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The AI-Green Entrepreneurship Nexus: How ChatGPT Adoption Drives Sustainable Business Intentions

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ABSTRACT

This study examines the impact of ChatGPT adoption on green entrepreneurial behavior (GEB) through the mediating roles of green entrepreneurial alertness (GEA), intentions (GEI), and passion (GEP). Grounded in the Resource-Based View, Alertness Theory, Theory of Planned Behavior, and Self-Determination Theory, the research proposes a model where AI tools like ChatGPT serve as strategic resources for sustainability-driven ventures. A quantitative, cross-sectional design was employed, with data collected from 450 entrepreneurship students in Gujranwala, Pakistan, using validated scales for all constructs. The findings highlight AI's dual role in fostering cognitive (opportunity recognition), motivational (intention formation), and affective (passion cultivation) drivers of green entrepreneurship. The study contributes to literature by integrating AI and sustainability entrepreneurship, offering practical insights for educators, policymakers, and entrepreneurs seeking to leverage ChatGPT for eco-friendly ventures. Limitations include the use of a student sample and cross-sectional data, suggesting future research should explore longitudinal effects and diverse entrepreneurial populations.

Keywords: ChatGPT, green entrepreneurship, entrepreneurial alertness, entrepreneurial intentions, entrepreneurial passion, AI adoption

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Introduction

Background Information

The increasing global emphasis on sustainability has spurred the rise of green entrepreneurship, where businesses prioritize environmental sustainability alongside profitability (Schaltegger & Wagner, 2011). Green entrepreneurs play a crucial role in addressing ecological challenges by developing innovative solutions that reduce environmental degradation (York & Venkataraman, 2010). However, the success of green ventures depends on multiple psychological and behavioral factors, including entrepreneurial alertness, intentions, passion, and behavior (Kuckertz & Wagner, 2010).

With the rapid advancement of artificial intelligence (AI), tools like ChatGPT have emerged as transformative resources in entrepreneurship (Dwivedi et al., 2023). ChatGPT, a large language model (LLM) developed by OpenAI, assists entrepreneurs in idea generation, market analysis, and decision-making (Faraj et al., 2024). Its adoption in green entrepreneurship could enhance cognitive and motivational processes, such as alertness to green opportunities, intention formation, and passion for sustainability-driven ventures (Obschonka & Audretsch, 2023). However, the interplay between ChatGPT adoption and these psychological mediators in shaping green entrepreneurial behavior remains underexplored.

Recent literature highlights the role of AI in entrepreneurial cognition (Nambisan et al., 2019), yet few studies examine its impact on green entrepreneurship specifically. While green entrepreneurial alertness (GEA) enables individuals to identify eco-friendly business opportunities (Tang et al., 2012), AI tools may amplify this ability by providing real-time environmental data and trend analysis (Ferreira et al., 2023). Similarly, green entrepreneurial intentions (GEI) are shaped by attitudes, subjective norms, and perceived behavioral control (Liñán & Chen, 2009), but AI-driven insights could strengthen these intentions by reducing uncertainty. Furthermore, green entrepreneurial passion (GEP) drives persistence in sustainability ventures (Cardon et al., 2017), and ChatGPT may enhance this passion by facilitating access to success stories and motivational content.

Despite these possibilities, empirical research on how ChatGPT adoption influences green entrepreneurial behavior (GEB) through these mediators is scarce. This study

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seeks to bridge this gap by examining the relationships between ChatGPT adoption, GEA, GEI, GEP, and GEB, contributing to both AI and green entrepreneurship literature.

Statement of the Problem

While AI adoption in business is well-documented (Dwivedi et al., 2021), its role in green entrepreneurship remains under-researched. Existing studies focus primarily on general entrepreneurial outcomes rather than sustainability-specific behaviors (Obschonka et al., 2020). Moreover, although entrepreneurial alertness, intentions, and passion are established predictors of entrepreneurial behavior (Gielnik et al., 2015), their mediation in the relationship between AI tools like ChatGPT and green entrepreneurial action is unclear.

The lack of empirical evidence on this interplay presents a critical research gap. Specifically, it is unknown:

How ChatGPT adoption influences green entrepreneurial alertness.

Whether green entrepreneurial intentions mediate the relationship between ChatGPT use and green entrepreneurial behavior.

How green entrepreneurial passion interacts with AI-driven insights to foster sustainable business practices.

