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Focus and Scope

The Transnational Journal of Business (TJB) is a peer-reviewed interdisciplinary and international journal published by the Accreditation Council for Business School and Programs (ACBSP). The TJB publishes manuscripts that link teaching and research to enhance student learning outcomes. More specifically the Journal is interested in interdisciplinary research that promotes teaching excellence in the various academic disciplines of business to include all theoretical and applied domains.

Mission Statement

The mission of the TJB is to provide a forum for a dialogue to advance teaching excellence through research across the disciplines in business. To this end, the TJB welcomes manuscripts from all ACBSP individual members. The goal is to facilitate a linkage between teaching and research at member institutions.

Disclaimer

The Transnational Journal of Business
Managing Editor — Justin Matus, Wilkes University (PA)

Scholar-Practitioner Publications Committee

The Transnational Journal of Business acknowledges the contributions of the many reviewers whose efforts made the publication of this issue possible. In particular, the TJB acknowledges the invaluable assistance in finalizing reviews and preparing them for publication.





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Letter from the Managing Editor

Dear Reader,

Welcome again to the 10th edition of the Transnational Journal of Business! Ten years is at once a long time, yet for a journal we are still very, very young! The good news is we have come up quite a bit on the learning curve and with the tireless help and support of the ACBSP staff, The Scholar and Practitioner Publications Committee, reviewers and of course, our authors the Journal is very well positioned for the next many years.

As always, I encourage everyone to share the journal's contents with your colleagues, students and alumni. I am especially interested in having more of our article cited in the literature which will only increase our visibility – a key element of sustaining a quality and relevant journal.

If you have any suggestions on improving the journal, comments or questions, do not hesitate to contact me directly at justin.matus@wilkes.edu.

Justin Matus

Student Perceptions of AI Integration in Accounting Education: Exploring the Value, Challenges, and Career Readiness

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Keywords

Artificial intelligence (AI), Accounting Education, Students' Perceptions, Career readiness, Skill Development, AI Integration Challenges, and Higher Education

Abstract

This study examines accounting students' perceptions of artificial intelligence (AI) integration in their education, focusing on its value, challenges, and influence on career readiness. A quantitative survey assessed students' views on AI's relevance, difficulties in learning and applying it, and its role in enhancing professional preparedness. Results show that most students see AI as beneficial for future careers, especially in strengthening data analysis, problem-solving, and technical skills. However, they face challenges such as limited exposure to real-world AI tools, a lack of hands-on experience, and insufficient instructor expertise. These issues point to the need for structured learning and faculty development. Despite the obstacles, students, particularly undergraduates, express confidence in AI's positive impact on their career prospects. The study recommends curriculum improvements, including more practical applications, enhanced faculty training, and a balance between technical skills and creative thinking. These findings support aligning AI education with student needs and evolving industry expectations.Bloom framework can add value, in different ways, to instructional design and assessment.

Introduction

Artificial intelligence (AI) is revolutionizing the accounting profession by changing the way financial information is processed, analyzed, and utilized for decision-making (Cudia & Legaspi, 2024). AI has transformed the conventional boundaries of accounting by automating tasks such as data entry, reconciliation, and report generation, which allows accounting professionals to concentrate on strategic activities such as forecasting and advisory functions (Bulău et al., 2024). This change mirrors wider industry trends prioritizing technological adoption to drive efficiency, accuracy, and strategic goals. As a result, accounting education has been subjected to a paradigm shift intended to prepare future professionals for this rapidly changing technological context (Țurcan et al., 2024).

The diverse applications of AI across the accounting profession highlight its importance. AI algorithms are also deployed in auditing to detect anomalies and patterns in large volumes of data, enhancing risk assessment and fraud detection (Nusa et al., 2024). AI-powered tools are also transforming tax planning by engaging in a complex analysis of your financials to help plan the best tax strategy while reducing compliance engagement. This trend demands a workforce that can not only understand accounting principles but also harness the power of AI technologies. Accordingly, professional bodies, including the International Federation of Accountants (IFAC), have stressed the importance of AI capabilities in their respective education systems (Thody, 2024). This study aims to fulfill that need by examining students' perceptions regarding the integration of AI in their accounting education. While there are innumerable articles written about the merit of AI in professional practice, the journey and perspectives of future practitioners on how they feel about these technologies being deployed in their workflows have been less considered. Knowing how students see it is important in terms of aligning the strategies adopted for education with the needs of industry and ensuring that future accountants are best placed to meet those expectations. This study highlights AI integration and three key areas of focus: perceived value, challenge, and the career-ready implications of AI integration.

Another critical area worth investigating is the perceived value of AI integration in accounting education. Supporters of this viewpoint suggest that access to AI tools and techniques provides students with valuable problem-solving skills, analytic thinking, and a grasp of real-world applications (Abdo-Salloum & Al-Mousawi, 2025). Integrating AI-based case studies within the curriculum can be part of the steps in helping students resolve the tension between the theory of literature and the process of individual application. However, if the curriculum does not contextualize the importance of AI for their future careers, not all students will appreciate these benefits (Baldwin-Morgan, 1995). Understanding how students perceive these benefits can help improve such courses' design and delivery.

However, while the inclusion of AI in core accounting programs may come with tangible benefits, the hurdles to implementation are not insignificant. One of the major challenges is the steep learning curve that comes with learning AI technologies, which can be particularly challenging for students with little or no prior experience in programming or data analytics. (Fülöp et al., 2022). Moreover, differences in institutional resources, including the availability of advanced software and qualified instructors, could further compound these challenges (Nusa et al., 2024). We need to counter not only barriers that exist to teach, but also to ensure that we do not create barriers for diverse student populations.

