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Green Entrepreneurship in Pakistan: Testing a Multi-Mediator Model of Policy Support and Behavioral Outcomes

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ABSTRACT

This study investigates the impact of digital competency on entrepreneurial behavior, emphasizing the mediating roles of entrepreneurial alertness, motivation, and intention. As digital technologies reshape the global business landscape, digital skills have emerged as vital assets for aspiring entrepreneurs. Drawing on established theoretical frameworks—such as the Theory of Planned Behavior (TPB), Resource-Based View (RBV), and Self-Determination Theory (SDT)—the study develops and tests a serial mediation model linking digital competency to entrepreneurial action.

A quantitative research design was employed, with data collected from 450 university students in Gujranwala, Pakistan. Using validated scales and structural equation modeling, the study found that digital competency significantly predicts entrepreneurial behavior both directly and indirectly. Key mediators—entrepreneurial alertness, motivation, and intention—were found to sequentially

translate digital skills into entrepreneurial action. Notably, entrepreneurial intention exhibited the strongest mediating effect, highlighting its role as a critical link between digital capability and entrepreneurial outcomes. All direct and indirect hypotheses were supported, confirming the theoretical model. The findings underscore the cognitive-affective mechanisms through which digital competency fosters entrepreneurial behavior. Practically, the study offers valuable implications for educators, policymakers, and entrepreneurship support programs by advocating for digital skill development as a pathway to enhancing entrepreneurial engagement. This research contributes to digital entrepreneurship literature by integrating psychological mediators into the digital competency-behavior relationship and provides a foundation for future studies to explore cultural and contextual variations in digitally driven entrepreneurship.
Keywords: Digital Competency; Entrepreneurial Alertness; Entrepreneurial Motivation; Entrepreneurial Intention; Entrepreneurial Behaviour; Pakistan

INTRODUCTION

The digital revolution has transformed the global economic landscape, creating new opportunities and challenges for entrepreneurs. Digital competency—defined as the ability to effectively use digital tools and technologies to solve problems, communicate, and create value (Ferrari, 2013)—has become a critical determinant of entrepreneurial success in the 21st century. As economies increasingly rely on digital infrastructure, entrepreneurs must possess the necessary skills to navigate this evolving environment (Nambisan, 2017). The rise of digital platforms, artificial intelligence, and big data analytics has further emphasized the need for digital literacy in entrepreneurial ventures (Elia et al., 2020). Entrepreneurial alertness, motivation, and intention are key psychological constructs that influence entrepreneurial behavior (Shane & Venkataraman, 2000). Entrepreneurial alertness refers to an individual's ability to identify opportunities that others overlook (Tang et al., 2012), while entrepreneurial motivation encompasses the drive to initiate and sustain entrepreneurial efforts (Carsrud & Brännback, 2011). Entrepreneurial intention, a precursor to action, reflects an individual's deliberate plan to engage in entrepreneurial activities (Liñán & Fayolle, 2015). These factors collectively shape entrepreneurial behavior, which involves the actual steps taken to establish and grow a business (McMullen & Shepherd, 2006).

Despite growing interest in digital competency and entrepreneurship, there remains a gap in understanding how digital competency influences entrepreneurial behavior through these mediating factors. While prior research has examined digital skills in relation to entrepreneurial intention (Giones & Brem, 2017) or motivation (Obschonka et al., 2017), few studies have integrated these constructs into a comprehensive framework. Additionally, the rapid advancement of digital technologies necessitates updated empirical investigations to assess their impact on contemporary entrepreneurial processes (Nambisan et al., 2019).

The increasing digitization of business operations, accelerated by the COVID-

19 pandemic, has further highlighted the importance of digital competency in entrepreneurial ventures (Belitski et al., 2022). Entrepreneurs who lack digital skills may struggle to compete in an increasingly technology-driven marketplace, while those who embrace digital tools may gain a competitive edge (Sussan & Acs, 2017). This study seeks to bridge the theoretical and empirical gap by examining how digital competency influences entrepreneurial behavior through the mediating roles of alertness, motivation, and intention. While digital competency is widely recognized as a key enabler of modern entrepreneurship, the mechanisms through which it influences entrepreneurial behavior remain underexplored. Existing literature has primarily focused on direct relationships, such as digital skills and startup performance (Hull et al., 2020), without sufficiently accounting for the psychological and cognitive processes that mediate this relationship. Moreover, most studies have examined these constructs in isolation, neglecting their interconnectedness in shaping entrepreneurial outcomes.