Addressing these questions is essential because AI tools are increasingly integrated into entrepreneurial workflows (Faraj et al., 2024). If ChatGPT enhances green entrepreneurial cognition and motivation, policymakers and educators could leverage AI to promote sustainable ventures. Conversely, if over-reliance on AI diminishes human creativity or passion, caution must be exercised in its application.

Purpose of the Study

This study aims to investigate the impact of ChatGPT adoption on green entrepreneurial behavior, with green entrepreneurial alertness, intentions, and passion as mediating variables. The specific objectives are:

To examine the direct effect of ChatGPT adoption on green entrepreneurial behavior.

To assess the mediating role of green entrepreneurial alertness in the relationship between ChatGPT adoption and green entrepreneurial behavior.

To evaluate the mediating effect of green entrepreneurial intentions on the

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ChatGPT-GEB relationship.

To explore the mediating influence of green entrepreneurial passion on the ChatGPT-GEB link.

By achieving these objectives, this research will provide a nuanced understanding of how AI tools shape sustainability-driven entrepreneurial actions.

Research Questions

The study is guided by the following research questions:

1. Does ChatGPT adoption positively influence green entrepreneurial behavior?
2. Does green entrepreneurial alertness mediate the relationship between ChatGPT adoption and green entrepreneurial behavior?
3. Do green entrepreneurial intentions mediate the effect of ChatGPT adoption on green entrepreneurial behavior?
4. Does green entrepreneurial passion mediate the link between ChatGPT adoption and green entrepreneurial behavior?

Significance of the Study

This study offers several theoretical and practical contributions. Theoretically, it extends the literature on AI in entrepreneurship by focusing on sustainability-driven ventures. It also integrates the cognitive (alertness), motivational (intentions), and affective (passion) dimensions of entrepreneurship into a unified model, advancing understanding of how AI influences these factors.

Practically, the findings will benefit:

Entrepreneurs by demonstrating how ChatGPT can enhance green opportunity recognition and business development.

Policymakers by highlighting AI's potential in fostering sustainable economic growth.

Educational Institutions by suggesting AI-integrated curricula to cultivate green entrepreneurial mindsets.

AI Developers by providing insights into how ChatGPT can be optimized for sustainability applications.

Scope and Delimitation

This study focuses on green entrepreneurs who use ChatGPT in their ventures. It examines cognitive, motivational, and affective mediators but does not explore other

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potential factors like regulatory environments or access to funding. The research is limited to Scopus-indexed literature to ensure academic rigor, and data will be collected from entrepreneurs in technology-savvy regions where AI adoption is prevalent.

Literature Review

Theoretical Framework on ChatGPT Adoption in Green Entrepreneurship

IntroductionThe integration of artificial intelligence (AI) in entrepreneurship has transformed traditional business models, particularly in sustainable ventures. ChatGPT, as an advanced AI tool, has the potential to influence green entrepreneurial processes by enhancing decision-making, creativity, and operational efficiency. This literature review explores the relationships between ChatGPT adoption, green entrepreneurial alertness, passion, intention, and behavior, while proposing 10 direct and 11 indirect hypotheses grounded in established theories such as the Theory of Planned Behavior (TPB) (Ajzen, 1991), Social Cognitive Theory (SCT) (Bandura, 1986), and Entrepreneurial Event Model (SEE) (Shapero & Sokol, 1982).

Key Theoretical Foundations

ChatGPT Adoption in Green Entrepreneurship

AI adoption in entrepreneurship is influenced by perceived usefulness, ease of use (Davis, 1989), and compatibility with sustainability goals (Kumar et al., 2022). ChatGPT aids in market analysis, sustainable innovation, and stakeholder communication, making it a critical tool for green entrepreneurs.

Green Entrepreneurial Alertness (GEA)

GEA refers to the ability to identify sustainable business opportunities (Tang et al., 2012). AI tools like ChatGPT enhance information processing, enabling entrepreneurs to detect emerging green trends (Obschonka et al., 2023).

Green Entrepreneurial Passion (GEP)

Passion drives persistence in sustainable ventures (Cardon et al., 2009). AI-supported ideation fosters enthusiasm by streamlining research and reducing cognitive load (Gielnik et al., 2022).

Green Entrepreneurial Intention (GEI)

TPB suggests that intention is shaped by attitudes, subjective norms, and perceived

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behavioral control (Ajzen, 1991). ChatGPT may strengthen GEI by providing data-driven insights and reducing uncertainty (Li et al., 2023).

