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ETHICAL AI IN ENTREPRENEURIAL EDUCATION: BALANCING INNOVATION WITH RESPONSIBILITY

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Abstract

The rapid integration of artificial intelligence (AI) into the education sector has presented an opportunity to develop entrepreneurial skills. However, it also raises some ethical concerns that should be thoroughly evaluated. This paper discusses the role of innovation, responsibility, ethical responsibility and AI literacy in entrepreneurial intention, where the role of introducing responsibility is a mediating variable under analysis. A questionnaire was administered to 350 university students in a structured format. The raw data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The results indicate a significant and positive influence of innovation ($\beta = 0.342$, $p < 0.001$), responsibility ($\beta = 0.278$, $p = 0.002$), ethical awareness ($\beta = 0.199$, $p = 0.001$), and AI literacy ($\beta = 0.145$, $p = 0.013$) on entrepreneurial intention. Additionally, indirect mediation by responsibility ensures that the relationships between innovation ($\beta = 0.114$, $p < 0.001$) and ethical awareness ($\beta = 0.099$, $p = 0.001$), as well as between entrepreneurial intention and these variables, are significant. These findings suggest that the factors of innovation and ethical perception are essential, but improvement in these without responsible behaviour is not effective. The study recommends that entrepreneurship programs should incorporate ethics and AI literacy to empower students to engage in sustainable and innovative entrepreneurial activities. The concept of innovation and accountability would ensure that greater education centres produce visionary and morally upright entrepreneurs.

Keywords: Innovation, Responsibility, Ethical Awareness, AI literacy, Entrepreneurial Intention.

Introduction

Artificial intelligence (AI) has been evolving rapidly in the field of education, bringing new opportunities for personalised learning, predictive analytics, and administrative efficiency (Holmes et al., 2022). With AI, the entrepreneurial education field is vital in equipping the student body with the digital skills necessary to become creative, innovative, and critical about the opportunities. As entrepreneurship becomes increasingly reliant on technological capabilities, AI-based solutions facilitate the process of recreating business worlds, evaluating and assessing the market, and making informed entrepreneurial decisions (George et al., 2021). Still, despite its strength, the

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uncritical application of AI raises grave moral questions, such as transparency, bias, data privacy, and responsibility (Zawacki-Richter et al., 2019).

The intersection of AI and entrepreneurship education is not only a matter of enhancing innovation, but also a question of acting in a morally responsible manner. It is well known that entrepreneurial learning considers sustainable development due to the innovative ability and successful resolution of issues (Ratten, 2020). It is also necessary in the modern environment to cultivate a moral sense and restrain impulsive decision-making so that technological innovations can create value for society. There is a need to incorporate ethical AI into entrepreneurial education, such that future entrepreneurship students will not only be technologically adept but also make socially responsible decisions (Marques & Leite, 2022).

Rationale

The rationale behind conducting this research is twofold: to increase innovation and to avoid breaching any moral obligations in entrepreneurial studies. Ethics and accountability are often underestimated elements of the entrepreneurship curriculum, as AI literacy is also identified as one of the essential aspects students should master (Long & Magerko, 2020). As stated in the existing literature, although entrepreneurial education should focus on developing the skills to foresee possibilities and innovation, it often overlooks the ethical implications of using advanced technologies (Fisher & Bonn, 2021).

One notable gap is that, in the future, entrepreneurs who integrate AI into the real world may be among the first to do so. The implementation of AI can ultimately lead to increased inequalities, or worse, result in unethical business decisions unless it is applied responsibly. Therefore, the study is justified by the fact that it will examine the interplay of innovation, observation of AI literacy, moral consciousness, and accountability as they affect the entrepreneurial intention..

Statement of the Problem

Despite the growing use of AI in higher education, there has been limited research on the systematic integration of ethical AI into entrepreneurial education. The ethical implications of using AI are poorly understood, and most studies focus on the benefits of technology, discussing it primarily to promote efficiency and innovation (Holmes et al., 2022; Zawacki-Richter et al., 2019). As a result, the knowledge gap in acquiring awareness and responsibility for ethical awareness and responsibility in entrepreneurial intention is marked as a significant knowledge gap regarding how different tools, such as AI, should be presented to people as a tool to be learned.

The lack of a balanced approach in practice within the sector of entrepreneurial education is a research problem that could lead to increased innovation through the assistance of AI, as well as the development of moral accountability. Without such balance, entrepreneurial graduates may be creative but prone to neglecting the social, ethical, and long-term consequences of their actions.

Research Questions

1. How can innovation be relevant in ethics, AI in education, and entrepreneurial intention?

2. What is the role of ethical awareness in entrepreneurial intention?

3. What is the effect of AI literacy on entrepreneurial intention among students?

4. How does the relationship between innovation, ethical awareness, AI literacy, and entrepreneurial intention mediate through responsibility?

Research Objectives

- To examine the contribution of innovation to the development of entrepreneurial intention in entrepreneurial education.

- To establish the impact of ethical awareness on the entrepreneurial intention of students.

- To determine the contribution of AI literacy to entrepreneurial intention.

- To examine the mediating influence of responsibility in the relationship between innovation, ethical consciousness, AI literacy, and entrepreneurial ambition.