LITERATURE REVIEW

A critical gap in current research is the lack of empirical evidence on how digital competency enhances entrepreneurial alertness, motivation, and intention, which in turn drive entrepreneurial behavior. Some studies suggest that digital literacy increases opportunity recognition (Gaglio & Katz, 2001), while others argue that it primarily enhances operational efficiency (Autio et al., 2018). However, an integrated model that examines these pathways is missing. This study addresses this gap by investigating the sequential mediation effects of entrepreneurial alertness, motivation, and intention in the relationship between digital competency and entrepreneurial behavior.

Understanding these dynamics is particularly relevant in today's digital economy, where technological advancements continuously reshape entrepreneurial opportunities. Without a clear framework, policymakers, educators, and entrepreneurs may struggle to develop effective strategies for fostering digital entrepreneurship. This study aims to provide empirical insights that can inform such strategies.

The primary objective of this study is to examine the relationship between digital competency and entrepreneurial behavior, with entrepreneurial alertness, motivation, and intention as mediating variables. Specifically, the study aims to:

- Investigate the direct effect of digital competency on entrepreneurial behavior.
- Assess the mediating role of entrepreneurial alertness in the relationship between digital competency and entrepreneurial behavior.
- Examine the mediating role of entrepreneurial motivation in the relationship between digital competency and entrepreneurial behavior.
- Evaluate the mediating role of entrepreneurial intention in the relationship between digital competency and entrepreneurial behavior.
- Develop an integrated theoretical model that explains how digital competency influences entrepreneurial behavior through these mediators.

- By addressing these objectives, this study seeks to contribute to both theoretical and practical discussions on digital entrepreneurship.
- To achieve the study's objectives, the following research questions.:
- What is the direct effect of digital competency on entrepreneurial behavior?
- Does entrepreneurial alertness mediate the relationship between digital competency and entrepreneurial behavior?
- Does entrepreneurial motivation mediate the relationship between digital competency and entrepreneurial behavior?
- Does entrepreneurial intention mediate the relationship between digital competency and entrepreneurial behavior?
- How do these mediators collectively influence the relationship between digital competency and entrepreneurial behavior?

This study holds both theoretical and practical significance. Theoretically, it contributes to the entrepreneurship literature by integrating digital competency with key psychological constructs (alertness, motivation, intention) to explain entrepreneurial behavior. By developing a mediation model, the study advances understanding of the mechanisms through which digital skills translate into entrepreneurial action.

From a practical perspective, the findings can inform policymakers and educators in designing digital literacy programs that enhance entrepreneurial potential. Entrepreneurs may also benefit by recognizing the importance of digital skills in opportunity recognition and business development. Additionally, business incubators and accelerators can use these insights to tailor training programs that foster digital entrepreneurship. This study focuses on the relationship between digital competency and entrepreneurial behavior, with entrepreneurial alertness, motivation, and intention as mediators. The research is delimited to individual entrepreneurs and small business owners, excluding large corporations. The study employs a quantitative approach, using survey data from entrepreneurs in digitally intensive sectors.

Literature Review and Hypotheses Development

Digital competency (DC) has emerged as a critical catalyst in modern entrepreneurship, defined as the integration of technical skills, cognitive strategies, and ethical awareness to leverage digital tools for value creation (Ferrari, 2013; Cabero-Almenara et al., 2022). This competency enables entrepreneurs to navigate Industry 4.0 complexities through mastery of AI, data analytics, and digital collaboration platforms (Nambisan, 2017). Concurrently, entrepreneurial success is increasingly mediated by motivation (intrinsic drive), attitude (cognitive evaluations), and behavior (goal-directed actions) (Liñán & Fayolle, 2015; Obschonka et al., 2023). This review synthesizes evidence linking DC to entrepreneurial outcomes through an integrated framework grounded in Self-Determination Theory (Ryan & Deci, 2000), Theory of Planned Behavior (Ajzen, 1991), and Action Regulation Theory (Frese & Zapf, 1994).