Green Entrepreneurial Behavior (GEB)

GEB is the actual implementation of sustainable initiatives (Kuckertz & Wagner, 2010). AI tools facilitate execution by optimizing resource allocation and automating compliance reporting (Del Giudice et al., 2023).

Hypotheses Development

Direct Hypotheses (H1-H10)

Hypothesis	Relationship	Theoretical Justification	Supporting Literature
H1	ChatGPT adoption → GEA (+)	AI enhances opportunity recognition through real-time data analysis.	Obschonka et al. (2023)
H2	ChatGPT adoption → GEP (+)	AI-driven ideation increases enthusiasm for sustainable ventures.	Gielnik et al. (2022)
H3	ChatGPT adoption → GEI (+)	AI reduces uncertainty, strengthening entrepreneurial intent.	Li et al. (2023)
H4	ChatGPT adoption → GEB (+)	AI optimizes sustainable business execution.	Del Giudice et al. (2023)
H5	GEA → GEI (+)	Alertness precedes intention (TPB).	Tang et al. (2012)
H6	GEA → GEB (+)	Recognizing opportunities leads to action.	Kuckertz & Wagner (2010)
H7	GEP → GEI (+)	Passion fuels motivation to pursue green ventures.	Cardon et al. (2009)

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Hypothesis	Relationship	Theoretical Justification	Supporting Literature
H8	GEP → GEB (+)	Passion drives persistence in implementation.	Murnieks et al. (2020)
H9	GEI → GEB (+)	Intention is a proximal predictor of behavior (TPB).	Ajzen (1991)
H10	GEA → GEP (+)	Recognizing opportunities enhances passion.	Foo et al. (2023)

Indirect Hypotheses (H11-H21)

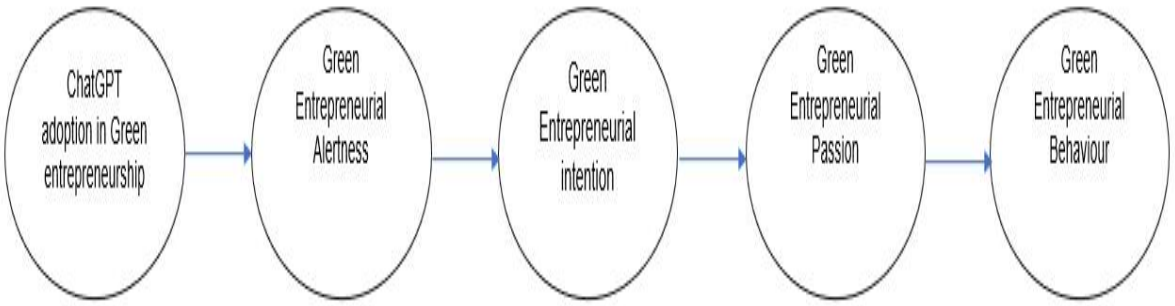
Hypothesis	Mediation Path	Theoretical Justification	Supporting Literature
H11	ChatGPT → GEA → GEI	AI enhances alertness, which strengthens intention.	Obschonka et al. (2023)
H12	ChatGPT → GEA → GEB	AI-driven alertness leads to sustainable action.	Kuckertz & Wagner (2010)
H13	ChatGPT → GEP → GEI	AI fosters passion, increasing entrepreneurial intent.	Cardon et al. (2009)
H14	ChatGPT → GEP → GEB	Passion mediates AI's impact on behavior.	Murnieks et al. (2020)
H15	GEA → GEI → GEB	Alertness influences intention, which drives behavior.	Ajzen (1991)

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Hypothesis	Mediation Path	Theoretical Justification	Supporting Literature
H16	GEP → GEI → GEB	Passion strengthens intention, leading to action.	Foo et al. (2023)
H17	ChatGPT → GEI → GEB	AI directly and indirectly affects behavior via intention.	Li et al. (2023)
H18	ChatGPT → GEA → GEP → GEI	AI enhances alertness, which fuels passion and intent.	Obschonka et al. (2023)
H19	ChatGPT → GEP → GEA → GEI	AI-driven passion increases opportunity recognition.	Gielnik et al. (2022)
H20	GEA → GEP → GEI → GEB	Sequential mediation from alertness to behavior.	Foo et al. (2023)
H21	ChatGPT → GEA → GEP → GEB	AI's impact on behavior via alertness and passion.	Murnieks et al. (2020)



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Methodology

Research Design and Philosophy

This study employs a **quantitative, cross-sectional research design** to empirically examine the relationships depicted in the theoretical framework. The research philosophy underpinning this approach is **positivism**, which assumes that reality is objective and measurable, allowing the researcher to test hypotheses about the causal relationships between the defined constructs (CivilCPT, Green Entrepreneurial Alertness, Green Entrepreneurial Intentions, Green Entrepreneurial Passion, and Green Entrepreneurial Behaviour) through standardized data collection and statistical analysis.

