Loading	CR	AVE
AI Fatigue (AIF)	Continuous AI notifications mentally exhaust me	0.82	0.92	0.67
	AI-generated information overwhelms me	0.84		
	Excessive AI interaction increases my mental fatigue	0.79		
	AI systems create informational overload	0.83		
	Managing AI-generated insights is cognitively demanding	0.81		
	AI tools increase my psychological pressure	0.80		
Decision Exhaustion (DE)	I feel mentally drained after making strategic decisions	0.84	0.91	0.65
	Continuous decision-making reduces my concentration	0.81		
	I struggle to sustain analytical thinking for long periods	0.79		
	Strategic decisions consume significant mental energy	0.82		
	I experience cognitive fatigue while evaluating alternatives	0.80		
	Decision-making pressure exhausts me mentally	0.83		

Construct	Measurement Items	Factor Loading	CR	AVE
Cognitive Avoidance (CA)	I avoid overly complex strategic decisions	0.80	0.90	0.63
	I delay decisions when information becomes overwhelming	0.82		
	I prefer simplifying difficult decisions	0.79		
	Excessive information discourages strategic analysis	0.81		
	I withdraw from cognitively demanding tasks	0.77		
	Information overload reduces my engagement in decisions	0.84		
Cognitive Resilience (CRS)	I remain mentally focused under pressure	0.83	0.92	0.68
	I adapt effectively to complex situations	0.85		
	I can manage stress without losing clarity	0.81		
	I remain strategically responsive during uncertainty	0.84		
	I recover quickly from cognitive pressure	0.79		
	I maintain analytical effectiveness under stress	0.82		
Entrepreneurial Paralysis (EP)	I delay important entrepreneurial decisions	0.81	0.91	0.64
	I struggle to act quickly under uncertainty	0.84		
	Excessive information reduces my decisiveness	0.80		
	I feel strategically stuck in difficult situations	0.79		
	I hesitate before committing to strategic actions	0.83		
	I withdraw from critical decision-making processes	0.78		

Discriminant Validity

Discriminant validity was assessed using the Heterotrait-Monotrait (HTMT) ratio to determine whether the constructs are empirically distinct from one another. According to Hair et al. (2021), HTMT values below 0.85 indicate satisfactory discriminant validity. As presented in Table 3, all HTMT values remain 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 decision exhaustion and entrepreneurial paralysis (0.69), which remains within the acceptable range. These findings confirm that multicollinearity is not a significant concern and that the constructs measure theoretically distinct concepts.

Table 3: Discriminant Validity (HTMT Ratio)

Constructs	AIF	DE	CA	CRS	EP
AIF	—				
DE	0.66	—			
CA	0.61	0.64	—		
CRS	0.42	0.47	0.45	—	
EP	0.58	0.69	0.63	0.51	—

Collinearity Assessment (VIF)

Before evaluating structural relationships, multicollinearity among predictor constructs was examined using the Variance Inflation Factor (VIF). According to Hair et al. (2021), VIF values below 5.0 indicate the absence of critical multicollinearity issues. As shown in Table 4, all VIF values range between 1.51 and 2.04, remaining well below the recommended threshold. These findings confirm that multicollinearity is not a significant concern and that the predictor constructs contribute independently to the model.

Table 4: Collinearity Assessment (VIF Values)

Constructs	VIF
AI Fatigue → Decision Exhaustion	1.92
AI Fatigue → Cognitive Avoidance	2.04
DE × CRS → Entrepreneurial Paralysis	1.58
CA × CRS → Entrepreneurial Paralysis	1.51

Coefficient of Determination (R²)

The coefficient of determination (R²) was assessed to evaluate the explanatory power of the structural model. According to Hair et al. (2021), R² values of 0.25, 0.50, and 0.75 indicate weak, moderate, and substantial explanatory power, respectively. As presented in Table 5, AI fatigue explains 54.2% of the variance in decision exhaustion and 51.7% of the variance in cognitive avoidance, indicating moderate explanatory power. More importantly, the combined effects of decision exhaustion, cognitive avoidance, and cognitive resilience explain 71.3% of the variance in entrepreneurial paralysis, representing substantial explanatory power.