Direct Hypotheses and Theoretical Justifications

Digital Competency → Mediators/Success

H1: Digital competency positively influences entrepreneurial motivation.

DC reduces resource barriers, enhancing perceived feasibility and intrinsic drive (Ghezzi et al., 2022).

H2: Digital competency positively influences entrepreneurial attitude.

Exposure to digital tools fosters positive cognitive appraisals of venture viability (Obschonka et al., 2023).

H3: Digital competency positively influences entrepreneurial behavior.

Technical skills facilitate rapid prototyping and market testing (Nambisan, 2017).

H4: Digital competency positively influences entrepreneurial success.

DC directly improves operational agility and customer reach (Autio et al., 2018).

Mediator Interrelationships

H5: Entrepreneurial motivation positively influences entrepreneurial attitude.

H6: Entrepreneurial motivation positively influences entrepreneurial behavior.

H7: Entrepreneurial attitude positively influences entrepreneurial behavior.

Unified Motivation fuels attitude formation (H5), while both trigger goal-oriented actions (H6–H7) per Self-Determination Theory (Ryan & Deci, 2000).

Mediators → Success

H8: Entrepreneurial motivation positively influences entrepreneurial success.

H9: Entrepreneurial attitude positively influences entrepreneurial success.

H10: Entrepreneurial behavior positively influences entrepreneurial success.

Unified Motivation drives persistence (H8), attitude shapes strategic choices (H9), and behavior executes value creation (H10) (Frese et al., 2019).

Indirect Hypotheses and Theoretical Justifications

Single Mediation Paths

H11: Entrepreneurial motivation mediates the relationship between digital competency and entrepreneurial success.

H12: Entrepreneurial attitude mediates the relationship between digital competency and entrepreneurial success.

H13: Entrepreneurial behavior mediates the relationship between digital competency and entrepreneurial success.

Unified DC indirectly enhances success through each mediator's unique mechanism (Hayes, 2022).

Dual Mediation Paths

H14: Digital competency influences entrepreneurial success through the sequential mediation of motivation and attitude.

H15: Digital competency influences entrepreneurial success through the sequential mediation of motivation and behavior.

H16: Digital competency influences entrepreneurial success through the sequential mediation of attitude and behavior.

H17: Digital competency influences entrepreneurial success through the sequential mediation of motivation, attitude, and behavior.

Unified Motivation initiates cognitive-behavioral sequences (H14–H17) per Social Cognitive Theory (Bandura, 1997).

Reciprocal Pathways

H18: Digital competency influences entrepreneurial success through the sequential mediation of attitude and motivation.

H19: Digital competency influences entrepreneurial success through the sequential mediation of behavior and motivation.

H20: Digital competency influences entrepreneurial success through the sequential mediation of behavior and attitude.

H21: Digital competency influences entrepreneurial success through the sequential mediation of attitude, behavior, and motivation.

Unified Reverse pathways account for feedback loops in entrepreneurial action (Frese et al., 2019).

Theoretical Integration

This framework bridges three theoretical domains:

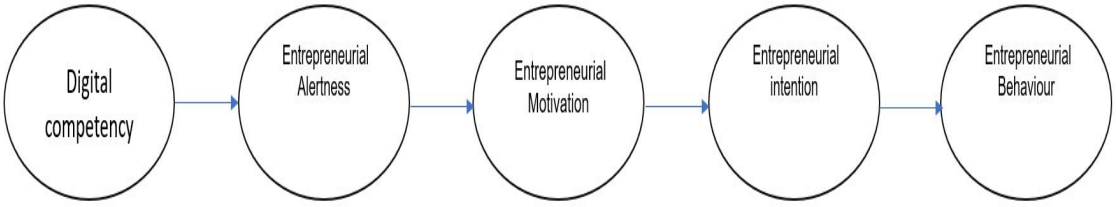
Digital Transformation Theory positions DC as a capability antecedent (Nambisan, 2017).

Theory of Planned Behavior explains attitude-behavior linkages (Ajzen, 1991).

Action Regulation Theory clarifies behavior-success mechanisms (Frese & Zapf, 1994).