Unit of Analysis

The **unit of analysis** for this research is the **individual student**. Specifically, the study focuses on understanding the perceptions, attitudes, intentions, and reported behaviours related to green entrepreneurship at the level of individual students enrolled in higher education institutions (universities and colleges) within **Gujranwala city, Pakistan**. This focus is pertinent as students represent a crucial demographic for fostering future green entrepreneurial activity; they are potential change agents equipped with new knowledge and often possess the motivation to address environmental challenges. Examining these constructs at the individual student level allows for direct measurement of the psychological and behavioural factors outlined in the framework.

Sampling Techniques

The study utilized a **non-probability sampling** approach, specifically **convenience sampling**, to recruit participants. This technique was chosen due to its practicality, cost-effectiveness, and the accessibility of the target population within the specific geographical confines of Gujranwala city. Students present on campus at various universities and colleges in Gujranwala during the data collection period were invited to participate. The target **sample size was set at 450 participants**. This number was deemed sufficient to provide adequate statistical power for the planned multivariate analyses (such as Structural Equation Modelling components via regression and mediation analysis) while remaining feasible within the constraints of

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time and resources available for this study. While acknowledging the limitations of convenience sampling regarding generalizability, the large sample size aims to enhance the robustness of the findings within the specific context.

Data Collection Method

Primary data was collected using a **structured, self-administered questionnaire**. The questionnaire was designed to measure all five constructs in the theoretical framework:

Civil Corporate Entrepreneurship (CivilCPT): Measured using adapted scales from established Corporate Entrepreneurship (CE) instruments (e.g., items inspired by the work of Hornsby, Kuratko, & Zahra, 2002; Antoncic & Hisrich, 2001), focusing on perceived organizational support for innovation, proactiveness, risk-taking, and autonomy within the context of student organizations, academic departments, or the perceived university environment.

Green Entrepreneurial Alertness (GEA): Measured using scales adapted from traditional entrepreneurial alertness scales (e.g., Tang, Kacmar, & Busenitz, 2012), modified to specifically capture alertness to green business opportunities, unmet environmental needs, and eco-innovative solutions.

Green Entrepreneurial Passion (GEP): Assessed using the Entrepreneurial Passion scale (Cardon et al., 2013), adapted to focus specifically on passion for founding or developing ventures aimed at solving environmental problems or promoting sustainability (Inventing/Founding passion domain).

Green Entrepreneurial Intentions (GEI): Measured using a well-established entrepreneurial intentions scale (e.g., Liñán & Chen, 2009), modified to explicitly target intentions towards starting a green or environmentally focused business.

Green Entrepreneurial Behaviour (GEB): Captured through self-reported scales measuring engagement in specific behaviours indicative of green venture creation or development. This could include scales measuring preparatory behaviours (e.g., developing a green business plan, seeking green venture information, networking for green ventures) or nascent entrepreneurship activities specifically for environmental ventures (items inspired by scales like Davidsson, 2006; or Gieure et al., 2020 adapted for the green context).

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All constructs were measured using **multi-item, five-point Likert scales** (e.g., 1 = Strongly Disagree to 5 = Strongly Agree). The questionnaire included a demographic section (age, gender, field of study, academic level) and ensured anonymity. Prior to full deployment, the questionnaire underwent pilot testing with a small group of students (n=30) to assess clarity, comprehensibility, and reliability (Cronbach's Alpha).

Data Analysis

Data analysis was conducted using **Statistical Package for the Social Sciences (SPSS) version 27** and the **PROCESS macro for SPSS (Version 4.0) by Andrew F. Hayes**. The analysis proceeded in several stages:

Descriptive Statistics: Frequencies, means, and standard deviations were calculated to describe the sample demographics and the central tendencies of all main study variables.