One other important aspect of this research is the association between AI integration and career preparedness. Matica et al. (2023) noted that the profession of accounting is seeking entrants skilled in AI, data analytics, and other new technologies. For example, research shows that graduates who do more study in AI-related skills are more in demand when introduced to the job market as they are more able to cope with the demands of modern accounting (Hsiao & Lei Han, 2023). Yet the confidence of students in being prepared for AI-infused careers is still a subject of discussion. Other research indicates that insufficient exposure to AI applications diminishes students' sense of preparedness, despite strong performance in classes (Hsiao & Lei Han, 2023). This study aims to investigate these perceptions and propose a way forward for education and employability.

Given how AI has been growing in importance in accounting education, extensive research has been done to explore the "best" practices of how to integrate these competencies into the curriculum. Researchers have stressed the urgent need for interdisciplinary education that draws together accounting, computer science, and business analytics (Cohen et al., 2023). Additionally, enhance the curriculum with collaborative projects and simulations to enable students to gain both technical skills and soft-skill abilities such as teamwork and communication (Abdo-Salloum & Al-Mousawi, 2025). Moreover, curricula should remain aligned with industry standards and certifications to both enhance students' marketability and ensure the relevance of their education (Thody, 2024).

This article adds to previous literature by centering students, a group sometimes neglected in conversations about educational innovation. This research aims to offer actionable insights to educators, administrators, and policymakers by exploring students' perceptions of the integration of AI based on value, challenges, and career readiness. These findings will not only help in curriculum design but will also serve the larger purpose of realigning accounting education to meet the requirements of a technology-driven workforce.

The following chapter of this paper describes the methodological approach taken for this research, which

is quantitative, and stipulates that a survey engages with a wide range of students' perspectives. This solid method guarantees an extensive perception of the reasons affecting student perceptions in addition to laying a beneficial platform for certainty-based suggestions.

Literature Review

The integration of artificial intelligence (AI) into education represents a significant advancement, revolutionizing traditional teaching models into more personalized, adaptive, and efficient systems. AI technologies such as machine learning, natural language processing, and intelligent tutoring systems enhance student engagement, offer tailored feedback, and improve administrative processes (Zawacki-Richter et al., 2019; Peng et al., 2022). Historically, the incorporation of technology into education has been gradual, starting with computer-aided instruction and online learning platforms, and evolving with the rise of AI due to advancements in computational power, big data analytics, and digital resources (Holmes et al., 2019). These developments enable AI to address complex challenges like skill gaps and employability issues.

The Value of AI in Education

AI and Career Readiness

AI in education aligns closely with industry needs, preparing students for increasingly automated and data-driven workplaces (Chan, 2024). Competence in AI tools correlates with improved employability, as businesses prioritize candidates with technical skills and adaptability (Damerji & Salimi, 2021). In fields like accounting, familiarity with AI technologies—such as automated bookkeeping, predictive analytics, and fraud detection—enhances students' ability to thrive in an evolving profession (Juniardi & Putra, 2024).

Skill Development Benefits

AI fosters the development of critical skills, including analytical thinking, problem-solving, and technical proficiency (Zawacki-Richter et al., 2019). Intelligent tutoring systems and AI-powered simulation platforms provide students with hands-on experience in solving complex problems, particularly valuable in data-intensive fields like accounting (Rojas & Chiappe, 2024). Furthermore, project-based learning environments that incorporate AI stimulate creativity and innovation by encouraging students to explore diverse solutions (Chan, 2024). Virtual workshops and simulations also enhance creative problem-solving skills through immersive, interactive experiences.

Student Perceptions of AI's Value

Students generally view AI as a beneficial addition to their education. Research indicates that AI tools simplify learning, improve access to resources, and customize instruction (Ravi Kumar & Raman, 2022). Students appreciate AI-driven tools for their ability to enhance engagement and provide real-world applications (Dubey et al., 2023). However, concerns about over-reliance on technology and potential harm to critical thinking skills persist (Strohmier et al., 2024). Addressing these concerns through guided interventions can enhance students' perceptions of AI's value.

Challenges of AI Integration in Education

Institutional Challenges

The integration of AI into education faces institutional hurdles such as inadequate infrastructure, high implementation costs, and regulatory issues (Chan, 2024). Many institutions struggle to align AI technologies with existing curricula and assessment standards (Murdan & Halkhoree, 2024).

Instructor-Related Challenges

Instructor readiness is another significant barrier. Many educators lack the training and expertise to effectively use AI tools, limiting their ability to design engaging AI-based coursework (Amado-Salvatierra et al., 2024). Resistance to change and a lack of understanding of AI's pedagogical potential further hinder integration (Afzaal et al., 2024). Successful AI implementation requires professional development and institutional support to shift teaching methodologies (Holmes et al., 2019).

Student-Identified Barriers

Students often find AI concepts challenging due to perceived complexity and limited access to resources. Many studies report insufficient exposure to AI during their education, which hampers their confidence in using these tools (Baidoo-Anu et al., 2024). Additionally, ethical concerns and a lack of practical applications, such as virtual labs or real-world examples, further complicate AI adoption (Dubey et al., 2023).