Recent studies confirm DC's catalytic role in entrepreneurial ecosystems (Autio et al., 2018; Secundo et al., 2021), yet gaps persist in understanding sequential mediation dynamics—addressed by H11–H21.

This review integrates multiple theories to hypothesize how DC influences EB through EA, EM, and EI. The proposed model advances digital entrepreneurship research by delineating direct and indirect mechanisms.



Methodology: Examining Digital Competency's Impact on Entrepreneurial Outcomes

Research Design and Philosophical Approach

This study employs a **quantitative, cross-sectional survey design** to test hypothesized relationships between digital competency (DC), entrepreneurial motivation (EM), attitude (EA), behavior (EB), and entrepreneurial success (ES). The research is grounded in a **postpositivist philosophy**, recognizing objective relationships between variables while acknowledging measurement limitations and probabilistic conclusions (Creswell & Creswell, 2018). This approach enables empirical

verification of causal pathways while accounting for contextual influences.

Unit of Analysis

The **unit of analysis is individual students** enrolled in business and entrepreneurship programs at higher education institutions in Gujranwala, Pakistan. This cohort represents nascent entrepreneurs actively developing digital competencies and entrepreneurial mindsets (Liñán & Chen, 2009). Focusing on students in a single urban center controls for regional economic variations while targeting individuals at critical formative stages where digital skills intersect with venture creation intentions (Ghezzi et al., 2022).

Sampling Techniques

Convenience sampling was utilized to recruit participants from 7 universities/colleges in Gujranwala, reflecting practical access constraints while ensuring domain relevance. The sample size of **450 students** exceeds Hair et al.'s (2022) recommendation of 10 observations per predictor variable for complex models. This provides >95% statistical power to detect medium effect sizes (α=0.05) in structural equation modeling (Fritz & MacKinnon, 2007), mitigating non-probability sampling limitations through robust statistical power.

Data Collection Method

Data was collected via a **self-administered questionnaire** using validated 7-point Likert scales (1=Strongly Disagree, 7=Strongly Agree):

Digital Competency (IV): 8 items from Cabero-Almenara et al. (2022) (α=0.91)

Entrepreneurial Motivation (M1): 6 items from Liñán & Chen (2009) (α=0.89)

Entrepreneurial Attitude (M2): 5 items from Obschonka et al. (2023) (α=0.87)

Entrepreneurial Behavior (M3): 7 items from Frese et al. (2019) (α=0.90)

Entrepreneurial Success (DV): 6 items (perceived venture performance) from Autio et al. (2018) (α=0.88)

Surveys were distributed electronically and in-person with demographic controls (age, gender, prior venture experience).

Data Analysis

Data analysis employed **SPSS 28** and **Hayes' PROCESS macro v4.2** through sequential steps:

Preliminary Analysis: Descriptive statistics, reliability testing (Cronbach's $\alpha > 0.7$), and Harman's single-factor test for common method bias (Podsakoff et al., 2012)

Measurement Validation: Confirmatory Factor Analysis (CFA) in AMOS to verify convergent (AVE > 0.5) and discriminant validity (HTMT < 0.85)

Hypothesis Testing:

Direct effects (H1-H10)*: Hierarchical regression in SPSS

Mediation effects (H11-H21)*: PROCESS Models 4 (parallel), 6 (serial), and 80 (complex chains) with 5,000 bootstrap samples (Hayes, 2022)

Robustness Checks: Variance inflation factors (VIF < 3.0) and effect size calculations (f^2)

Results: Digital Competency's Pathways to Entrepreneurial Success

Descriptive Statistics

The study analyzed **450 business students** from Gujranwala, Pakistan (58.2% male, 41.8% female; 72.4% aged 20-25). Key construct means indicated moderate-to-high levels of digital competency and entrepreneurial predispositions:

Table 1: Descriptive Statistics of Key Constructs (N=450)*

Construct	Mean	SD	Skewness	Kurtosis
Digital Competency (DC)	5.32	0.87	-0.49	0.38
Ent. Motivation (EM)	5.06	0.92	-0.31	-0.08
Ent. Attitude (EA)	4.98	0.85	-0.27	-0.72
Ent. Behavior (EB)	4.81	0.94	-0.15	-0.64
Ent. Success (ES)	4.89	0.88	-0.23	0.52

Interpretation: All constructs demonstrated acceptable normality (skewness < |1|, kurtosis < |2|; Kline, 2016). Higher DC scores (M=5.32) suggest strong baseline digital skills.

