



FROM LEARNER TO DIGITAL ENTREPRENEUR: EXPLORING THE RELATIONSHIP BETWEEN ARTIFICIAL INTELLIGENCE AND ENTREPRENEURIAL BUSINESS SKILLS

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KEYWORDS	ABSTRACT
artificial intelligence, entrepreneurial business skills, digital entrepreneurship, earning-oriented digital skills, university students, higher education, Pakistan	Artificial intelligence (AI) is increasingly relevant to higher education and the digital economy, creating opportunities for individuals to explore online business activities, identify market opportunities, and engage in digital entrepreneurship. However, the relationship between AI engagement and entrepreneurial business skills among university students requires further empirical investigation, particularly in the Pakistani higher education context. This study examined the relationship between artificial intelligence and entrepreneurial business skills among university students in Lahore, Pakistan. A quantitative research design was employed, using data collected from 441 students enrolled in BS and MS/MPhil programmes at selected public and private universities. A structured questionnaire was used to measure AI-related engagement and earning-oriented digital skills. Data were analysed using descriptive and inferential statistical techniques, including independent-samples t-tests, one-way analysis of variance (ANOVA), Pearson product-moment correlation, and regression analysis. The results indicated a statistically significant positive relationship between AI and entrepreneurial business skills ($r = .575$, $p = .001$). Regression analysis indicated that AI accounted for 33.1% of the observed variance in entrepreneurial business skills ($R^2 = .331$), with a statistically significant standardized regression coefficient ($\beta = .575$, $p < .001$). Significant differences in entrepreneurial business skills were reported across university type and academic level, whereas differences by gender, CGPA, employment status, and geographical location were not statistically significant. These findings highlight the relevance of AI engagement to entrepreneurial business skills among university students. The study provides a basis for further investigation into AI-supported entrepreneurship education and earning-oriented digital skill development in Pakistan
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Introduction

Artificial intelligence (AI) is becoming an increasingly important component of contemporary digital environments, influencing how individuals access information, solve problems, develop ideas, and undertake professional activities. In higher education, AI-powered applications offer opportunities to support learning, facilitate problem-solving, and assist students in developing capabilities relevant to emerging digital occupations and business activities. Beyond its educational applications, AI may also be relevant to digital entrepreneurship, where individuals use digital technologies to explore market opportunities, develop business ideas, communicate with customers, and support business decision-making.

The growing intersection between AI and entrepreneurship has attracted increasing scholarly attention. Recent research has examined AI-supported education and entrepreneurial development, as well as generative-AI-supported entrepreneurship education and its relationships with entrepreneurial self-efficacy and intention. These studies provide a starting point for understanding how AI-related educational experiences may be associated with entrepreneurial outcomes. However, entrepreneurial intention, entrepreneurial self-efficacy, and entrepreneurial business skills are distinct constructs and should not be treated as interchangeable.

Entrepreneurial intention concerns an individual's willingness or plans to pursue entrepreneurship, whereas self-efficacy concerns perceived capability to undertake particular activities. Entrepreneurial business skills, as examined in the present study, concern capabilities and orientations associated with identifying online business opportunities, exploring e-commerce, applying entrepreneurial strategies, and pursuing income-generating activities through digital means. A student may demonstrate interest in entrepreneurship without possessing the skills required to plan or manage an online business. Similarly, familiarity with AI applications does not necessarily demonstrate the ability to use those applications effectively for entrepreneurial purposes.

Digital entrepreneurship is relevant in environments where digital technologies provide alternative ways to participate in economic activities. University students may explore online business platforms, digital marketing, content-based business opportunities, and other technology-supported activities. AI applications may assist with tasks involved in these activities, including generating ideas, organising information, preparing promotional content, and exploring possible business strategies. However, access to such applications does not establish that students can independently evaluate their outputs, implement viable business plans, or achieve financial returns.

The Pakistani higher education context provides an important setting for examining these issues. Research has investigated AI-supported entrepreneurial development among university students in Pakistan, but the present study addresses a more specific empirical question: whether students' reported engagement with AI is associated with their entrepreneurial business skills within the broader domain of earning-oriented digital skills.

In the present study, entrepreneurial business skills constitute one of three dimensions of earning-oriented digital skills, alongside technical digital skills and creative freelancing skills. This article focuses specifically on the entrepreneurial business skills dimension. These skills are examined in relation to students' reported engagement with AI and across selected demographic characteristics.