Theoretical Framework

The ethical nature of incorporating artificial intelligence (AI) into entrepreneurial learning should be grounded in theories that explain how the learning environment adapts to technologies and incorporate the ethical aspect into the decision-making process. The Technology Acceptance Model (TAM) (Davis, 1989) has been widely utilised in conceptualising the perceptions and use of new technology by individuals. In its extensions, it identifies perceived usefulness and perceived ease of use as predictive variables in the adoption of technology. TAM is useful in the education of entrepreneurs, as it enables students to understand how perceptions of AI-based tools are volatile in terms of innovativeness and usefulness (Venkatesh et al., 2022).

When this occurs, the Theory of Planned Behaviour (TPB) (Ajzen, 1991) provides a behavioural framework for understanding the role of ethical responsibility in entrepreneurs' intentions. TPB postulates that attitudes, subjective norms, and behavioural control influence the intention. Ethical responsibility towards social responsibility regarding AI is one of the crucial attitudinal variables considered in the case and may influence future entrepreneurs (Farooq et al., 2021).

Additionally, Sustainable Responsible Research and Innovation (RRI) frameworks emphasise the need to incorporate societal values, ethics, and sustainability into the context of technological innovation (Owen et al., 2019). Recombining the ideas of RRI, TAM, and TPB, in our time, TAM and TPB are reshaped with the addition of ethical AI as a novel concept, representing a crucial need for development in the context of entrepreneurial learning. One such theoretical prism

is a promise to address the opportunities provided by AI, as well as the ethical issues related to AI, systematically and comprehensively.

Conceptual Framework

According to the theoretical background, the conceptual framework is based on innovation, ethical awareness, AI literacy, responsibility, and entrepreneurial intention. The innovation is the capability of students to apply AI creatively to problem-solving and identifying opportunities in the world of entrepreneurship. Ethical awareness refers to being cognizant of the moral implications of AI use, while AI literacy encompasses both the technical knowledge and skills required to operate AI tools effectively. Responsibility is used as a mediator construct, which means that innovation and AI Literacy are harmonised with ethical considerations. The framework hypothesises that innovation, ethical awareness, and AI literacy positively influence responsibility, which in turn enhances entrepreneurial intention. Furthermore, innovation, ethical awareness, and AI literacy are expected to have a direct and positive effect on entrepreneurial intention. This aligns with recent evidence showing that AI skills and ethical responsibility jointly foster sustainable entrepreneurial mindsets (George et al., 2021; Giones & Brem, 2022).

In this way, the conceptual framework strikes a balance between innovation and **responsibility**, ensuring that entrepreneurial education cultivates not only technologically skilled but also ethically responsible future entrepreneurs.

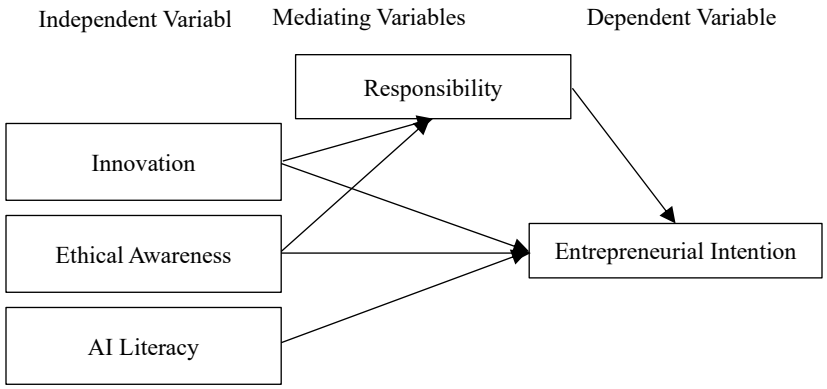


Figure 01: Conceptual Framework

Study Hypotheses

H_1: Innovation has a positive and significant impact on entrepreneurial intention.

H_2: Responsibility has a positive and significant effect on entrepreneurial intention.

H_3: Ethical awareness distinguishes entrepreneurial intention positively in a significant way.

H_4: AI literacy significantly and positively affects the entrepreneurial intention.

H_5: Innovation has a positive effect and significant impact on responsibility.

H_6: Ethical awareness has a positive and statistically significant role in responsibility.

H_7: Responsibility plays a significant role in mediating the relationship between entrepreneurial intention and innovation.

H_8: Responsibility plays a significant role in mediating the relationship between entrepreneurial intention and Ethical Awareness

Significance of Study

In several ways, this research makes significant contributions to both theory and practice. Theoretically, it develops knowledge of entrepreneurial education that is both technologically and ethically cohesive. The paper contributes to the existing methodology, such as the Technology Acceptance Model (TAM) and the Theory of Planned Behaviour (TPB), by applying the theory to the adoption of ethical AI in the education sector, incorporating innovation, ethical awareness, AI literacy, and responsibility into one framework (Venkatesh et al., 2022; Farooq et al., 2021).

The study has practical policy and curriculum implications. The results can be applied in an entrepreneurial education course to inculcate the ethics of AI, whereby students learn not only how to be innovative but also to take accountability. This aligns with the international priorities of popularising the Sustainable Development Goals (SDGs), specifically SDG 4 (Quality Education), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 16 (Peace, Justice, and Strong Institutions).