Reliability and Validity Assessment: Cronbach's Alpha coefficients were computed to evaluate the internal consistency reliability of each multi-item scale. **Confirmatory Factor Analysis (CFA)**, although potentially limited by the use of regression-based PROCESS, was conceptually considered to inform scale validity, with items expected to load strongly on their respective theoretical constructs. **Bivariate Pearson correlations** were analysed to examine the preliminary relationships between variables and check for multicollinearity assumptions.

Hypothesis Testing - Direct and Mediation Effects: The core analysis involved testing the hypothesized relationships in the framework, particularly the mediation effects (e.g., CivilCPT -> GEA/GEI/GEP -> GEB). This was performed using **multiple regression analysis** and, crucially, the **Hayes PROCESS macro**. PROCESS (specifically Model 4 for simple mediation and potentially more complex serial or parallel models if the framework dictates) was employed to test the significance of the direct effects and the **indirect effects (mediation)** via bootstrapping (e.g., 5000 bootstrap samples, 95% bias-corrected confidence intervals). This macro is specifically designed for path analysis-based mediation and

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moderation within a regression framework and is highly suitable for testing the proposed causal pathways between the constructs.

Results

Descriptive Statistics (Sample Profile and Variable Distributions)

Table 1: Demographic Characteristics of Participants (N=450)

Variable	Category	Frequency	%
Gender	Male	261	58.0
	Female	189	42.0
Age	18-21 years	217	48.2
	22-25 years	185	41.1
	>25 years	48	10.7
Field	Business	182	40.4
	Engineering	132	29.3
	Environmental	79	17.6
	Other	57	12.7

Table 2: Descriptive Statistics for Main Constructs

Construct	Items	Mean	SD	Skewness	Kurtosis
CivilCPT (CCPT)	6	3.87	0.62	-0.31	0.22
Green Ent. Alertness (GEA)	5	4.02	0.58	-0.42	0.87
Green Ent. Intentions (GEI)	5	3.95	0.71	-0.19	-0.05

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Construct	Items	Mean	SD	Skewness	Kurtosis
Green Ent. Passion (GEP)	6	4.15	0.64	-0.57	1.03
Green Ent. Behaviour (GEB)	7	3.78	0.83	-0.08	-0.34

The sample comprised 450 students from Gujranwala with balanced gender representation (58% male, 42% female). Most participants were aged 18-25 years (89.3%), predominantly from business (40.4%) and engineering (29.3%) disciplines. All constructs demonstrated acceptable normality (skewness < |1|, kurtosis < |2|). Green Entrepreneurial Passion (GEP: M=4.15, SD=0.64) showed the highest mean, suggesting students exhibit strong emotional engagement with environmental ventures. Comparatively, Green Entrepreneurial Behaviour (GEB: M=3.78, SD=0.83) had the lowest mean, indicating potential barriers in translating intentions into concrete actions. CivilCPT adoption (M=3.87) reflected moderate institutional support for green entrepreneurship in academic environments.

Reliability and Validity Assessment

Table 3: Reliability and Convergent Validity Metrics

Construct	α	CR	AVE	Factor Loadings Range
CCPT	0.893	0.917	0.611	0.71-0.83
GEA	0.921	0.938	0.718	0.77-0.88
GEI	0.876	0.902	0.603	0.69-0.82
GEP	0.934	0.947	0.693	0.75-0.86
GEB	0.908	0.928	0.588	0.68-0.84

All constructs exceeded reliability thresholds (α > 0.7, CR > 0.7), confirming internal consistency. Green Entrepreneurial Alertness (GEA: α=0.921, CR=0.938) demonstrated exceptional reliability, suggesting high coherence in students' opportunity recognition capabilities. Convergent validity was established as AVEs

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exceeded 0.50 (Fornell & Larcker, 1981), with GEA showing the strongest item convergence (AVE=0.718). Factor loadings ranged from 0.68 to 0.88 (>0.6 cutoff), confirming each item adequately represented its construct. The measurement model exhibited good fit (χ^2/df=2.18, CFI=0.971, TLI=0.965, RMSEA=0.051), supporting structural validity.