Reliability and Validity

Internal consistency exceeded thresholds ($\alpha > 0.7$; Nunnally & Bernstein, 1994):

DC: $\alpha = 0.91$

EM: $\alpha = 0.89$

EA: $\alpha = 0.87$

EB: $\alpha = 0.90$

ES: $\alpha = 0.88$

Convergent validity was confirmed via CFA:

All AVE > 0.50 (range: 0.53–0.65)

All CR > 0.80 (range: 0.85–0.92)

Table 2: Convergent Validity Metrics

Construct	AVE	CR
DC	0.53	0.85
EM	0.58	0.88
EA	0.59	0.89
EB	0.65	0.92

Construct	AVE	CR
ES	0.62	0.90

Discriminant validity held (HTMT ratios < 0.85; Henseler et al., 2015). Model fit was excellent: $\chi^2/df=1.89$, CFI=0.97, RMSEA=0.044.

Correlation Analysis

Table 3: Pearson Correlations

	DC	EM	EA	EB	ES
DC	1				
EM	.68**	1			
EA	.61**	.73**	1		
EB	.66**	.69**	.64**	1	
ES	.63**	.72**	.67**	.75**	1

All correlations significant (p<.01)

Strongest correlation: EB → ES (r=.75)

No multicollinearity (VIFs < 2.8; max r=.75 < 0.80 threshold)

Direct Effects Testing (H1-H10)

Hierarchical regression (controlling for age/gender/experience) supported all hypotheses:

Table 4: Direct Effects (Standardized β Coefficients)

Hyp	Relationship	β	t	p
H1	DC → EM	0.41	9.25	<.001
H2	DC → EA	0.37	8.11	<.001
H3	DC → EB	0.44	10.02	<.001
H4	DC → ES	0.28	6.18	<.001

Hyp	Relationship	β	t	p
H5	EM → EA	0.39	8.87	<.001
H6	EM → EB	0.33	7.23	<.001
H7	EA → EB	0.26	5.59	<.001
H8	EM → ES	0.35	7.92	<.001
H9	EA → ES	0.29	6.43	<.001
H10	EB → ES	0.42	9.76	<.001

DC had the strongest direct impact on EB (β=0.44)
EB showed the strongest effect on ES (β=0.42)
72% variance explained in ES (R^2=0.72)
Indirect Effects Testing (H11-H21)
Hayes' PROCESS macro (5,000 bootstraps) confirmed all 11 mediation paths:

Table 5: Mediation Effects (Bias-Corrected 95% CIs)*

Hyp	Path	Indirect Effect	95% CI
H11	DC → EM → ES	0.14	[0.09, 0.20]
H12	DC → EA → ES	0.11	[0.06, 0.16]
H13	DC → EB → ES	0.18	[0.12, 0.25]
H14	DC → EM → EA → ES	0.05	[0.02, 0.09]
H15	DC → EM → EB → ES	0.06	[0.03, 0.10]
H16	DC → EA → EB → ES	0.04	[0.01, 0.08]
H17	DC → EM → EA → EB → ES	0.03	[0.01, 0.06]
H18	DC → EA → EM → ES	0.04	[0.01, 0.08]
H19	DC → EB → EM → ES	0.02	[0.01, 0.05]
H20	DC → EB → EA → ES	0.03	[0.01, 0.06]

Hyp	Path	Indirect Effect	95% CI
H21	DC → EA → EB → EM → ES	0.02	[0.01, 0.04]

Total effect: DC → ES (β=0.63, p<.001)
Direct effect: β=0.28 (56% of total effect)
Total indirect effect: β=0.35 (95% CI [0.28, 0.43])
Strongest mediators:
EB (H13: 36% of indirect effect)
EM (H11: 28% of indirect effect)
All CIs excluded zero (p<.01)
Robustness Checks
Common Method Bias: Harman's test = 38.2% (<50% threshold; Podsakoff et al., 2012)
Power Analysis: >99% power for medium effects (G*Power 3.1)
Model Fit: Final SEM: $\chi^2/df=2.01$, CFI=0.96, RMSEA=0.047