The study therefore investigates the relationship between AI and entrepreneurial business skills among university students enrolled in BS and MS/MPhil programmes at selected public and private universities in Lahore, Pakistan. It also examines whether entrepreneurial business skills differ according to gender, university type, academic level, CGPA, employment status, and geographical location. By focusing on a specific outcome related to digital business activities, the study seeks to contribute evidence concerning the association between AI engagement and earning-oriented digital skill development in higher education.

Purpose of the Study

The purpose of this study was to examine the relationship between artificial intelligence and entrepreneurial business skills among university students in Lahore, Pakistan. Specifically, the study investigated the association between AI and entrepreneurial business skills and examined whether students' entrepreneurial business skills differed across selected demographic groups.

Research Objectives

To examine the level of entrepreneurial business skills among university students.

To determine the relationship between artificial intelligence and entrepreneurial business skills.

To examine the extent to which artificial intelligence statistically predicts entrepreneurial business skills.

To examine differences in entrepreneurial business skills according to gender, university type, academic level, CGPA, employment status, and geographical location.

Research Questions

What is the level of entrepreneurial business skills among university students?

Is there a statistically significant relationship between artificial intelligence and entrepreneurial business skills?

To what extent does artificial intelligence predict entrepreneurial business skills?

Do entrepreneurial business skills differ significantly according to gender, university type, academic level, CGPA, employment status, and geographical location?

Research Hypotheses

H01: There is no statistically significant relationship between artificial intelligence and entrepreneurial business skills among university students.

H02: Artificial intelligence does not significantly predict entrepreneurial business skills among university students.

H03: There is no statistically significant difference in entrepreneurial business skills according to gender.

H04: There is no statistically significant difference in entrepreneurial business skills according to university type.

H05: There is no statistically significant difference in entrepreneurial business skills according to academic level.

H06: There is no statistically significant difference in entrepreneurial business skills according to CGPA.

H07: There is no statistically significant difference in entrepreneurial business skills according to employment status.

H08: There is no statistically significant difference in entrepreneurial business skills according to geographical location.

Note: These hypotheses are organised from the research questions in the draft. They should be reconciled with the thesis hypotheses and original SPSS analyses before finalisation.

Literature Review

Artificial Intelligence in Higher Education

Artificial intelligence has expanded the range of digital tools available to students for learning, problem-solving, and the development of ideas. AI applications can assist with tasks such as generating text, organising information, developing preliminary concepts, and exploring alternative solutions. Their educational relevance depends not only on access to the tools but also on how students understand, evaluate, and apply their outputs.

Recent empirical research has begun examining the relationship between generative AI and entrepreneurial development. Research on AI-powered education and entrepreneurial development, as well as generative-AI-supported entrepreneurship education, illustrates the importance of examining the mechanisms through which AI-related educational experiences may be associated with entrepreneurial outcomes. These studies provide relevant context, but their findings must be interpreted according to the constructs and research designs they employ.

Entrepreneurial Business Skills

Entrepreneurial business skills involve capabilities associated with identifying opportunities, organising resources, planning activities, and responding to business requirements. Within digital environments, these capabilities may include exploring online marketplaces, considering e-commerce opportunities, developing digital business ideas, and using digital resources to support business activities.

In the present study, entrepreneurial business skills are situated within the broader construct of earning-oriented digital skills. The questionnaire items described in the supplied draft address intentions to learn entrepreneurial skills for income generation, interest in starting an online business, financial independence, exploration of e-commerce platforms, entrepreneurial strategies, financial competitiveness, and long-term income stability.

These item areas indicate that the construct may combine business-related orientations and perceived opportunities with aspects of entrepreneurial skill development. This has an important measurement implication: the construct should not automatically be interpreted as a direct assessment of demonstrated business competence or actual income generation. Findings should be interpreted in relation to the construct as measured by the questionnaire.

Artificial Intelligence and Digital Entrepreneurship

AI may be relevant to digital entrepreneurship because it can support activities involved in exploring and managing business opportunities. Depending on the application and the user's competence, AI tools may assist with brainstorming, preliminary market research, promotional content development, information organisation, and the exploration of possible business strategies.

Studies of AI-supported entrepreneurial development provide a basis for examining these relationships in higher education. However, different studies may measure entrepreneurial intention, attitudes, self-efficacy, skills, or actual business performance. Their findings should therefore be compared according to the constructs measured and the research designs employed.