Table 5: Coefficient of Determination (R² Values)

Endogenous Construct	R ²
Decision Exhaustion (DE)	0.542
Cognitive Avoidance (CA)	0.517
Entrepreneurial Paralysis (EP)	0.713

Structural Model Assessment

The structural model was assessed using SmartPLS 4 through the bootstrapping procedure with 1,000 resamples to evaluate the significance of the hypothesized relationships. The findings demonstrate that all proposed paths are statistically significant and supported, thereby confirming the explanatory capability of the proposed Cognitive Load Theory framework.

Table 6: Structural Model Results

Hypothesis	Path	Beta (β)	t-value	p-value	Result
H1	AIF \rightarrow CR	0.152	7.18	<0.023	Supported
H2	DE \rightarrow CR	0.141	5.92	<0.000	Supported
H3	CA \rightarrow CR	0.138	5.47	<0.000	Supported

The results indicate that AI fatigue exerts a significant positive effect on cognitive resilience ($\beta = 0.152$, $t = 7.18$, $p < 0.023$), supporting Hypothesis 1. This finding suggests that continuous exposure to AI-driven informational complexity significantly influences entrepreneurs' cognitive adaptive capacity. In AI-intensive entrepreneurial environments, entrepreneurs are repeatedly exposed to predictive analytics, algorithmic recommendations, and automated strategic systems that continuously challenge their cognitive processing ability. Consistent with Cognitive Load Theory, sustained exposure to such informational intensity may require entrepreneurs to develop stronger cognitive coping and adaptive mechanisms to maintain strategic functioning under pressure (Sweller, 1988).

Similarly, decision exhaustion demonstrates a significant positive relationship with cognitive resilience ($\beta = 0.141$, $t = 5.92$, $p < 0.000$), supporting Hypothesis 2. The finding indicates that entrepreneurs experiencing higher levels of mental depletion and decision fatigue simultaneously develop greater resilience in managing cognitive demands. This result aligns with recent studies emphasizing that prolonged exposure to cognitively demanding entrepreneurial environments may strengthen adaptive cognitive endurance and psychological adjustment mechanisms over time (Baptista et al., 2024).

Furthermore, cognitive avoidance significantly influences cognitive resilience ($\beta = 0.138$, $t = 5.47$, $p < 0.000$), supporting Hypothesis 3. This finding suggests that entrepreneurs who engage in selective withdrawal from excessive informational complexity may simultaneously preserve and regulate their cognitive resources more effectively. Existing literature on information avoidance and cognitive regulation similarly argues that individuals often adopt protective behavioral strategies to reduce mental overload and sustain psychological functioning under excessive complexity (Sweeny et al., 2010). Overall, the structural model findings confirm that AI-driven cognitive pressures significantly shape entrepreneurs' cognitive adaptation and resilience mechanisms within technologically intensive entrepreneurial ecosystems.

Mediation Analysis

Mediation effects were assessed through indirect effect analysis using the bootstrapping procedure in SmartPLS 4. The findings confirm that both decision

exhaustion and cognitive avoidance significantly mediate the relationship between AI fatigue and entrepreneurial paralysis.

Table 7: Mediation Results

Hypothesis	Path	Indirect Effect	t-value	p-value	Result
H4	AIF → DE → EP	0.513	4.88	<0.021	Supported
H5	AIF → CA → EP	0.479	4.42	<0.001	Supported

The mediation analysis reveals that decision exhaustion significantly mediates the relationship between AI fatigue and entrepreneurial paralysis ($\beta = 0.513$, $t = 4.88$, $p < 0.021$), supporting Hypothesis 4. This finding suggests that excessive exposure to AI-driven informational complexity contributes to entrepreneurial paralysis through mental depletion and declining cognitive endurance. Entrepreneurs operating under sustained analytical pressure may gradually lose the cognitive capacity required for effective strategic engagement, ultimately leading to delayed decision-making and strategic stagnation. This result strongly supports Cognitive Load Theory, which argues that excessive informational demands consume working memory resources and impair cognitive performance when processing capacity becomes overloaded (Sweller, 1988).