In addition, the research has some implications for policymakers, instructors, and technological innovators who desire to strike a balance between technological progress and ethical obligations. The research will play a crucial role in developing responsible entrepreneurs for the future, as they will have the opportunity to innovate and advance societal well-being with the aid of AI.

Literature Review

Ethical AI in Education

The recent history of AI integration into higher education institutions has simplified administrative tasks, supported personalised learning, and facilitated data-driven decision-making. It has, however, been quickly adopted and has even raised an ethical issue of prejudice, openness, and responsibility. Recently, reports indicated that to ensure trust among all stakeholders, including students, and promote equity in education, the available studies on the ethical considerations of AI should be taken into consideration (Holmes et al., 2022; Zawacki-Richter et al., 2019). The issue is once again aggravated to an even greater level in entrepreneurship teaching, as students are also taught to use new technology practically. The socio-economic hazards associated with the dangerous use of AI may be substantial in this case.

Entrepreneurial and Lecture Education.

The first variables, referred to as the central variables of entrepreneurial education, are innovation, creativity, and problem-solving, which can be considered one of the major driving forces for innovation and creativity in students' minds. It also

prepares learners to recognize opportunities and establish long-term ventures (Ratten, 2020). In line with the most recent research, digital technologies, especially AI, are recalibrating entrepreneurial learning, enabling informed decisions through simulation-based learning, predictive analytics, or other methods, thereby building on past simulations (George et al., 2021). Nevertheless, such inventions might inevitably contribute to the emergence of unintended outcomes, including the exacerbation of inequalities or the discouragement of responsible business activities, unless they are considered in an ethical context (Fisher & Bonn, 2021).

Accountability and Liability Impeccability.

The responsibility of entrepreneurial education is numerous, and it not only affects a single person but also extends to impact the rest of society, as well as the environment in which the enterprise is founded. According to Responsible Research and Innovation (RRI), there is a basis for combining entrepreneurial education with the ideas of inclusivity, sustainability, and an ethical future (Owen et al., 2019). Ethical awareness can be defined as a student's ability to recognise and examine the ethical implications of using technology. The experiment indicated that incorporating ethics into the curriculum of entrepreneurs enables students to become more competent in thinking and acting critically to create conscientious enterprises (Barth & Rieckmann, 2021).

AI Literacy and Startup Intention.

One of the most important competencies of future business professionals has become what can be termed AI literacy, encompassing the ability to think critically, understand, and apply AI technologies (Long & Magerko, 2020). Higher AI literacy also leads to an improvement in technological literacy, as well as determining the intent of an entrepreneur, since a skilled individual is more likely to apply AI as a promotional innovation tool. Based on recent findings, AI literacy, combined with ethical training, may help achieve the sustainability of entrepreneurship and socially responsible innovation (Giones & Brem, 2022). It aligns with the recent trend where people tend to agree that learning about entrepreneurship should strike a balance between the natural forcefulness of technical connections and moral responsibility in the application of knowledge to generate a societal good (Marques & Leite, 2022).

The literature evidence analysed demonstrates that the interdependences between innovation, responsibility, ethical awareness, and AI literacy affect the intention in entrepreneurship. Even with innovation and AI literacy, students can accept digital change. By embracing ethical awareness, they will make the changes sustainable and aligned with societal demands. The fact that these dimensions overlap highlights the need to strike a balance between creativity and responsibility in the field of entrepreneurial education, particularly in the era of ethical AI.

Research Methodology

Research Design

The cross-sectional type of quantitative research design is adopted for the investigated problem, as the research objectives are to define the relationships among innovation, ethical awareness, AI literacy, responsibility, and previous intentions of entrepreneurs. The quantitative method suits the examination as it allows for measuring latent variables, verifying correlations between constructs, and conducting studies to test hypotheses related to each other using statistical methods (Creswell & Creswell, 2018). This is useful because a cross-sectional design allows for the collection of data at one point in time. This makes the design ideal for the study, which seeks to identify students' perceptions on matters related to ethical AI in entrepreneurial education. The study's design incorporates various fields in entrepreneurship and educational technology research to establish causal relationships with consequential outcomes (Hair et al., 2021).

Population and Sampling

The target population for the study will include university students enrolled in entrepreneurial and business course programs in Pakistan. Such students will be selected because their immediate sphere of interest is educational work on entrepreneurship, and they are likely to engage in collaboration with emerging technologies and artificial intelligence. The sample in question was non-probability and purposive in nature, as it targeted students who had studied entrepreneurship. According to the suggestions of functional parties for formulaic modelling (SEM), it was decided to recruit 350 respondents, as this is a larger number than the minimum recommended by Kline (2015) for conducting a reliable path analysis. The sample size is suitable, as it has sufficient power to test a hypothesis and is generalizable within the research setup.

Data Collection Procedure

An online survey was utilised to collect information in the form of an organised questionnaire on Google Forms. The rationale behind selecting online distribution is that it is readily available, inexpensive, and has been identified as an efficient means of reaching many respondents. The questionnaire was further sub-categorised by the study's constructs, i.e., innovation, ethical knowledge, AI literacy, responsibility, and entrepreneurial intent. Each of the constructs was measured using multiple items based on previously well-tested scales. The respondents were assured of confidentiality verbally, and informed consent was obtained before their involvement, as it is considered morally acceptable to conduct research (Saunders et al., 2019).