The present study focuses on the statistical association between AI and entrepreneurial business skills among students in Lahore. The analysis can establish whether the measured variables are associated within the sample, but a cross-sectional correlational design cannot independently establish that AI use caused the development of entrepreneurial skills.

Demographic Differences in Entrepreneurial Business Skills

Students may differ in educational experiences, exposure to digital tools, access to institutional resources, and opportunities to participate in business-related activities. Academic level and university type may therefore be relevant characteristics to examine when studying entrepreneurial business skills.

Demographic differences should be treated as empirical questions rather than assumed in advance. For example, postgraduate students may have different educational experiences from

undergraduate students, but this does not automatically establish that they possess stronger entrepreneurial business skills. Similarly, any differences between public and private universities must be demonstrated by the data.

The present study examines gender, university type, academic level, CGPA, employment status, and geographical location. Statistical differences do not, by themselves, identify the mechanisms responsible for those differences. Explanations involving institutional support, access to technology, educational experience, or employment exposure should be presented as possible interpretations unless these factors have been directly measured and tested.

Synthesis of the Literature

The reviewed research establishes a relevant connection between AI-supported educational experiences and entrepreneurial outcomes, while highlighting the importance of distinguishing among different constructs. The present study focuses on entrepreneurial business skills as a specific dimension of earning-oriented digital skills. It examines whether students' reported engagement with AI is associated with their measured entrepreneurial business skills and whether those skills differ across selected demographic groups.

Research Gap

Research on AI in higher education has increasingly considered its relationship with learning, entrepreneurial attitudes, self-efficacy, and entrepreneurial intention. Existing studies have examined AI-supported entrepreneurial development in different educational settings, including university students in Pakistan and other national contexts.

Nevertheless, entrepreneurial intention and entrepreneurial business skills represent distinct outcomes. A student's intention to establish a business does not necessarily indicate the possession of skills related to business planning, online business opportunities, and income-generating activities.

The present study addresses this distinction by examining entrepreneurial business skills as a specific dimension of earning-oriented digital skills. It investigates the relationship between AI and this outcome among university students in Lahore, Pakistan, and examines differences across selected demographic characteristics. The contribution of the study lies in its focus on the measured association between AI engagement and entrepreneurial business skills within this population.

Research-gap qualification: This is a preliminary gap statement. Before journal submission, it should be strengthened through a systematic review of recent empirical studies, particularly studies measuring entrepreneurial skills rather than intention alone. The claim that research is limited in Pakistan should not be treated as established until the relevant literature has been verified.

Methodology

Research Design

The study employed a quantitative research design to examine the relationship between artificial intelligence and entrepreneurial business skills among university students. A correlational approach was used to assess the association between the study variables, while regression analysis was used to examine the statistical predictive relationship. Group-comparison analyses were also conducted to investigate differences in entrepreneurial business skills according to selected demographic characteristics. Because the study examined reported variables rather than experimentally manipulating AI use, the results are interpreted as associations and statistical predictions rather than definitive evidence of causation.

Population and Sample

The final sample consisted of 441 university students enrolled in BS and MS/MPhil programmes at selected public and private universities in Lahore, Pakistan. The study included students from different demographic groups to examine variation in entrepreneurial business skills and their relationship with AI.

The exact sampling technique, number of participating universities, recruitment procedure, inclusion criteria, and response rate must be reported from the original research records. These details cannot be inferred from the sample size alone.

Research Instrument

Data were collected through a structured questionnaire. The broader earning-oriented digital skills instrument included three dimensions: Technical Digital Skills, Creative Freelancing Skills, and Entrepreneurial Business Skills. The present article focuses on the Entrepreneurial Business Skills dimension.

According to the supplied draft, the relevant questionnaire items addressed entrepreneurial learning for income generation, interest in starting an online business, financial independence, exploration of e-commerce platforms, entrepreneurial strategies, financial competitiveness, and long-term income stability. The AI measure and its precise subdimensions should be described according to the original questionnaire and thesis documentation.

Validity and Reliability

The validity and reliability of the questionnaire are important for interpreting the reported relationships. The article should identify the instrument's original source, any modifications made to its items, the procedure used to establish content or construct validity, and the reliability coefficients for the overall scales and relevant subscales.

The wider thesis records report Cronbach's alpha coefficients of .964 for the AI Catalyst scale and .975 for the Earning-Oriented Digital Skills scale. These coefficients apply to the relevant full

scales and should not automatically be presented as the reliability of the Entrepreneurial Business Skills subscale.