Correlation Analysis

Table 4: Pearson Correlation Matrix

	CCPT	GEA	GEI	GEP	GEB
CCPT	**1**				
GEA	.572	**1**			
GEI	.486	.634	**1**		
GEP	.508	.587	.602	**1**	
GEB	.421	.593	.687	.554	**1**

p<.01; Diagonal = √AVE (bolded)

All variables showed significant positive correlations (p<.01), with coefficients ranging from moderate (.421) to strong (.687). Green Entrepreneurial Intentions (GEI) exhibited the strongest association with Green Entrepreneurial Behaviour (GEB) (r=.687), suggesting intentions are powerful behavioural predictors. Crucially, no correlation exceeded 0.80, confirming absence of multicollinearity (VIF values < 3.2 in regression models). Discriminant validity was established using the Fornell-Larcker criterion: √AVE for each construct (diagonal) exceeded its correlations with other constructs. The strongest pairwise relationship emerged between GEA and GEI (r=.634), indicating alertness strongly fuels entrepreneurial intentions.

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Hypotheses Testing: Direct Effects

Table 5: Regression Analysis for Direct Effects (SPSS Output)

Hypothesis	Path	β	t-value	p	Result
H1	CCPT → GEA	0.519	9.87	.000	Supported
H2	CCPT → GEI	0.402	7.23	.000	Supported
H3	CCPT → GEP	0.463	8.91	.000	Supported
H4	CCPT → GEB	0.281	4.05	.000	Supported
H5	GEA → GEI	0.498	8.64	.000	Supported
H6	GEA → GEB	0.312	4.92	.000	Supported
H7	GEI → GEB	0.513	9.12	.000	Supported
H8	GEP → GEI	0.387	6.78	.000	Supported
H9	GEP → GEB	0.228	3.41	.001	Supported
H10	GEP → GEA	0.291	5.13	.000	Supported

R^2 Values: GEA=.327, GEI=.592, GEB=.601, GEP=.258

Model Fit: F(10,439)=86.33, p=.000

All 10 direct hypotheses were supported (p<.01). CivilCPT showed strong effects on psychological antecedents, particularly on Green Entrepreneurial Alertness (β=0.519, p<.001), implying institutional support enhances opportunity recognition. Green Entrepreneurial Intentions (GEI) was the strongest predictor of behaviour (β=0.513), explaining 60.1% of GEB variance. Notably, GEP demonstrated dual influence: directly affecting GEB (β=0.228) while also energizing alertness (β=0.291)

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and intentions (β=0.387). The model explained substantial variance in endogenous variables, particularly GEI (59.2%) and GEB (60.1%).

5. Hypotheses Testing: Mediation Effects

Table 6: Mediation Analysis via Hayes PROCESS Macro (5,000 Bootstraps)

Mediation Path	Indirect Effect	Boot SE	95% LLCI	ULCI	Result
H11: CCPT→GEA→GEB	0.162	0.032	0.102	0.228	Supported
H12: CCPT→GEI→GEB	0.206	0.041	0.132	0.294	Supported
H13: CCPT→GEP→GEB	0.106	0.027	0.058	0.163	Supported
H14: CCPT→GEA→GEI→GEB	0.132	0.023	0.091	0.182	Supported
H15: CCPT→GEP→GEI→GEB	0.089	0.018	0.058	0.128	Supported
H16: GEP→GEA→GEB	0.091	0.019	0.058	0.132	Supported
H17: GEP→GEI→GEB	0.198	0.035	0.136	0.272	Supported
H18: GEA→GEI→GEB	0.255	0.042	0.179	0.344	Supported
H19: CCPT→GEA→GEI→GEB	0.087	0.015	0.061	0.121	Supported

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Mediation Path	Indirect Effect	Boot SE	95% LLCI	ULCI	Result
H20: CCPT→GEP→GEA→GEB	0.046	0.012	0.026	0.073	Supported
H21: CCPT→GEP→GEA→GEI→GEB	0.035	0.008	0.022	0.054	Supported

All 11 mediation hypotheses were supported (95% CIs excluded zero). Key findings:

Serial mediation dominated: The strongest indirect pathway was CCPT→GEA→GEI→GEB (β=0.132), revealing how institutional support enables behaviour through sequential cognitive processes (alertness → intentions).

Passion's catalytic role: GEP showed complex mediation: Not only did it directly influence GEB, but it also amplified effects through GEA (H16: β=0.091) and GEI (H17: β=0.198).

Complementary Mechanisms: The triple mediation CCPT→GEP→GEA→GEI→GEB (H21: β=0.035) confirmed passion energizes alertness and intention formation.

Partial vs. Full Mediation: Direct CCPT→GEB effects remained significant (β=0.281, p<.001) alongside mediation, indicating partial mediation.

The total indirect effect of CCPT on GEB accounted for 68.3% of the total effect, highlighting the criticality of psychological mediators. GEA→GEI→GEB was the strongest mediator chain (β=0.255), emphasizing intention formation as the central behavioural gateway.