AI and Career Readiness in Accounting

The Role of AI in Accounting

The accounting profession is undergoing significant transformation due to AI technologies like machine learning, robotic process automation (RPA), and data visualization tools (Kaur et al., 2023). Machine learning algorithms assist in fraud detection, risk analysis, and predictive modeling, highlighting the need for advanced technical skills (Ibrahim, 2019). Routine tasks like bookkeeping and compliance are increasingly automated, improving accuracy and allowing accountants to focus on strategic decision-making (Greenman et al., 2024).

AI's Impact on Accounting Roles and Competencies

AI is reshaping accounting job roles and required competencies. Algorithms can analyze large datasets to identify discrepancies and streamline compliance processes, reducing human error (Greenman et al., 2024). Predictive analytics and machine learning tools enhance decision-making and risk assessment (Holmes et al., 2019). The growing adoption of AI in auditing, financial reporting, and tax preparation demands that accountants acquire skills in AI implementation, data analytics, and cybersecurity to remain competitive (Juniardi & Putra, 2024).

Bridging the Gap Between Education and Industry

To prepare students for AI-driven workplaces, educational curricula must align with industry expectations (Damerji & Salimi, 2021). Strategies such as partnerships with accounting firms, internships, and case-based learning models help bridge this gap by providing practical experience alongside theoretical knowledge (Ibrahim, 2019).

Student Preparedness and Confidence

AI-focused education boosts students' confidence in using AI tools, especially when they engage with practical applications during their studies (Baidoo-Anu et al., 2024). Students with hands-on experience in AI-driven platforms feel better prepared for the workforce (Ravi Kumar & Raman, 2022). However, some students still perceive a disconnect between classroom instruction and real-world applications, underscoring the need for more hands-on learning opportunities and industry-aligned projects (Dubey et al., 2023).

Gaps in Current Research

Limited Focus on Accounting Education

Despite widespread AI integration across disciplines, research specific to accounting education remains scarce (Amado-Salvatierra, 2024). Most studies focus on general education or STEM fields, limiting the development of tailored strategies for accounting students (Kaur et al., 2023; Juniardi & Putra, 2024).

Insufficient Analysis of Student Perceptions

The current literature primarily examines faculty or institutional perspectives, leaving a gap in understanding students' views on AI integration (Baidoo-Anu et al., 2024). Few studies explore students' perceptions regarding AI's value, challenges, and impact on career readiness (Afzaal et al., 2024; Dubey et al., 2023). Addressing this gap is critical for improving AI adoption in accounting education.

Emerging Technologies and Evolving Industry Needs

The rapid evolution of AI technologies poses a challenge for educators to keep pace with industry trends. Existing research often overlooks emerging tools, reducing relevance to current industry needs (Goldman et al., 2024). Further research is needed to assess how new AI technologies influence educational practices and workforce demands (Bobula, 2024).

AI holds transformative potential for education, particularly in accounting, by enhancing career readiness and skill development. However, challenges related to institutional readiness, instructor training, and student engagement need to be addressed for successful integration. Research gaps—particularly the limited focus on accounting education and insufficient analysis of student perspectives—must be bridged to optimize AI adoption. Future studies should explore strategies to align education with evolving industry needs and incorporate emerging technologies, ensuring that students are well-prepared for an AI-driven future.

Methodology

Approach

This study employed a quantitative research approach using a survey to collect data. Surveys are effective tools for gathering

standardized information from a large population, enabling the identification of patterns, trends, and relationships within the data. The structured format allows for an efficient comparison of responses, supporting robust statistical analysis.

Participants

The target population for this study consisted of undergraduate accounting students at different academic levels during the Fall 2024 semester at a private, four-year institution in Ohio. The sample size consisted of 119 students with an average of 15 students per class participating in the study. Participants were selected from various accounting courses to ensure a diverse representation of experience and perspectives within the accounting field. Efforts were made to include students from different years of study to capture a comprehensive view of their academic progression and related experiences.

Data Collection Tool

The primary data collection tool was a structured survey designed to capture a range of quantitative data. The survey included a combination of Likert-scale questions, multiple-choice questions, and ranking items. Likert-scale questions assessed participants' attitudes and perceptions on various topics, while multiple-choice questions gathered factual information and categorical data. Ranking questions enabled participants to prioritize factors or preferences, providing additional insight into their decision-making processes. The survey was distributed electronically to facilitate broad participation and ensure ease of access.

Data Analysis

The survey data collected will be analyzed using statistical methods to identify trends, relationships, and significant differences among variables. Descriptive statistics, such as means, frequencies, and standard deviations, will be used to summarize the data. Inferential statistical tests, including t-tests, ANOVA, and regression analysis, will be employed to examine relationships between variables and differences across groups. The analysis will be conducted using the Statistical Package for Social Sciences (SPSS) to ensure accuracy and reliability in the results. Findings will be interpreted in the context of the research questions to draw meaningful conclusions and inform future research in the field of accounting education.

Results

This data was gathered from a small university in Northwest Ohio. The information came from three sections of ACC 210 (Financial Accounting) or ACC 228 (Managerial Accounting) that are required for all Bachelor of Business Administration (BBA) degree-seeking students and thus included both majors and non-majors. Lastly, the three upper-division courses of ACC 301 (Intermediate Accounting), ACC 313 (Cost Accounting 1), and ACC 403 (Accounting Information Systems) made up the remainder of the sample. If a student was in more than one of these classes, they were asked to take the survey only once to eliminate overlap.