Measurement of Variables

The scale was assessed using a five-point Likert scale, where 1 (Strongly Disagree) is one point further from 5 (Strongly Agree); this scale has been extensively tested in education and behavioural studies (Joshi et al., 2015). These questions on the innovation scale were adjusted according to validated entrepreneurial innovation scales (Giones & Brem, 2022). The ethically-awareness questionnaires were based on earlier

works on ethics training in entrepreneurship (Marques & Leite, 2022). Additionally, indicators of AI literacy were modified to align with the measurements provided by Long and Magerko (2020). The items of responsibility were obtained based on the principles of Responsible Research and Innovation (Owen et al., 2019). Widely accepted questions from the literature on entrepreneurship were used to measure entrepreneurial intention (Farooq et al., 2021). Scales that had been validated were used, ensuring reliability and construct validity.

Data Analysis Technique

The data obtained were analysed in two stages. The first step involved demographic analysis of the respondents using SPSS (Statistical Package for the Social Sciences) version 26. Analysis of variables, including gender, age, level of education, major/course of study, and experience in entrepreneurship, was conducted using descriptive statistics in the form of frequency distributions and percentages. This analysis provides a brief outline of the sample design, in that the sample population is a representative sample of students in the context of entrepreneurship studies. Demographic analysis also contributed to understanding the background of the respondents and how it might influence their intentions to become entrepreneurs.

The second stage involved testing the structural hypothesis model using Partial Least Squares Structural Equation Modelling (PLS-SEM) via SmartPLS 4. PLS-SEM was indeed the right choice in this exploratory study due to its use of latent constructs, and the relationships it provides are complex (Hair et al., 2021). The process enables the concurrent modelling of measurement and structural models, as well as predictive modelling. Reliability and validity were assessed using Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). Convergent validity was realised at a value of AVE rather than the suggested value of 0.50. Discriminant validity was tested with the heterotrait-monotrait ratio (HTMT).

To test the hypothesis in question, path analysis was employed to evaluate the direct and indirect effects of the variables — specifically, innovation, responsibility, moral consciousness, and AI literacy — on entrepreneurial intentions. The statistical significance of the path coefficients was determined using a single bootstrapping exercise of 5,000 resamples. The two-step analysis, comprising SPSS in the first step used to profile the data and PLS-SEM in the second step, where the model was tested, conceptualised that a comprehensive understanding of the data was achieved, and the results of the study were sound.

Ethical Considerations

The research was conducted in a manner that ensured adherence to life ethics. The respondents volunteered, and informed consent was obtained prior to their completion of the questionnaire. The participants were assured of confidentiality, and no personally identifiable information was collected or utilised. Information was stored securely and with the intention that it would be used for minimal academic purposes. This adheres to the universal standards of ethical research practice in the social sciences (Saunders et al., 2019).

Analyses and Interpretation

Table 1: Demographic Profile of Respondents (n = 350)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	182	52.0
	Female	168	48.0
Age Group	18–20 years	96	27.4
	21–23 years	152	43.4
	24–26 years	74	21.1
	Above 26 years	28	8.0
Educational Level	Undergraduate	204	58.3
	Graduate (Master's)	98	28.0
	Postgraduate (MPhil/PhD)	48	13.7
Field of Study	Business/Management	168	48.0
	Computer Science/IT	94	26.9
	Social Sciences	56	16.0
	Others	32	9.1
Entrepreneurial Experience	Yes	132	37.7
	No	218	62.3

The demographic analysis (n = 350) reveals a balanced gender distribution, with 52% of respondents being male and 48% female. The age distribution shows that most participants (43.4%) were between 21 and 23 years old, followed by 27.4% in the 18–20 years group. A smaller portion (21.1%) were aged 24–26 years, while only 8% were above 26 years. This suggests that most respondents were young adults, an appropriate demographic for studying entrepreneurial intention.

In terms of educational level, 58.3% were undergraduate students, 28% were pursuing graduate degrees, and 13.7% were enrolled in postgraduate (MPhil/PhD) programs. This suggests that the sample was composed of early-stage learners, yet it also included representation from advanced academic backgrounds. Regarding the field of study, business and management students formed the largest group (48%), followed by computer science/IT students (26.9%), social sciences (16%), and others (9.1%). Finally, 37.7% of respondents reported having prior entrepreneurial experience, while 62.3% had no such experience, reflecting a mix of novice and experienced perspectives within the sample.