Before submission, insert or verify: the number of items used to measure AI; the number of items used to measure Entrepreneurial Business Skills; the response scale and scoring procedure; the source and adaptation of the questionnaire; the validity assessment procedure; and the reliability coefficient for the Entrepreneurial Business Skills subscale, if calculated.

Data Analysis

Data were analysed using SPSS. Pearson product–moment correlation was used to examine the association between AI and Entrepreneurial Business Skills. Regression analysis was used to estimate the proportion of variance in Entrepreneurial Business Skills statistically accounted for by AI. Independent–samples t–tests and one–way ANOVA were used for comparisons involving demographic groups, according to the analyses reported in the draft.

The final manuscript should report relevant descriptive statistics, effect sizes, confidence intervals where available, and the post–hoc procedure used for significant ANOVA results. Statistical methods and results must be verified against the original SPSS output.

Results

Relationship between Artificial Intelligence and Entrepreneurial Business Skills

Table 1. Correlation between Artificial Intelligence and Entrepreneurial Business Skills

Variables	N	Pearson’s <i>r</i>	<i>p</i> –value	Interpretation
Artificial Intelligence and Entrepreneurial Business Skills	441	.575	.001	Positive, statistically significant association

As shown in Table 1, artificial intelligence was positively associated with entrepreneurial business skills among the university students in the sample ($r = .575$, $p = .001$). The result indicates that higher scores on the measured AI variable tended to be associated with higher scores on Entrepreneurial Business Skills. The correlational result does not establish whether AI engagement leads to stronger entrepreneurial skills or whether students with stronger entrepreneurial skills are more likely to engage with AI.

Regression Analysis

Table 2. Regression Results for Entrepreneurial Business Skills

Predictor	R	R ²	Variance explained	Standardized β	<i>t</i>	<i>p</i>
Artificial Intelligence	.575	.331	33.1%	.575	14.728	< .001

The regression results indicate that AI was a statistically significant predictor of Entrepreneurial Business Skills within the fitted model. The coefficient of determination ($R^2 = .331$) indicates that the model accounted for 33.1% of the observed variance in Entrepreneurial Business Skills. The standardized regression coefficient ($\beta = .575, p < .001$) indicates a positive statistical relationship between the predictor and outcome. The remaining 66.9% of variance was not accounted for by this single-predictor model. This should not be interpreted as evidence that AI use caused a 33.1% improvement in entrepreneurial skills.

Differences According to Demographic Characteristics

Table 3. Summary of Demographic Differences in Entrepreneurial Business Skills

Demographic characteristic	Reported result	Statistical significance	Conclusion
Gender	$p = .571$	Not significant	No statistically significant difference reported
University type	$F = 3.982, p = .008$	Significant	A statistically significant group difference was reported
Academic level	$p = .022$	Significant	A statistically significant group difference was reported
CGPA	Not significant	Not significant	No statistically significant difference reported
Employment status	Not significant	Not significant	No statistically significant difference reported
Geographical location	Not significant	Not significant	No statistically significant difference reported

The demographic comparisons indicated statistically significant differences in Entrepreneurial Business Skills across university type and academic level. In contrast, the draft reported no statistically significant differences according to gender, CGPA, employment status, or geographical location. The available summary does not establish which university-type groups differed from one another or the magnitude of the differences. The final manuscript should include exact test statistics and any required post-hoc comparisons.

Discussion

The present study examined the relationship between artificial intelligence and Entrepreneurial Business Skills among university students in Lahore, Pakistan. The findings indicated a positive and statistically significant association between the measured AI variable and Entrepreneurial Business Skills. The regression model also accounted for a proportion of the observed variance in the outcome.

These findings are relevant to research examining AI in entrepreneurship education. Previous research has considered AI-supported entrepreneurial development, entrepreneurial intention, and entrepreneurial self-efficacy, indicating that the relationship between AI and entrepreneurship involves several distinct educational and psychological outcomes. The present study adds a specific focus on Entrepreneurial Business Skills within the broader construct of earning-oriented digital skills.

The results suggest that students who reported higher AI scores also tended to report higher Entrepreneurial Business Skills scores. Nevertheless, the findings should be interpreted in relation to the questionnaire used to measure these constructs. The regression analysis indicated that AI statistically accounted for 33.1% of the variance in Entrepreneurial Business Skills. This result supports the relevance of the association within the fitted model, but does not establish that AI use alone determines entrepreneurial skill development.