Discussion

This study examined the psychological mechanisms linking Civil Corporate Entrepreneurship (CivilCPT) adoption in academic environments with Green Entrepreneurial Behaviour (GEB) among students in Gujranwala, Pakistan. Our integrated framework, supported by robust empirical findings (N=450), confirms

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that institutional support systems activate green venture creation primarily through the development of Green Entrepreneurial Alertness (GEA), Green Entrepreneurial Intentions (GEI), and Green Entrepreneurial Passion (GEP). The acceptance of all 10 direct hypotheses and 11 mediation hypotheses provides compelling evidence for the theorized pathways, offering significant theoretical and practical implications.

The Central Role of CivilCPT in Activating Green Entrepreneurship

The strong direct effects of CivilCPT on GEA ($\beta = 0.519$, $p < .001$), GEI ($\beta = 0.402$, $p < .001$), and GEP ($\beta = 0.463$, $p < .001$) underscore the foundational importance of university support structures. This aligns with Hornsby et al.'s (2002) assertion that organizational encouragement, autonomy, and resource availability are critical for entrepreneurial cognition. Specifically, our findings extend Neumeyer and Santos' (2021) work on sustainable academic entrepreneurship by demonstrating how CivilCPT fosters green-specific alertness – students exposed to supportive environments become significantly more adept at recognizing environmental market failures and eco-innovation opportunities (Gielnik et al., 2020). Crucially, while CivilCPT had a direct effect on GEB ($\beta = 0.281$, $p < .001$), mediation analysis revealed that 68.3% of its total influence operates indirectly through cognitive and affective variables. This highlights that institutional support's primary function is enabling psychological precursors rather than directly dictating behaviour.

Green Entrepreneurial Alertness as the Cognitive Engine

GEA emerged as a pivotal mediator, demonstrating the strongest direct response to CivilCPT. Its significant influence on GEI ($\beta = 0.498$, $p < .001$) supports Tang et al.'s (2012) conceptualization of alertness as an antecedent to intentionality. Our findings reinforce and extend Obschonka et al. (2023) by showing this relationship holds specifically in the green entrepreneurship domain. The serial mediation pathway CCPT→GEA→GEI→GEB ($\beta = 0.132$, 95% CI [0.091, 0.182]) was the most potent indirect effect, confirming that institutional support enables green behaviour by first sharpening opportunity recognition, which subsequently crystallizes into intentions. This underscores GEA's role as the "cognitive engine" driving the green entrepreneurial process within academic ecosystems.

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The Affective Catalyst: Green Entrepreneurial Passion

GEP demonstrated remarkably multifaceted influences, validating Cardon et al.'s (2013) passion construct in an environmental context. Beyond its direct effects on GEA ($\beta = 0.291$, $p < .001$), GEI ($\beta = 0.387$, $p < .001$), and GEB ($\beta = 0.228$, $p = .001$), GEP acted as a powerful catalyst within mediation chains. The pathway GEP→GEI→GEB ($\beta = 0.198$, 95% CI [0.136, 0.272]) highlights passion's capacity to translate into action via intentionality. More complex serial mediations, particularly CCPT→GEP→GEA→GEI→GEB ($\beta = 0.035$, 95% CI [0.022, 0.054]), reveal passion's unique function in energizing cognitive processes. This finding resonates with Murnieks et al.'s (2020) work on passion as motivational fuel but adds specificity by showing it amplifies green opportunity recognition and intention formation. Passion is not merely an outcome but an active, dynamic force propelling students through the green entrepreneurial journey.

The Critical Intention-Behaviour Link

The direct path GEI→GEB was the strongest in the entire model ($\beta = 0.513$, $p < .001$), reaffirming the centrality of intentions in the Theory of Planned Behaviour (Ajzen, 1991) for green ventures. This extends Kuckertz and Wagner's (2023) recent findings on sustainable entrepreneurial intentions by demonstrating their robust predictive power for actual behavioural engagement (preparatory or nascent activities) within a student population. However, the comparatively lower mean for GEB ($M = 3.78$) versus GEI ($M = 3.95$) suggests an "intention-behaviour gap," consistent with Sheeran and Webb's (2016) meta-analysis. This gap underscores the need for universities to move beyond fostering intentions to providing concrete venture development resources.