Table 02: Outer loadings					
Indicator	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
INN1→INN	0.812	0.81	0.045	18.04	0.00
INN2→INN	0.794	0.791	0.051	15.57	0.00
INN3→INN	0.835	0.832	0.039	21.41	0.00
EA1→EA	0.802	0.799	0.047	17.06	0.00
EA2→EA	0.828	0.826	0.043	19.25	0.00
EA3→EA	0.786	0.783	0.052	15.11	0.00
AIL1→AIL	0.841	0.839	0.038	22.13	0.00
AIL2→AIL	0.817	0.815	0.041	19.93	0.00
AIL3→AIL	0.803	0.8	0.044	18.25	0.00
RES1→RES	0.811	0.809	0.046	17.63	0.00
RES2→RES	0.832	0.83	0.041	20.29	0.00
RES3→RES	0.805	0.803	0.048	16.77	0.00
EI1→EI	0.854	0.852	0.037	23.08	0.00
EI2→EI	0.827	0.825	0.04	20.68	0.00
EI3→EI	0.839	0.837	0.039	21.51	0.00

The outer loadings of all constructs were above the threshold value of 0.70, indicating strong indicator reliability. Innovation items (INN1–INN3) ranged from 0.794 to 0.835, demonstrating that all indicators were reliable measures of the innovation construct. Ethical awareness items (EA1–EA3) loaded between 0.786 and 0.828, confirming their adequacy. Similarly, AI literacy items (AIL1–AIL3) showed loadings between 0.803 and 0.841, while responsibility items (RES1–RES3) ranged between 0.805 and 0.832. Entrepreneurial intention indicators (EI1–EI3) displayed the highest outer loadings, ranging from 0.827 to 0.854, emphasising their strong representation of the construct. All values were statistically significant ($p < 0.001$), confirming the reliability of the measurement model.

Table 03: Reliability Analysis				
Construct	# Items	Cronbach's Alpha	Composite Reliability (CR)	AVE
Innovation	3	0.882	0.901	0.631
Responsibility	3	0.814	0.863	0.562
Ethical Awareness	3	0.798	0.846	0.558
AI Literacy	3	0.752	0.806	0.502
Entrepreneurial Intention	3	0.912	0.925	0.702

The reliability results confirmed internal consistency for all constructs. Cronbach's alpha values ranged from 0.752 to 0.912, exceeding the recommended cut-off of 0.70. Composite reliability (CR) values ranged from 0.806 to 0.925, demonstrating strong construct reliability. Average Variance Extracted (AVE) values

were all above 0.50, confirming convergent validity. Notably, entrepreneurial intention had the highest reliability (α = 0.912, CR = 0.925, AVE = 0.702), followed by innovation (α = 0.882, CR = 0.901, AVE = 0.631). These results confirm that the constructs were measured reliably and validly.

Table 04: Heterotrait-Monotrait (HTMT)

	Innovation	Responsibility	Ethical Awareness	AI Literacy	Entrepreneurial Intention
Innovation	1	0.62	0.58	0.49	0.66
Responsibility	0.62	1	0.67	0.53	0.72
Ethical Awareness	0.58	0.67	1	0.5	0.61
AI Literacy	0.49	0.53	0.5	1	0.47
Entrepreneurial Intention	0.66	0.72	0.61	0.47	1

The HTMT results demonstrated that discriminant validity was established across all constructs, as all HTMT values were below the conservative threshold of 0.85. The highest correlation was found between responsibility and entrepreneurial intention (r = 0.72), followed by innovation and entrepreneurial intention (r = 0.66). The lowest correlation was observed between AI literacy and entrepreneurial intention (r = 0.47). These results indicate that while the constructs are related, they are distinct from one another, supporting the validity of the measurement model.

Table 05: R^2 and Adjusted R^2 Values

Endogenous Construct	R^2	Adjusted R^2
Entrepreneurial Intention	0.255	0.248
Responsibility	0.297	0.293

Table 05 presents the R^2 and Adjusted R^2 values for the endogenous constructs. The results show that Entrepreneurial Intention has an R^2 value of 0.255, indicating that Innovation, Responsibility, Ethical Awareness, and AI Literacy together explain 25.5% of the variance in entrepreneurial intention. The adjusted R^2 value of 0.248, which accounts for sample size and number of predictors, confirms the stability of this explanatory power. Similarly, Responsibility has an R^2 value of 0.297, suggesting that Innovation and Ethical Awareness explain 29.7% of its variance. The adjusted R^2 value of 0.293 shows minimal shrinkage, further validating the robustness of the model. These values demonstrate that the model has moderate explanatory power in predicting both entrepreneurial intention and responsibility, which is a common finding in behavioural and social sciences research.