Of the 119 students who were sampled, 85 said that they had taken a course where AI topics were included as part of the curriculum. The descriptive statistics differentiated between 45 accounting majors and 74 non-majors. Sixteen students in this sample were first-year students, 100 were second-year students, 129 were third-year students, and 36 were fourth-year students. One student was identified as a graduate-level student. Not all students answered every question with a valid answer, so sample sizes vary slightly by question.

The research framework contained the structural components of the study concerning the 3 major themes of the value of AI, the challenges of AI, and the impact of AI on career readiness. In addition to demographic questions such as major, year of study at the university, and exposure to AI in coursework, the study focused on four research questions that were then subdivided into eleven specific survey questions. Likert scale ratings, rank orders, and yes/no data were collected for the eleven specific survey questions. The study followed the following outline:

A. Perceived Value of AI in Accounting Education

RQ1 To what extent do students believe that learning AI skills is valuable for their future careers? (Survey 4, 5)

B. Perceived Challenges of AI Integration

RQ2 What challenges do students identify in learning AI as part of their curriculum? (Survey 6, 7)

RQ3 Do students feel they have adequate resources, support, and instruction to understand and apply AI tools? (Survey 8, 9)

C. Impact on Career Readiness and Skill Development

RQ4 Do students feel that AI integration in courses enhances their readiness for their careers? (Survey 10, 11)

Concerning the first major theme on the value of AI, students answered Research Question 1 in the form of survey questions 4 and 5. The surveyed question 4 asked if students felt that AI had value in their future careers. Students answered in the Likert scale format where 1= not valuable, 3= neutral, and 5= very valuable. When separated by the categorical variables of major or non-major year of study within the university, and exposure to AI in the curriculum, the results were tabulated as crosstabs and extended as a Chi-Square goodness of fit to accommodate the nominal variable status of major, year, or the existence of AI in the curriculum. There were no significant differences in proportions between those groupings as is demonstrated in Table 1.

Table 1

Students Believe that Learning AI Skills is Valuable for Their Future Careers

(Survey Question 4)

		Chi-square Goodness of fit by Major (n=119)	Chi-square Goodness of fit by year of study (n=118)	Chi-square Goodness of fit by AI in the curriculum (n=118)
Value of AI	Survey#4	$\chi2$=3.421, p=.331	$\chi2$ =8.706, p=.728	$\chi2$ = 5.410, p=.144
*P<.05, **P<.01				

Staying within the umbrella of Research Question 1, the survey further explored students' perception in question #5, which asked students to rank a given skill set that would be most enhanced by learning AI. Students reported a rank ordering of the following skills: problem-solving and critical thinking, data analysis and interpretation, creativity and innovation, technical proficiency and coding skills, and communication and collaboration. When using those ranked categories for the perceived value of AI in the career, a Spearman's Rho was utilized as it concerns the relationships with the ranking of data. Information gathered on creativity and innovation, data analysis and interpretation, technical proficiency, problem-solving, and communication and collaboration were studied. This information was broken into three specific parts to identify any significant relationships for all information gathered (n = 119), then for relationships for majors only (n = 37), and those for non-majors (n = 50). It was found that significant relationships for all students existed in creativity and innovation with data analysis and interpretation R=-.461**, technical proficiency with problem-solving R=-.462**, technical proficiency with creativity and innovation R=-.371***, and lastly, with communication and collaboration with technical proficiency R=-.213*. Within the majors, significant relationship relationships were found in technical proficiency with problem-solving R=-.538**, creativity and innovation with data analysis and interpretation R=-.383*. Lastly, the results demonstrated significant relationships for non-majors. For this subgroup, technical proficiency related rankings with problem-solving R=-.412***, creativity in innovation with data analysis and interpretation R=-.531**, technical proficiency with creativity and innovation R=-.519**, and communication collaboration with technical proficiency R=-.327**. These results are summarized in Table 2.

Table 2

Students Believe that Learning AI Skills is Valuable for Their Future Careers

(Survey Question 5)

Survey question 5		Creativity and Innovation with Data Analysis and Interpretation	Technical Proficiency with Problem-solving	Technical Proficiency with Creativity and Innovation	Communication and Collaboration with Technical Proficiency
	All N=119 (87 valid entries)	R=-.461**	R=-.462**	R=-.371**	R=-.213*
	Majors (n= 37)	R=-.383*	R=-.538**	R=-.157	R=-.519**
	Non-majors (n= 50)	R=-.531**	R=-.412**	R=-.519**	R=-.327**
*P<.05, **P<.01					

In the instances where the values provided by the students might also be considered quantitatively by the Likert scale number, comparable results were compiled as insignificant to the population. There were no significant differences in Likert values by major, year, or AI in the curriculum. This information is summarized in Table 4.

Regarding the second theme, challenges of AI integration as perceived by students, survey questions six and seven were identified to answer research question two: students' perceptions of challenges to learning AI as part of their overall curriculum. The choices provided for ranking included limited access to real-world applications, lack of relevant course content, insufficient practice, inadequate instructor expertise and instruction, and a steep learning curve for AI concepts. For Spearman's Rho for relationships and ranked challenges as specified in survey question 6, there were significant

relationships for all students (n = 101 valid data entries). For example, limited access to real-world applications showed a ranked relationship with a lack of relevant course content R=-.299**, as did insufficient practice with a lack of relevant course content R=-.218*, the learning curve for AI concepts with a lack of relevant course content, R=-.332**. Additionally, inadequate instructor expertise related to limited access to real-world applications R=-.357***. Insufficient practice related to both inadequate instruction R=-.347 ** and with a steep learning curve for AI R=-.331***.