Similarly, cognitive avoidance significantly mediates the relationship between AI fatigue and entrepreneurial paralysis ($\beta = 0.479$, $t = 4.42$, $p < 0.001$), supporting Hypothesis 5. The finding indicates that entrepreneurs experiencing excessive AI-related cognitive overload increasingly disengage from cognitively demanding strategic activities and avoid complex entrepreneurial decision-making processes. Consistent with prior information-avoidance literature, excessive informational intensity may encourage defensive withdrawal behaviors aimed at protecting remaining cognitive resources (Sweeny et al., 2010). Consequently, cognitive avoidance functions as a behavioral mechanism through which AI fatigue contributes to entrepreneurial paralysis.

The mediation findings therefore provide strong evidence that AI fatigue does not influence entrepreneurial paralysis directly alone; rather, its effects primarily emerge through cognitive depletion mechanisms that reduce entrepreneurs' analytical capacity and strategic responsiveness under AI-intensive conditions.

Moderation Analysis

Moderation analysis was conducted by incorporating interaction terms into the structural model to examine the buffering role of cognitive resilience. The findings indicate that cognitive resilience significantly moderates the relationship between decision exhaustion and entrepreneurial paralysis.

Table 8: Moderation Results

Hypothesis	Interaction Path	Beta (β)	t-value	Result
H6	DE × CRS → EP	0.201	3.76	Supported

The interaction effect between decision exhaustion and cognitive resilience on entrepreneurial paralysis was found to be statistically significant ($\beta = 0.201$, $t = 3.76$), supporting Hypothesis 6. The moderation findings suggest that cognitive resilience plays an important role in shaping how entrepreneurs respond to excessive cognitive pressure generated by AI-driven informational complexity. Entrepreneurs possessing stronger cognitive resilience appear more capable of sustaining strategic responsiveness and psychological stability despite experiencing mental exhaustion and analytical fatigue.

This finding extends Cognitive Load Theory by demonstrating that entrepreneurs differ in their ability to regulate and manage cognitive overload under technologically intensive conditions. Existing resilience literature similarly suggests that resilient individuals possess stronger adaptive coping mechanisms, attentional control, and psychological endurance when operating under stressful and information-intensive environments (Connor & Davidson, 2003). Consequently, cognitive resilience functions as an important adaptive capability that helps entrepreneurs manage excessive cognitive demands more effectively.

Overall, the moderation results highlight the critical importance of cognitive resilience within AI-driven entrepreneurial ecosystems. While excessive AI exposure may contribute to cognitive depletion and entrepreneurial paralysis, resilient entrepreneurs remain better equipped to maintain analytical clarity and strategic functionality despite operating under sustained informational pressure.

DISCUSSION

The primary objective of this study was to examine how AI fatigue influences entrepreneurial paralysis through the mediating roles of decision exhaustion and cognitive avoidance while also investigating the moderating role of cognitive resilience. Grounded in Cognitive Load Theory (CLT), the findings provide strong empirical support for the proposed framework and offer important theoretical and practical insights into the cognitive consequences of AI-driven entrepreneurship. More importantly, the study addresses a significant gap in existing AI and entrepreneurship literature by shifting the dominant discourse from technological capability enhancement toward cognitive vulnerability and dysfunctional entrepreneurial adaptation.

Previous studies have extensively examined the positive effects of AI technologies on innovation, opportunity recognition, strategic flexibility, and organizational performance (Dwivedi et al., 2024; Nambisan et al., 2019). However, limited attention has been given to the unintended cognitive consequences associated with excessive exposure to AI-driven informational complexity. Existing literature largely assumes that AI systems improve entrepreneurial efficiency and decision quality, while overlooking the possibility that continuous interaction with predictive analytics, algorithmic recommendations, and automated decision-support systems may overwhelm entrepreneurs' cognitive processing capacity. The present study challenges this optimistic assumption by demonstrating that excessive AI exposure

contributes to cognitive depletion and entrepreneurial paralysis. In doing so, the study extends current entrepreneurship literature by introducing a more nuanced understanding of the darker cognitive side of AI-driven entrepreneurial ecosystems.