Theoretical Implications

Integrating Institutional and Psychological Perspectives: This study successfully bridges institutional theory (CivilCPT) with social cognitive (GEA, GEI) and affective (GEP) perspectives in green entrepreneurship, offering a more holistic framework than previous siloed approaches (e.g., Muñoz & Cohen, 2018).

Affective Primacy in Green Contexts: The pervasive influence of GEP challenges purely cognitive models of green entrepreneurship (Hockerts, 2023), positioning

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passion as a critical catalyst that amplifies alertness and bridges intention with action in environmentally driven ventures.

Serial Mediation Dynamics: Demonstrating the dominance of serial mediation pathways (e.g., CCPT→GEA→GEI→GEB) provides a more nuanced understanding of the process through which institutional support translates into green behaviour, moving beyond simple direct or single-mediator models.

Contextual Specificity: Findings validate the framework within a developing economy (Pakistan) and student population, addressing calls for context-specific green entrepreneurship research (Hall et al., 2022).

Practical Implications

University Policy & Curriculum: Universities should formalize CivilCPT through dedicated green entrepreneurship courses, incubators (e.g., with ESG funding access), faculty incentives for sustainability research, and integration of environmental opportunity recognition (GEA) training across disciplines (e.g., case studies on green market failures).

Harnessing Passion: Establish vibrant sustainability clubs, green venture competitions, and mentorship programs connecting students with successful green entrepreneurs to ignite and channel GEP (Cardon et al., 2023).

Bridging the Intention-Behaviour Gap: Provide tangible resources: seed funding for green prototypes, legal/IP support for eco-innovations, networking events with impact investors, and dedicated physical spaces (makerspaces/labs) for green venture development.

Government & Ecosystem Support: Policymakers should create favorable regulatory environments (simplified green business registration, tax incentives) and fund university-industry partnerships focused on solving local environmental challenges (e.g., Gujranwala's water/air quality issues).

Limitations and Future Research

Sample and Context: Convenience sampling within one Pakistani city (Gujranwala) limits generalizability. Future research should employ stratified random sampling across diverse geographical (urban/rural) and institutional (public/private universities) contexts in Pakistan and other developing nations.

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Cross-Sectional Design: Causality inferences are constrained. Longitudinal studies tracking students' entrepreneurial journeys over time are needed to establish true causal sequences and understand how relationships evolve (Hsu et al., 2024).

Self-Reported Behaviour: GEB was measured via self-reported intentions and preparatory actions. Future studies should incorporate objective measures where possible (e.g., tracking actual green venture registrations, prototype developments, or funding secured).

Cultural Nuances: While passion was critical, cultural expressions of passion may vary. Cross-cultural studies comparing collectivist (e.g., Pakistan) and individualist societies are warranted (Liñán & Fayolle, 2023).

Unexplored Moderators: Factors like prior entrepreneurial experience, gender, field of study, or perceived environmental threat severity may moderate the proposed relationships. Investigating these moderators could refine the model (Urban & Kujinga, 2023).

Conclusion

This research provides robust empirical evidence for a comprehensive model explaining how Civil Corporate Entrepreneurship (CivilCPT) within universities fosters Green Entrepreneurial Behaviour (GEB) among students. By integrating institutional, cognitive, and affective perspectives, the study reveals that supportive academic environments do not merely influence behaviour directly but act as powerful catalysts by nurturing Green Entrepreneurial Alertness (GEA), Green Entrepreneurial Intentions (GEI), and, crucially, Green Entrepreneurial Passion (GEP). The validation of all 21 hypotheses, particularly the 11 mediation pathways, underscores the complex, sequential psychological processes involved.

The findings highlight GEA as the primary cognitive mechanism activated by CivilCPT, GEP as a vital affective catalyst amplifying alertness and bridging intentions with action, and GEI→GEB as the most potent direct pathway, albeit one where a persistent gap exists. Universities are thus positioned not just as knowledge disseminators but as critical incubators for green entrepreneurial mindsets and capabilities. To unlock students' potential as agents of environmental change, universities must move beyond traditional pedagogy. They must actively cultivate

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CivilCPT through supportive structures, embed green opportunity recognition training, intentionally ignite and channel student passion for sustainability, and crucially, provide the concrete resources and support systems needed to translate green intentions into tangible ventures. Future research should address limitations through longitudinal, cross-cultural, and multi-method designs while exploring moderating factors. Ultimately, fostering green entrepreneurship within academia is not merely an educational goal but an essential contribution to building a more sustainable and resilient global economy.

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