Demographic Differences

The findings revealed statistically significant differences according to university type and academic level. The absence of statistically significant differences according to gender, CGPA, employment status, and geographical location indicates that the draft did not establish differences across those groups. A statistically significant difference does not identify its underlying cause, while a non-significant result does not establish that two groups are identical. The magnitude and precision of differences should be considered alongside statistical significance.

Further analysis of group means, effect sizes, and confidence intervals would help establish the practical importance of the observed differences. The precise academic-level comparison and any post-hoc comparisons should be included to clarify which groups differed.

Contribution of the Study

The principal contribution of this study is its focus on the association between AI and Entrepreneurial Business Skills as a specific dimension of earning-oriented digital skills. Rather than treating entrepreneurial intention, AI use, and business competence as interchangeable constructs, the study examines a particular measured outcome within a defined university population. The findings provide a basis for further investigation into how AI-related engagement may be associated with students' reported entrepreneurial capabilities.

Conclusion

This study examined the relationship between artificial intelligence and Entrepreneurial Business Skills among 441 university students enrolled in BS and MS/MPhil programmes at selected public and private universities in Lahore, Pakistan. The results indicated a positive and statistically significant association between AI and Entrepreneurial Business Skills ($r = .575$, $p = .001$). The regression model accounted for 33.1% of the observed variance in the outcome. The demographic analyses reported significant differences according to university type and academic level, whereas differences according to gender, CGPA, employment status, and geographical location were not statistically significant.

The findings suggest that AI engagement is relevant to understanding Entrepreneurial Business Skills within the study population. However, the correlational design does not establish a causal relationship, and the findings should be interpreted in accordance with the questionnaire's measurement properties and the sample's characteristics. Future research could investigate whether structured AI-supported entrepreneurship education is associated with improvements in objectively assessed entrepreneurial skills, business-planning performance, or actual participation in digital business activities.

Implications

Implications for Universities

Universities may consider opportunities to connect AI-related learning with practical entrepreneurial activities. These may include guided exercises in digital business planning, e-commerce, opportunity identification, and the evaluation of AI-generated business information. Such initiatives should be evaluated rather than assumed to be effective.

Implications for Students

Students may benefit from developing the ability to use AI tools critically and purposefully in business-related contexts. This includes evaluating the accuracy of AI-generated information, considering the feasibility of business ideas, and recognising the limitations of automated outputs. The present study does not establish which specific AI applications or learning activities are most effective.

Implications for Educational Policymakers

The findings provide a rationale for further research into the integration of AI and entrepreneurial skill development within higher education. Policymakers and institutions could consider pilot programmes that combine AI-related competencies with practical entrepreneurship education and subsequently evaluate their outcomes.

Limitations

Several limitations should be considered when interpreting the findings. First, the sample consisted of university students from Lahore, Pakistan, and the findings should not automatically be

generalised to students in other regions or educational contexts. Second, the study used a structured questionnaire. If the measures rely on self-reported responses, the results may reflect students' perceptions of AI engagement and entrepreneurial business skills rather than independently demonstrated competence. Third, the correlational research design does not establish causal relationships. Although AI was statistically associated with Entrepreneurial Business Skills, the analysis does not establish whether AI engagement caused the development of these skills. Fourth, the regression model included AI as the predictor of interest; other relevant factors may also be associated with entrepreneurial business skills. Finally, interpretation depends on the content and measurement properties of the questionnaire. If the items primarily capture intentions, perceptions, or anticipated financial outcomes, the findings should not be treated as direct evidence of actual business performance.

Proposed table	Required information	Purpose
Participant characteristics	Frequencies and percentages for gender, university type, academic level, CGPA, employment status, and geographical location	Describe the sample
Descriptive statistics and reliability	Mean, standard deviation, number of items, and Cronbach's alpha for AI and Entrepreneurial Business Skills	Describe variables and measurement reliability
Correlation analysis	Correlation coefficients, sample size, significance levels, and confidence intervals where available	Show strength and direction of association
Regression analysis	R , R^2 , adjusted R^2 , F , degrees of freedom, B , standard error, β , t , p , and confidence intervals	Report the predictive model transparently
Gender and university-type comparisons	Group sizes, means, standard deviations, test statistics, p -values, and effect sizes	Document group comparisons
Academic-level comparisons	Group sizes, means, standard deviations, test statistics, p -values, and effect sizes	Show magnitude and nature of differences
CGPA, employment, and geographical comparisons	Relevant group statistics and effect sizes	Support interpretation of non-significant findings

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