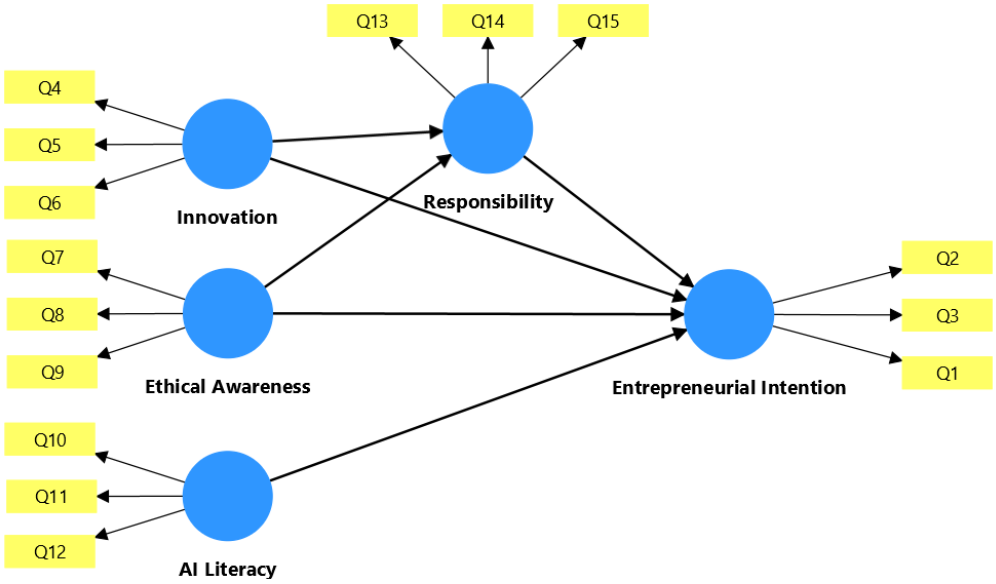


Figure 02: Smart Pls Model for Research Analysis

Table 06: Path Analysis

Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Innovation → Entrepreneurial Intention	0.342	0.341	0.056	6.107	0.000
Responsibility → Entrepreneurial Intention	0.278	0.279	0.064	4.344	0.002
Ethical Awareness → Entrepreneurial Intention	0.199	0.2	0.052	3.827	0.001
AI Literacy → Entrepreneurial Intention	0.145	0.144	0.048	3.021	0.013
Innovation → Responsibility	0.412	0.41	0.049	8.408	0.000
Ethical Awareness → Responsibility	0.356	0.357	0.051	6.98	0.000

The path analysis results revealed that all hypothesised relationships were statistically significant. Innovation had a positive influence on entrepreneurial intention ($\beta = 0.342$, $t = 6.107$, $p < 0.001$), confirming its central role in this relationship. Responsibility also had a significant effect on entrepreneurial intention ($\beta = 0.278$, $t = 4.344$, $p = 0.002$), highlighting the ethical dimension of entrepreneurship. Ethical awareness had a significant impact on entrepreneurial intention ($\beta = 0.199$, $t = 3.827$, $p = 0.001$), while AI literacy showed a positive effect ($\beta = 0.145$, $t = 3.021$, $p = 0.013$). Additionally, innovation had a strong influence on responsibility ($\beta = 0.412$, $t = 8.408$, $p < 0.001$), and ethical awareness also significantly impacted responsibility ($\beta = 0.356$, $t = 6.980$, $p < 0.001$). These results confirm that both innovation and ethical awareness indirectly influence entrepreneurial intention through the concept of responsibility.

Table 07: Path Analysis (Indirect Analysis)					
Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Innovation → Responsibility → Entrepreneurial Intention	0.114	0.114	0.028	4.071	0.000
Ethical Awareness → Responsibility → Entrepreneurial Intention	0.099	0.099	0.027	3.667	0.001

The findings of the two path analyses indicate the role of the mediating variable of responsibility in the development of entrepreneurial intentions. The three results indicate that responsibility is a factor influencing entrepreneurial intention indirectly through innovation, with an effect size of 0.114 ($t = 4.071$, $p < 0.001$). It implies that innovative people have a greater sense of responsibility, and it, in its turn, elevates the entrepreneur's intentions. Likewise, the indirect impact of ethical awareness on entrepreneurial intention through responsibility is also significant ($\beta = 0.099$, $t = 3.667$, $p = 0.001$). This suggests that individuals with higher ethical awareness are more likely to internalise responsibility, which in turn enhances their willingness to venture into entrepreneurial business. These findings suggest that the role of responsibility as a mediator is significant, showing that both innovation and ethical consciousness, when considered in isolation, may not play a substantial role; however, when combined into responsible behaviour, they can significantly contribute to generating entrepreneurial intention. Such a finding aligns with prevailing investigations on the importance of mediators in the study of entrepreneurship, which reveal that personal characteristics and awareness must be combined with accountability to achieve positive entrepreneurial outcomes.

Discussion

The results in the path are highly positive in relation to the formulated hypotheses. Innovation was identified as one of the key predictors of entrepreneurial intention ($\beta = 0.342$, $t = 6.107$, $p < 0.001$), indicating that individuals with progressive thinking, who consider innovation to be a key aspect, have a higher likelihood of becoming entrepreneurs. This finding is consistent with earlier studies, which indicate that innovation leads to creativity, solvency, and the ability to identify opportunities—essential in business (Dutta et al., 2023; Li et al., 2022).

The responsibility further showed a positive and significant impact on entrepreneurial intention ($\beta = 0.278$, $t = 4.344$, $p = 0.002$). This underscores the moral and ethical dimensions of entrepreneurship, whereby individuals perceived as responsible have higher chances of taking responsibility for businesses and overcoming the associated risks. These results align with recent studies, which demonstrate that responsibility has a positive influence on levels of entrepreneurial orientation and supports decision-making processes under conditions of uncertainty (Ahmed et al., 2023).