Again, when separated by major, though the sample size was reduced to n = 39, comparable results were found. Here, insufficient practice with a lack of relevant course content showed a rho of R=-.353*, while a steep learning curve for AI concepts with a lack of relevant course content was R=-.335*. Then, inadequate instruct direct expertise related to limited access to real applications R=-.418*and Insufficient practice combined with a steep learning curve had a Spearman's Rho value of R=-.328*. When analyzed for non-majors only, the sample size was 62 for another series of related ideas in their rank orderings. Here, limited access to real-world applications related to a lack of relevant course content R=-.364** and a steep learning curve for AI concepts with a lack of relevant course content R=-.338*. Inadequate instructor expertise was found to mimic limited access to real-world applications, R=-.302*, and insufficient practice with inadequate instruction, R=-.360. These analyses are summarized in Table 3.

Table 3

Students Identify Learning AI as Part of Their Curriculum (Survey Question 6)

Challenges RQ2 Survey question 6		Limited access to real-world applications with a Lack of relevant course content	Insufficient practice with a Lack of relevant course content	The steep learning curve for AI concepts, with a Lack of relevant course content	Inadequate instructor expertise with Limited access to real-world applications	Insufficient practice with Inadequate instruction	Insufficient practice with a Steep learning curve
	All (n= 101)	R=-.299**	R=-.218	R=-.332**	R=-.357**	R=-.347**	R=-.331**
	Majors (n= 39)	R=-.175	R=-.353*	R=-.335*	R=-.418*	R=-.307	R=-.328*
	Non-majors (n= 62)	R=-.364**	R=-.338*	R=-.338	R=-.302*	R=-.360**	R=.284*
*P<.05, **P<.01							

Also identified as a perceived challenge of AI integration was survey question number seven, the difficulty in learning AI. Using the Likert scale scores from 1=very easy, 3=neutral, to 5=very hard as quantitative values, the following tests were administered: an independent T for major, an ANOVA for the year of study, and an independent t-test for the existence of AI in the curriculum. No significant findings were demonstrated in any of these analyses, as shown in summary Table 4.

Within the thematic element of challenges of AI integration was research question three: Do students feel like they have adequate resources, support, and instruction to understand and apply AI tools? Here, two additional survey questions were administered. The first was to discern any differences in the perception of the quality of resources to learn AI (1=very poor, 3= neutral, 5= excellent) when separated by major, year of study, or the existence of AI in the student's curriculum. Again, no significant findings were gathered. Similarly, in survey question number nine, addressing adequate instructor knowledge of AI (1=very poor, 3= neutral, 5= excellent), the same groups discerned by major, your study, and AI in curriculum garnered no significant findings. All the information concerning students' perceived challenges of AI integration is summarized in Table 4.

Finally, the last theme was the impact of career readiness. Here, survey questions 10 and 11 addressed research question number four: Do students feel that AI integration into their courses enhances their readiness for their careers? The overall summary of research question number 10 was again delineated for major by independent t-test, year students of the study were compared as an ANOVA, and then again by the existence of AI in the curriculum to separate the surveyed students into groups for an independent t-test. As in survey questions 7-9, there were no significant findings. The results are reported in Table 4.

Table 4

Students perceived challenges of AI integration (Survey Questions 7-9)

Table 4Theme	Research Question: Survey#	Independent value by Major (n=115)	ANOVA value by year of study (n= 116)	Independent value by AI in the curriculum (n=117)
Value of AI	RQ1: Survey 5	t=.111, p=.912	F=1.159, p=.333	t=1.305, p=.195
Challenges of AI	RQ2: Survey 7	t = -.129, p=.898	F=.486, p=.746	t= .691, p=.491
	RQ3: Survey 8	t=-.580, p=.563	F=.486, p=.746	t=.632, p=.528
Career Readiness from AI	RQ3: Survey 9	t=-.738, p=.462	F=.486, p=.746	t=-.668, p=.505
	RQ4: Survey 10	t=1.292, p=.199	F=2.076, p=.089	1.318, p=.190
*P<.05, **P<.01				

Lastly, survey question number 11 asked if students would recommend AI for career readiness. Here, a Chi-square test for independence was appropriate as all the information

was qualitative and analyzed as dummy variables where 1 recognized "yes" to recommend or "no" as a 0. The major was similarly coded as a 1 to represent accounting majors or zero for the non-accounting majors. The year of study coded variable applied as an ordinal level of measurement rather than a quantitative measurement as well (i.e., 1= first-year student, 2=2nd year, 3=3rd year, 4=5th year, 5=graduate student). There was only one statistically significant relationship finding: recommending AI was dependent upon exposure to AI in the curriculum for career readiness. The chi-square test for independence was 7.150*. No significance was found in the subgroups of major/non-major status or year. These results are summarized in Table 5.

Table 5

Students feel that AI integration in courses enhances their readiness for their careers (Survey Questions 10 and 11)

Survey question 11	Would recommend a Major	Would recommend by year	Would recommend AI in the curriculum
	$\chi 2$ =.349, p=.840	$\chi 2$ =.940, p=.322	$\chi 2$=7.150, p=.028

*P<.05, **P<.01

Conclusion

Findings

The study expands on the current literature on using AI in accounting education. Specifically, the study focuses on a critical but often overlooked stakeholder perspective, the students.

Perceived Value of AI in Accounting Education

Using the survey of 119 participants across various accounting courses, we observed a consistent recognition of the importance of AI skills in their future careers, which was irrespective of the year of study or whether they were an accounting major or a non-accounting major.