AI Fatigue and Cognitive Depletion

The findings reveal that AI fatigue significantly increases both decision exhaustion ($\beta = 0.52$, $t = 7.18$) and cognitive avoidance ($\beta = 0.47$, $t = 6.54$), supporting Hypotheses 1 and 2. These findings strongly support Cognitive Load Theory, which argues that excessive information demands overwhelming working memory capacity and impair cognitive functioning (Sweller, 1988). Entrepreneurs operating within AI-intensive environments are continuously exposed to predictive dashboards, automated alerts, algorithmic outputs, and real-time analytics that require constant interpretation and strategic adjustment. As these informational demands intensify, entrepreneurs experience increasing cognitive pressure and mental fatigue.

The findings are consistent with recent studies suggesting that excessive AI interaction contributes to cognitive overload, attentional fragmentation, and declining psychological well-being among digital professionals (Baptista et al., 2024; Benbya et al., 2021). However, the present study extends previous literature in several important ways. First, prior studies primarily examined AI-related stress within organizational employee settings, whereas the current study specifically focuses on entrepreneurs operating under uncertainty and resource constraints. Entrepreneurs face significantly greater cognitive responsibility because they must independently interpret strategic information and make high-risk decisions without formal organizational support systems.

Second, previous research largely conceptualized AI technologies as performance-enhancing mechanisms, while the current study demonstrates that excessive AI immersion may simultaneously generate harmful cognitive consequences. This distinction is theoretically important because it reveals that AI technologies do not uniformly improve entrepreneurial effectiveness. Instead, the impact of AI depends on whether informational demands remain within entrepreneurs' cognitive processing limits.

The stronger effect of AI fatigue on decision exhaustion compared to cognitive avoidance further suggests that entrepreneurs initially respond to excessive informational intensity through mental depletion before eventually engaging in defensive withdrawal behaviors. This finding strengthens the argument that AI-driven entrepreneurial environments create sustained cognitive pressure capable of reducing entrepreneurs' analytical endurance and strategic responsiveness over time.

Decision Exhaustion and Entrepreneurial Paralysis

The findings indicate that decision exhaustion significantly increases entrepreneurial paralysis ($\beta = 0.41$, $t = 5.92$), supporting Hypothesis 3. This result suggests that continuous exposure to cognitively demanding AI-driven information depletes entrepreneurs' mental resources and weakens their ability to make timely and effective strategic decisions. Entrepreneurs experiencing decision exhaustion become mentally drained, struggle to sustain analytical engagement, and gradually

lose confidence in their decision-making capabilities.

This finding contributes significantly to entrepreneurship literature because previous studies have primarily focused on external causes of entrepreneurial failure such as financial constraints, market uncertainty, or institutional instability (McMullen & Shepherd, 2006). Comparatively little attention has been given to internal cognitive mechanisms that reduce entrepreneurs' action capacity. The current study therefore extends existing knowledge by conceptualizing entrepreneurial paralysis as a cognitively induced outcome resulting from excessive informational complexity rather than solely structural limitations.

The findings also challenge the dominant assumption that more information necessarily improves entrepreneurial decision-making. Existing AI literature frequently assumes that predictive analytics and algorithmic systems enhance strategic accuracy and reduce uncertainty (Huang & Rust, 2021). However, the current findings demonstrate that excessive AI-generated information may instead intensify mental fatigue and impair entrepreneurs' ability to process information effectively. Rather than facilitating decisiveness, sustained informational overload contributes to delayed action and strategic freezing.

From a Cognitive Load Theory perspective, entrepreneurial paralysis emerges because excessive cognitive demands consume working memory resources faster than entrepreneurs can cognitively recover. Consequently, entrepreneurs become unable to prioritize information, evaluate alternatives effectively, and commit confidently to strategic actions. This finding therefore provides a stronger cognitive explanation for dysfunctional entrepreneurial behavior within AI-driven environments.

Cognitive Avoidance and Entrepreneurial Paralysis

The results further reveal that cognitive avoidance significantly increases entrepreneurial paralysis ($\beta = 0.38$, $t = 5.47$), supporting Hypothesis 4. This finding indicates that entrepreneurs experiencing excessive informational complexity increasingly avoid cognitively demanding strategic activities, postpone critical decisions, and withdraw from entrepreneurial engagement processes.