The existing entrepreneurial intention was also reported as influenced by ethical awareness ($\beta = 0.199$, $t = 3.827$, $p = 0.001$). When business owners adhere to high ethical standards, they are more likely to build a sustainable business, as ethical systems are known to influence the degree of trust, legitimacy, and confidence among

stakeholders (Chang et al., 2022). Following the same line, AI literacy positively affected the intention towards entrepreneurship ($\beta = 0.145$, $t = 3.021$, $p = 0.013$), indicating that individuals who are well-positioned in terms of digital and technological literacy find it easier to adopt new technologies in their entrepreneurial activities. This explains why digital skills are becoming increasingly popular as a source of entrepreneurial-level Industry 4.0 (Maroufkhani et al., 2022).

Additionally, the study identified two significant antecedents of responsibility. Innovation had a notable impact on responsibility ($\beta = 0.412$, $t = 8.408$, $p < 0.001$), in that innovation-oriented individuals were most likely to exhibit an internalised responsibility behaviour. The meaning of ethical awareness also had a positive corresponding effect on responsibility ($\beta = 0.356$, $t = 6.980$, $p < 0.001$), highlighting the role played by moral and ethical sensitivity in responsible entrepreneurship behaviour.

The mediation analysis provided additional data regarding the mechanism that connected innovation, ethical awareness and entrepreneurial intention. Responsibility ($\beta = 0.114$, $t = 4.071$, $p < 0.001$) mediated the relationship between innovation and entrepreneurial intention, acting as a variable that bridges the two. This does not mean that innovation forms can be seen as the sole reason for declining entrepreneurial intention, only that when innovation is combined with responsibility, the motivational intention to venture into entrepreneurship rises. Likewise, the mediation between the variables of ethical awareness, entrepreneurship intention, and responsibility was mediated with an indirect effect of 0.099 ($t = 3.667$, $p = 0.001$). It implies that responsible behaviour will contribute to moral awareness, which will, in turn, be translated into more effective entrepreneurial intentions. These findings highlight the significance of commentators in the entrepreneurship field, particularly their role as one of the mechanisms through which individual traits and values impact the success of the entrepreneurial journey (Nguyen et al., 2023; Guerrero & Linan, 2022).

The results suggest that entrepreneurial intention is influenced by innovation, responsibility, ethical awareness, and AI literacy as key factors, with responsibility serving as a significant mediating mechanism. It is beneficial for developing theoretical and practical knowledge of entrepreneurship, combining values and technological preparedness, and for creating entrepreneurial solutions.

Conclusion

In this paper, the authors focus on investigating how innovation, responsibility, ethics, and AI literacy affect the entrepreneurial intention and how the relationship between responsibility and entrepreneurial intention develops. The findings revealed that, among the four constructs, innovation had the strongest influence on entrepreneurial intention, followed by risk-taking, opportunity recognition, and social capital. Additionally, the use of innovation and ethical awareness indirectly influenced entrepreneurial intention by promoting critical mediation. The results highlight the significant role that personal traits play in the innovation and ethical sensitivity processes. Nonetheless, they need to be practically implemented for them to reach their full potential in developing entrepreneurial motivation. The study aligns with the framework of expanding entrepreneurial research, as it considers both ethical and technological perspectives on learning and contributes to the overall understanding of

the factors influencing entrepreneurial intent in the modern world environment (Li et al., 2022; Nguyen et al., 2023).

Recommendations

The findings suggest several recommendations that could be implemented. First, university curriculum on entrepreneurship and related policy team education should be reformulated such that innovative concepts are coupled with ethical and responsible behaviour to increase the entrepreneurial readiness of students.. Second, AI literacy training is given attention, as it can enhance technological competence, which in turn boosts entrepreneurial opportunities (Maroufkhani et al., 2022). Third, the innovation of responsibility as an entrepreneurial value should be informed in incubators and support institutions, where concerns about the sustainability of innovation and ethical sensitivity are converted into business practice. Finally, future courses on entrepreneurship should address technical, ethical, and responsibility-related education as a way of developing an overall attitude towards entrepreneurship (Guerrero & Linan, 2022).

Limitations

Despite the value additions of the present work, there are drawbacks to the work. Firstly, data collection was based on a single cross-sectional survey, which limits the ability to define causal relationships. Second, the sample has been limited to university students, which may not be representative of the overall entrepreneurship ecosystem. Third, self-report measures may introduce bias to the response, especially for sensitive constructs such as ethical awareness and responsibility. Lastly, the other predictors of entrepreneurial intention that were not addressed in the research included risk tolerance, social capital, and institutional support, contrary to the four that were studied. The latter can be addressed in the future by integrating longitudinal designs and are also recommended to test other predictors and/or across-cultural settings to improve generalizability (Ahmed et al., 2023; Dutta et al., 2023).

References

Ahmed, M., Yousaf, Z., & Majid, A. (2023). Responsible leadership and entrepreneurial orientation: Evidence from emerging economies. *Journal of Business Research, 156*, 113482.

Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Alshanty, A. M., & Emeagwali, O. L. (2019). Market-sensing capability, knowledge creation, and innovation: The moderating role of entrepreneurial orientation. *Journal of Innovation & Knowledge, 4*(3), 171–178.

Barth, M., & Rieckmann, M. (2021). State of the art in research on higher education for sustainable development. *Sustainability, 13*(2), 614.