Students identified data analytics, problem-solving, and technical proficiency as the three top skills that benefited from the integration of AI in the classroom and their future careers. A series of interrelationships among these skills were identified via a series of Spearman's Rho tests, in which the students highlighted how creativity/innovation rankings were negatively correlated (R= -.461**, p<.01) with students' emphasis on data analysis and interpretation. Students who highly ranked data analysis tend to rank creativity slightly lower, which suggests that students may see technical and creative proficiency as separate skill sets. While the year of study nor their major (accounting or non-accounting major) produced a statistically significant difference in the mean Likert-scale scores about the perceived AI value, the finding implies the AI exposure may be sufficient to align their perception of the career relevance of using AI across other disciplines and class standing

Perceived Challenges of AI Integration

The use of AI in the classroom by students notwithstanding the identification of challenges for effective AI integration. The students' highest-ranked hurdles were limited access to real-world AI applications, insufficient hands-on practice, and concerns about instructor expertise. In the students' identification of the most pressing barriers, survey participants often linked the lack of real-world application examples with insufficient course content (R=-.299**, p<.01), and a steep learning curve for AI concepts (R=-.332**, p<.01). In addition, inadequate instructor expertise also correlated with limited real-world application exposure (R=-.357**, p<.01), which can underscore how content and pedagogy can constrain learning. The data did not reveal statistically significant group differences by class or major, which suggests that the barriers of insufficient practice and resources are a constraint among all students, not just accounting students.

These findings add a dimension to the existing literature by quantitatively evaluating how students perceive and prioritize challenges. The analysis demonstrates that these challenges frequently interlink in students' views (e.g., insufficient practice was strongly correlated with inadequate instructor knowledge, R=-.347**, p<.01). There was no evidence to suggest that any specific academic year or major felt more prepared. Collectively, this highlights a need for scaffolding AI integration in the curriculum from entry-level to advanced classes. It also suggests enhanced professional development for instructors. These collective highlights may be key to overcoming students' perceived obstacles in AI-focused accounting curricula.

Impact on Career Readiness and Skill Development

The final theme examined whether the students perceived integrating AI in courses bolsters students' career readiness.

There were no statistically significant differences in self-reported career preparedness among the subgroups across majors, academic years, or prior AI exposure. However, 81.36% would recommend that more courses incorporate AI training to better prepare students for their careers.

There was a notable finding among students who had already been exposed to AI in their coursework. Those students were significantly more likely to advocate for the inclusion of AI for preparedness in their careers. No statistically significant relationship emerged by major or year of study.

Together, these results indicate that while most students value AI in preparing them for career readiness, the students who had been previously exposed to AI within a course appear to endorse the value of the use of AI in preparing them for career readiness. The direct exposure of AI in multiple courses leads to a higher level of AI for the student.

Filling a Gap in Literature

Previous research on using AI and Higher Ed often focuses on faculty perspective, pedagogical frameworks, and institutional constraints; however, they frequently do not capture the nuances of the student population. Previous studies have confirmed that with the use of AI, students can strengthen analytical and technical competencies. However, there is a gap in the evaluation of how students perceive the importance of those skills and the development of those skills to prepare them for career readiness. The findings of our research address the gaps by focusing on actual students' experiences.

First, the research has determined that a key factor determining a student's recommended AI training and use with other students is that they need to be exposed to previous coursework using AI. While previous research has described technology in the classroom as a broad term, our research reveals a specific, statistically significant link between student advocacy using AI and their AI course-related experience. Our research goes beyond mirror exposure in the classroom, which quantifies a student's heightened endorsement of AI usage to even minimum AI content. This provides greater empirical evidence regarding specific curricular components that effectively shape perceived student preparedness.

Second, this research shed light on two areas of identified barriers to AI adoption and higher education of structural barriers and resource-based barriers. Previous research has acknowledged the importance of institutional infrastructure and faculty training. However, research has not evaluated the students' perspectives on these barriers and specifically on how those barriers interact. The research analyses show a correlation that there is an interlink between the lack of real-world applications and inadequate instructor experience with using AI. The finding of this interlink fills a gap and research of understanding the different forms of support related to AI integration in the classroom.

Finally, previous studies have focused on advanced majors and/or single cohorts. This research provided comparative data at the crust academic level and both accounting and non-accounting majors that offer a larger view of how AI may potentially evolve across different learner profiles and time. This multi-level analysis indicates the enriching scaffolding of AI education integration at various points within a program and aligns with future investigations that may focus on specific student subgroups.

This research contribution addresses several pronounced gaps in the accounting education literature. This research also provides actionable insights that guide educators and administration toward strategies for AI integration in the curriculum design that is evidence-based.

Future Research Directions

To expand on this research and the gaps identified in the literature, there are multiple areas for building on these expanded findings and the identified gaps in the literature, via several avenues for future research.

Longitudinal Studies Across Course Progressions

This study captured cross-sectional perceptions at various academic levels and by accounting majors and non-accounting majors in an introductory accounting course; a longitudinal study design would illuminate how these student perceptions evolve as AI is integrated over time. Even tracking a cohort of students over multiple semesters would identify how learning engagement with AI shapes their identification of AI, related to the perceived value of AI in accounting education, perceived challenges of AI integration, and the impact on career readiness and skill development.

Expansion of Survey Participants

Replicating the study to a broader survey group based on other degrees or within a specific school, such as a school of business, would add to the generalizability of the research findings. By having a broader survey group, institutions would be able to evaluate AI integration of core curriculum courses beyond a specific major.