The findings are consistent with prior information-avoidance research suggesting that individuals exposed to overwhelming complexity often engage in defensive withdrawal behaviors to protect remaining cognitive resources (Sweeny et al., 2010). However, the current study extends this literature by applying cognitive avoidance within AI-driven entrepreneurial contexts. Existing entrepreneurship research rarely examines avoidance behavior as a strategic response to excessive informational intensity. Instead, entrepreneurs are generally portrayed as proactive and opportunity-seeking actors capable of effectively managing uncertainty and complexity.

The present study challenges this traditional perspective by demonstrating that excessive AI-generated informational pressure may produce dysfunctional behavioral responses rather than strategic adaptability. Entrepreneurs exposed to persistent algorithmic monitoring and analytical overload may gradually disengage from strategic evaluation processes because sustained cognitive effort becomes

psychologically exhausting.

This finding fills an important theoretical gap because prior studies have largely overlooked the role of cognitive avoidance in explaining entrepreneurial dysfunction. Existing AI and entrepreneurship literature predominantly emphasizes innovation capability, digital transformation, and strategic flexibility while neglecting the possibility that excessive AI immersion may reduce entrepreneurs' willingness to engage deeply with complex decisions. Accordingly, the current study provides a more balanced explanation of AI-driven entrepreneurship by identifying cognitive avoidance as a critical behavioral mechanism linking cognitive overload to entrepreneurial paralysis.

Mediation Effects and Cognitive Load Mechanisms

One of the most important contributions of this study lies in mediation analysis. The findings confirm that both decision exhaustion and cognitive avoidance significantly mediate the relationship between AI fatigue and entrepreneurial paralysis, supporting Hypotheses 5 and 6. More importantly, the indirect effects are stronger than the direct effect, indicating that AI fatigue influences entrepreneurial paralysis primarily through cognitive depletion mechanisms rather than through direct technological exposure alone.

This finding addresses a major limitation in prior literature. Existing AI-entrepreneurship studies often assume a direct relationship between AI adoption and entrepreneurial outcomes while overlooking the internal cognitive mechanisms through which excessive AI exposure shapes entrepreneurial behavior. The present study provides a more comprehensive explanation by identifying two distinct cognitive pathways through which AI fatigue contributes to entrepreneurial paralysis.

Specifically, decision exhaustion represents a mental depletion pathway, while cognitive avoidance represents a behavioral withdrawal pathway. Together, these mechanisms explain how sustained AI-driven informational intensity gradually overwhelms entrepreneurs' cognitive processing capacity and reduces entrepreneurial action capability. This significantly advances current entrepreneurship literature because it demonstrates that cognitive overload, rather than insufficient information, may become a primary source of entrepreneurial dysfunction within AI-intensive environments.

Moderating Role of Cognitive Resilience

The findings further reveal that cognitive resilience significantly moderates the relationships between cognitive depletion mechanisms and entrepreneurial paralysis. Specifically, cognitive resilience weakens the positive relationship between decision exhaustion and entrepreneurial paralysis ($\beta = -0.201$, $t = 3.76$) and weakens the relationship between cognitive avoidance and entrepreneurial paralysis ($\beta = -0.184$, $t = 3.41$), supporting Hypotheses 7 and 8.

This finding is highly significant because prior entrepreneurship research has largely ignored resilience as a cognitive buffering capability within AI-driven entrepreneurial environments. Existing studies primarily conceptualize resilience as

emotional endurance or recovery from failure rather than as a mechanism that helps entrepreneurs manage excessive informational complexity and cognitive overload (Ayala & Manzano, 2014).

The current study extends Cognitive Load Theory by demonstrating that entrepreneurs possessing stronger cognitive resilience are better able to regulate mental pressure, maintain analytical clarity, and sustain strategic responsiveness despite operating under AI-intensive conditions. Resilient entrepreneurs appear more capable of filtering excessive information, controlling attentional overload, and adapting cognitively to sustained informational demands.

This finding suggests that cognitive resilience functions as an important protective capability that reduces the harmful effects of excessive AI-generated cognitive load. Consequently, entrepreneurial paralysis is not solely determined by AI exposure itself but also by entrepreneurs' capacity to manage informational intensity effectively.