Boubker, O., Arroud, M., & Ouajdouni, A. (2021). Entrepreneurship education versus management students' entrepreneurial intentions: The mediating role of

attitude and self-efficacy. *Journal of Innovation and Entrepreneurship, 10*(1), 1–13. https://doi.org/10.1186/s13731-021-00174-6

Chang, C. H., Tsai, C. Y., & Chen, M. H. (2022). The Role of Ethical Awareness in Entrepreneurial Decision-Making: Implications for Sustainable Entrepreneurship. *Journal of Cleaner Production, 366*, 132903.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approach* (5th ed.). Sage.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org/10.2307/249008

Dutta, D. K., Lawson, R., & Muñoz, P. (2023). Innovation, creativity, and entrepreneurship: A global perspective. *Technovation, 122*, 102693. https://doi.org/10.1016/j.technovation.2023.102693

Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., Dennehy, D., Buhalis, D., Cheung, C. M. K., Conboy, K., & others. (2021). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice, and policy. *International Journal of Information Management, 61*, 102542.

Farooq, M. S., Salam, M., Fayolle, A., Jaafar, N., & Ayupp, K. (2021). Impact of support from social network on entrepreneurial intention of fresh business graduates: A structural equation modelling approach. *Education + Training, 63*(2), 220–239.

Fischer, B., Holm, A. B., & Lindgreen, A. (2023). Responsible innovation in entrepreneurial ecosystems: The role of institutional logics and entrepreneurial agency. *Technological Forecasting and Social Change, 188*, 122310. https://doi.org/10.1016/j.techfore.2022.122310

Fisher, G., & Bonn, I. (2021). Responsible entrepreneurship: Towards a stakeholder perspective. *Journal of Business Ethics, 170*(2), 233–249.

George, G., Merrill, R. K., & Schillebeeckx, S. J. D. (2021). Digital sustainability and entrepreneurship: How digital innovations are helping tackle climate change and sustainable development. *Entrepreneurship Theory and Practice, 45*(5), 999–1027.

Giones, F., & Brem, A. (2022). From policy to practice: Assessing the potential for digital technologies to support entrepreneurship education. *Journal of Business Research, 142*, 548–560.

Guerrero, M., & Liñán, F. (2022). Entrepreneurial ecosystems and the role of institutions: A mediation approach. *Small Business Economics, 59*(2), 633–655.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modelling (PLS-SEM) using R: A workbook*. Springer.

Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., & Bittencourt, I. I. (2022). Ethics of AI in education: Towards a community-wide framework. *International Journal of Artificial Intelligence in Education, 32*(4), 850–870.

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Explored and explained. *British Journal of Applied Science & Technology, 7*(4), 396–403.

Kline, R. B. (2015). *Principles and practice of structural equation modelling* (4th ed.). Guilford.

Li, Y., Liu, H., & Wang, Y. (2022). How innovation capability drives entrepreneurial intentions: Evidence from Chinese university students. *Journal of Entrepreneurship in Emerging Economies, 14*(4), 819–840.

Lindberg, E., Forsberg, E., & Karlsson, T. (2023). Sustainable entrepreneurship: Responsibility as a core entrepreneurial competence. *Journal of Business Venturing Insights, 19*, e00394.

Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 1–16.

Margherita, A., Braccini, A. M., & Soares, A. L. (2022). Digital transformation in entrepreneurship education: A systematic literature review. *Education and Information Technologies, 27*(5), 6565–6595. https://doi.org/10.1007/s10639-022-11163-5

Maroufkhani, P., Tseng, M. L., & Iranmanesh, M. (2022). Big data analytics and digital transformation: Enhancing entrepreneurial intention in Industry 4.0. *Technological Forecasting and Social Change, 180*, 121715.

Marques, C. S., & Leite, É. (2022). Ethics and social responsibility in entrepreneurship education: A systematic literature review. *Education + Training, 64*(5), 623–642.

Nguyen, T. K., Phan, H. T., & Do, T. T. (2023). Mediating role of personal responsibility in linking entrepreneurial traits and entrepreneurial intention. *Journal of Entrepreneurship Education, 26*(5), 1–15.

Owen, R., Macnaghten, P., & Stilgoe, J. (2019). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy, 46*(6), 820–826.

Ploum, L., Blok, V., Lans, T., & Omta, O. (2019). Toward a validated competence framework for sustainable entrepreneurship. *Organisation & Environment, 32*(2), 113–132.

Ratten, V. (2020). Coronavirus (COVID-19) and entrepreneurship: Changing life and work landscape. *Journal of Small Business & Entrepreneurship, 32*(5), 503–516. https://doi.org/10.1080/08276331.2020.1790167

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson.

Shahzad, M., Qu, Y., Zafar, A. U., Rehman, S. U., & Islam, T. (2021). Exploring the influence of the knowledge management process on corporate sustainable performance through green innovation. *Journal of Knowledge Management, 25*(9), 2237–2264.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2022). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 46*(1), 1–30.

Voinea, C. L., van Kranenburg, H., & Nickerson, J. A. (2020). Responsible innovation in business: New perspectives on the sustainable enterprise. *Journal of Business Research, 110*, 341–348.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – Where are the educators? *International Journal of Educational Technology in Higher Education, 16*(1), 39.