Diverse Institutional Contexts

Replicating this study across universities with differing profiles, such as large research institutions and community colleges, would further evaluate the generalizability of the findings. Institutional differences may influence the students' perceptions of AI because of the availability of AI resources and faculty expertise in diverse ways.

Qualitative Explorations of Challenges

Qualitative research analysis would add more depth to the challenges the students ranked in this research. Such research could identify more nuanced information from student interviews and/or focus groups to identify the potential of how the barriers and challenges could be addressed more effectively from the student's perspective.

Experimental or Intervention-Based Research

Future studies could use experimental designs to test the impact of AI learning and faculty development programs on students' perceptions. For example, comparing cohorts that receive specialized AI assignments (i.e., real-world AI case studies, tutorials, or immersive partnerships with industry could yield robust evidence of integrating AI into the curriculum. The creation of hands-on, real-world case studies for the classroom holds significant promise. These case studies would allow students to apply AI tools to realistic scenarios—analyzing genuine or simulated financial data, detecting fraud patterns, and generating predictive models. By engaging students in problem-solving tasks, educators can measure the development of skill sets in accounting AI-driven work.

The direction of potential future research can potentially enable an actionable objective around AI integration in an educational curriculum, specifically an accounting curriculum. This would enable a nuanced insight into the role of higher educational institutions and educators toward shaping accounting curricula for the professional development of students to prepare them for a career that is increasingly using AI.

Research Limitations

Despite the valuable insights from this research into the students' perceptions of AI integration in accounting education, this study has several limitations that should be acknowledged. The data were collected from one private, four-year institution in the state of Ohio in the United States. Consequently, the findings may not represent students at larger universities and community colleges.

In addition, it may not represent students in different geographic or cultural settings. The survey did have limits to the statistical power of 119 students when divided into major, academic year, and exposure to AI coursework. This may have constrained the generalizability of potentially meaningful differences across subgroups. The survey was also inherently susceptible to students' self-reported data biases such as overestimation or underestimation on the rankings. The survey was also conducted at a single point in time. Without a longitudinal approach, it is difficult to determine if a student's perceptions change significantly as they proceed through their curriculum or even in the real world.

The study did not assess broader institutional or classroom factors, such as faculty professional development efforts, budgets for AI resources, and/or partnerships with industries. Expanding on these limitations in future work would provide a more comprehensive understanding of how to effectively integrate AI into accounting education, which would better prepare students for the evolving demands of using AI in the accounting profession.

It is not an "either-or" proposition, however. The revised Bloom taxonomy is well-suited for some purposes. Curriculum design specialists, or faculty in charge of program review, might use revised Bloom to guide the assessment and revision of the entire, multi-year program (Feliberty & Rodriguez, 2022; Ching & de Silva, 2017; Karanja & Malone, 2021). Accreditation standards incorporate language from Bloom's taxonomy (ACBSP, 2023; AACSB, 2020), so those who communicate with accreditation bodies should be conversant with Bloom. However, for typical instructors who want to prepare students to deal with complex, evolving aspects of professional life after college, the SLT is an excellent place to start.

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Bridging Across Borders: Collaborative Strategies for Academic and Professional Success in AI-era

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Artificial Intelligence, collaboration, interdisciplinary collaboration, cultural intelligence, soft systems methodology, critical thinking, cross-cultural communication, continuous learning, AI-enhanced education, professional success

Abstract

As artificial intelligence (AI) and globalization reshape academic and professional landscapes, effective collaboration across disciplines, institutions, and cultures becomes increasingly vital. This paper draws on Cultural Intelligence (CQ) theory and Soft Systems Methodology (SSM) to propose a cross-level framework for AI-mediated collaboration. We show how AI can enhance collective learning and performance when integrated with inclusive, human-centered practices. The framework addresses ethical considerations and promotes equity, adaptability, and continuous learning in collaborative settings. Implications for leadership, cross-functional teams, and organizational learning are discussed. AI education with student needs and evolving industry expectations.Bloom framework can add value, in different ways, to instructional design and assessment.

Bridging Across Borders: Critical Role of Collaboration in Navigating the AI Era

The rapid integration of artificial intelligence (AI) into industries and educational systems is fundamentally transforming the way we collaborate. AI technologies promise to revolutionize teamwork and decision-making, yet their implementation presents complex challenges, particularly around inclusivity, equity, and ethical responsibility(Chalutz-Ben Gal, 2023; Hughes & Davis, 2024). As AI systems increasingly mediate collaboration, it is crucial to explore how these technologies can foster more effective and inclusive interactions across diverse cultural contexts. This paper addresses these challenges by applying Cultural Intelligence (CQ) and Soft Systems Methodology (SSM), two complementary frameworks that provide insights into navigating the social and systemic complexities of AI-enhanced collaboration (Checkland, 1981; Earley & Ang, 2003; Ang

et al., 2007; Ravasi et al., 2024). Specifically, we propose a multi-level framework to guide the development of AI systems that not only maximize technical efficiency but also promote equity, inclusivity, and ethical decision-making in collaborative work environments.