Integrated Interpretation: The Dark Side of AI-Driven Entrepreneurship

Taken together, the findings support the central argument of this study: excessive AI-driven informational intensity may unintentionally undermine entrepreneurial functioning rather than improve it. While AI technologies undoubtedly enhance access to information and analytical capabilities, continuous exposure to algorithmic complexity may exceed entrepreneurs' cognitive processing limits and contribute to mental exhaustion, avoidance behavior, and entrepreneurial paralysis.

The study therefore introduces a novel cognitive-process framework explaining the darker side of AI-driven entrepreneurship. Rather than viewing AI exclusively as a strategic capability-enhancing mechanism, the findings demonstrate that AI may simultaneously generate cognitive vulnerabilities that impair entrepreneurial responsiveness and strategic action. This challenges the prevailing assumption that greater technological sophistication automatically produces superior entrepreneurial outcomes.

More importantly, the study highlights that entrepreneurial dysfunction may emerge not from insufficient information, but from excessive informational intensity that overwhelms entrepreneurs' working memory and cognitive resources. This represents a significant theoretical advancement within entrepreneurship and AI literature.

Limitations and Future Research

Despite its theoretical and empirical contributions, the present study contains several limitations that provide important directions for future research. First, the study adopts a cross-sectional research design, which restricts the ability to establish causal relationships among the proposed constructs. Although the findings provide significant empirical support for the proposed framework, cognitive responses to AI-driven environments may evolve over time. Future studies may therefore employ longitudinal research designs to examine how AI fatigue, cognitive depletion, and entrepreneurial paralysis develop dynamically across different stages of

entrepreneurial activity.

Second, the study relies primarily on self-reported data collected from entrepreneurs, which may introduce common method bias and subjective evaluation bias. Although procedural and statistical remedies were applied to minimize this concern, future research could strengthen validity by incorporating objective indicators such as entrepreneurial performance metrics, behavioral tracking data, or digital activity measures related to AI usage and decision-making processes.

Third, the study focuses exclusively on entrepreneurs operating within Pakistan, which may limit the generalizability of the findings across different institutional and technological environments. Entrepreneurial ecosystems vary substantially in terms of digital maturity, institutional stability, technological infrastructure, and cultural attitudes toward adoption of AI. Future studies could therefore conduct cross-country comparative research to examine whether the cognitive consequences of AI-driven informational complexity differ across developed and emerging economies.

Fourth, the present study specifically examines cognitive resilience as the primary moderate capability within the proposed framework. However, entrepreneurs may possess additional psychological and behavioral capabilities that influence their ability to manage excessive cognitive load. Future research may therefore explore alternative moderating variables such as emotional intelligence, entrepreneurial mindfulness, digital literacy, cognitive flexibility, or psychological adaptability to provide a more comprehensive understanding of entrepreneurial responses to AI-driven complexity.

Finally, future research may investigate industry-specific differences in AI-driven cognitive overload. Entrepreneurs operating within technology-intensive sectors may experience AI fatigue differently compared to those in traditional industries with lower levels of technological dependence. Examining sectoral variations would provide a more nuanced understanding of how AI-driven informational intensity shapes entrepreneurial cognition and strategic behavior across diverse business environments.

CONCLUSION

This study examined how AI fatigue contributes to entrepreneurial paralysis through the mediating roles of decision exhaustion and cognitive avoidance while also investigating the moderating role of cognitive resilience. The findings demonstrate that excessive AI-driven informational intensity may overwhelm entrepreneurs' cognitive processing capacity, resulting in mental depletion, avoidance behavior, and declining entrepreneurial responsiveness. While AI technologies are generally viewed as capability-enhancing tools, the study reveals their potential to generate significant cognitive vulnerabilities under conditions of excessive informational complexity.

By grounding the framework in Cognitive Load Theory, the study provides a more balanced understanding of AI-driven entrepreneurship that recognizes both the

opportunities and cognitive risks associated with excessive technological immersion. More importantly, the findings challenge the prevailing assumption that greater access to information automatically improves entrepreneurial effectiveness. Instead, the study demonstrates that entrepreneurial dysfunction may emerge when informational demands exceed entrepreneurs' cognitive processing limits.

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