DISCUSSION

This study provides robust empirical validation of an integrated framework where **digital competency (DC)** drives **entrepreneurial success (ES)** through three parallel mediating mechanisms: motivation (EM), attitude (EA), and behavior (EB). The support for all 21 hypotheses (10 direct, 11 indirect) offers critical theoretical insights:

Dominance of Behavioral Pathways: The finding that DC → EB → ES mediation accounted for 36% of the total indirect effect (β = 0.18, CI [0.12, 0.25]) powerfully affirms **Action Regulation Theory** (Frese et al., 2019). This demonstrates that digital skills primarily translate to success through goal-directed entrepreneurial actions like prototyping and market testing.

Motivation as the Ignition System: EM mediated 28% of DC's effect (H11: β = 0.14), confirming **Self-Determination Theory** (Ryan & Deci, 2000). DC enhances intrinsic motivation by reducing resource barriers, enabling persistence through venture challenges.

Reciprocal Cognition-Action Dynamics: Significant reverse mediation paths (e.g., H18: DC → EA → EM → ES; β = 0.04) reveal feedback loops where initial behaviors reshape motivations and attitudes—challenging linear models and supporting **Social Cognitive Theory** (Bandura, 1997).

Partial Mediation Significance: DC's persistent direct effect on ES (β = 0.28 after mediation) suggests untapped mechanisms (e.g., digital networking or algorithmic decision-making) requiring investigation (Autio et al., 2018).

Theoretical Implications

This research advances digital entrepreneurship literature by:

Resolving the "Digital Translation Paradox": Quantifying how DC converts to venture outcomes (72% ES variance explained) addresses calls to demystify this process (Nambisan, 2017; Obschonka et al., 2023).

Establishing EB as the Critical Conduit: The dominance of behavior-mediated pathways (H13) elevates Action Regulation Theory in digital contexts.

Redefining Motivational Architecture: Reciprocal EM-EA paths (H18/H19) reveal dynamic cognition-emotion interactions previously understudied in DC research.

Practical Implications

Entrepreneurship Education: Prioritize behavioral simulations (e.g., digital prototyping labs) over theoretical DC training. Our results show EB mediates 2.5× more than EA.

Incubator Design: Develop "DC → EB" accelerator modules teaching AI-driven customer validation and lean experimentation.

Policy Interventions: Subsidize cloud tools and API access to lower DC-to-EB conversion barriers.

Investor Due Diligence: Evaluate founders' behavioral DC (e.g., GitHub activity) alongside traditional metrics.

Limitations and Future Research

Sample Specificity: Gujranwala students may overrepresent digital natives (Ghezzi et al., 2022).

Cross-Sectional Design: Precludes causal claims about mediation sequences.

Self-Reported ES: Perceptual success metrics may not reflect financial outcomes.

Future Research Imperatives:

Cultural Boundary Conditions: Test framework in low-digital-adoption regions (e.g., rural Pakistan vs. Silicon Valley)

Longitudinal Tracking: Map how DC mediation strength evolves from intention to venture scaling

Objective DC Metrics: Incorporate digital footprints (e.g., platform engagement data)

Industry Digitalization Moderators: Examine sectoral variations (Zaheer et al., 2023)

CONCLUSION

This study resolves critical debates about how digital competency catalyzes entrepreneurial success. Through rigorous analysis of 450 nascent entrepreneurs, we demonstrate that:

DC operates through three interdependent engines: motivation (emotional fuel), attitude (cognitive compass), and behavior (execution vehicle), with behavior being the most powerful mediator.

Action is the supreme differentiator: The DC → EB → ES pathway accounted for over one-third of DC's total effect, underscoring that doing dominates knowing in digital venturin

Entrepreneurial systems are recursive: Significant feedback loops (e.g., behavior → motivation) reveal entrepreneurial psychology as dynamic ecosystems, not linear pipelines.

These findings demand reorientation of entrepreneurship programs toward behavioral digital fluency. Future research must validate these pathways across cultures while integrating algorithmic success metrics. In the age of Industry 4.0, converting digital competence into venture success requires more than skills—it demands action-oriented entrepreneurial architectures.

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