While much of the existing research (Anthony et al., 2024; Fernandez et al., 2024; Lafkas, 2024; Ma et al., 2024; McLees et al., 2024; Russell & Norvig, 2020) has focused on AI's technical potential (e.g., enhancing productivity or optimizing processes), few studies have explored its social implications, such as how AI tools influence human relationships, team dynamics, and cultural inclusivity. These gaps are especially evident in understanding how diverse groups (e.g., gender, race, age) engage with AI technologies in collaborative settings. As AI increasingly shapes academic and professional environments, from AI-driven tutoring systems to workforce analytics, failure to address these social dimensions risks perpetuating existing inequities and biases(Chalutz-Ben Gal, 2023; Muhdi, 2023; Rosani et al., 2024). This paper seeks to bridge this gap by proposing a framework that integrates both Cultural Intelligence and Soft Systems Methodology, offering strategies for building collaborative capacity in AI-enhanced work environments. The central question we address is: What collaborative strategies and competencies are essential for navigating AI-driven transformations in an inclusive and responsible manner? How can we prepare students for a present and a future shaped by intelligent systems without compromising critical human values—critical thinking, collaboration, and ethical responsibility?

We argue that successful engagement with AI requires not only technical adaptation but also the development of collaborative capacity—the ability to bridge interdisciplinary, cultural, and technological divides. This necessitates expanding the concept of collaboration beyond teamwork to encompass socio-technical integration, ethical deliberation, and cultural fluency (Roberto, 2024; Salas et al., 2024). Through this study, we contribute to management literature in two ways:

- **Integrating Cultural Intelligence into Digital Collaboration:** We explore the role of CQ in AI-mediated environments, emphasizing the importance of cross-cultural competencies for successful collaboration.
- **Proposing a Cross-Level Framework for Collaborative Capacity:** We offer a framework that spans individual, team, institutional, and societal levels, outlining strategies for fostering inclusive, ethical AI adoption.

By synthesizing insights from management, education, technology, and organizational behavior, this paper offers a holistic, theory-driven approach to understanding and enabling AI-driven collaboration. In the following sections, we will review literature on AI and collaboration before presenting our framework, recommended strategies, and future research agenda.

Literature Review

AI, Collaboration, and the Imperative for Inclusive Design

The integration of artificial intelligence (AI) into education and knowledge work is transforming how individuals learn, collaborate, and solve complex problems. AI tools—such as ChatGPT, CoPilot, Napkin AI, NotebookLM, Grammarly, Zoom, Teams, etc.—enhance cognitive processes, personalize learning, and streamline collaboration across geographies and disciplines. In both academic and organizational contexts, these technologies facilitate knowledge exchange, automate routine tasks, and support real-time decision-making, fundamentally reshaping collaborative practices (Abbas et al., 2024; Purdy, 2024; Roberto, 2024). AI-driven platforms in education promote adaptive learning by tailoring content to individual needs, offering real-time feedback, and reducing administrative burden (Tuomi, 2018; Slimi, 2023). These capabilities foster inclusive learning environments and help students develop both subject knowledge and fluency in emerging digital tools increasingly vital for employability in AI-augmented workplaces (University of Bridgeport, 2023; Shahzad et al., 2024). Concurrently, educators use AI to design learner-centered curricula, analyze classroom data, and enhance instructional quality(Zeivots & Shalavin, 2024).

In professional settings, agentic AI supports cross-functional teams by independently managing workflows and enabling data-driven decision-making(Lawler et al., 2025). Collaboration tools powered by AI facilitate interdisciplinary exchange, distributed teamwork, enhance decision-making, and automate routine tasks (L. Thomas & Ambrosini, 2021). Yet this technological shift also introduces tensions around ethics, bias, and the potential erosion of critical human capabilities, including creativity, empathy, and judgment(Chalutz-Ben Gal, 2023; McLees et al., 2024). Increasingly, we see an erosion of soft skills while we upskill technical competencies to match the proliferation of AI tools, since the integration of AI into collaborative workflows introduces new demands.

As we adopt these AI systems and tools, we must also champion the development of competencies not only in using emerging technologies but also in navigating interdisciplinary and cross-functional settings. In the industry, cross-functional collaboration—bringing together professionals from IT, operations, and marketing—ensures that complex AI challenges are addressed from multiple vantage points (Lawler et al., 2025). Similarly, interdisciplinary collaboration, combining insights, is essential to ensure that AI tools reflect broader human and societal concerns(L. Thomas & Ambrosini, 2021; R. J. Thomas, 2011). Applying this in our pedagogy, we can foster learning and diffusion of knowledge, competencies through collaborative learning powered and facilitated by AI systems. These interactive learning approaches demand not only technical fluency but also cultural intelligence and systemic thinking.

Reframing Collaboration in the Age of AI: Cultural and Systemic Perspectives

While AI tools promise greater efficiency and connectivity, they also raise complex social, ethical, and cultural questions. In this context, collaboration must be reconceptualized not just as a technical process, but as a dynamic, culturally embedded, and ethically sensitive practice. Cultural Intelligence (CQ) and Soft Systems Methodology (SSM) offer valuable perspectives for understanding and shaping collaboration in the AI era.

Cultural Intelligence and Inclusive Collaboration: Cultural Intelligence (CQ), developed by Earley and Ang (2003), refers to an individual's ability to function effectively across culturally diverse contexts. In AI-enhanced collaboration, CQ plays a critical role in ensuring that interactions remain inclusive and respectful, especially in global or cross-functional teams. As AI systems increasingly mediate communication and decision-making, there is a growing need for culturally aware design and implementation practices (Ang et al., 2015). CQ enables teams to recognize cultural differences in how AI is perceived, used, and trusted. For example, in high power distance cultures, AI may be viewed as an authority, while in low power distance cultures, it may be seen as a tool to support human agency. These cultural nuances impact team dynamics, user adoption, and the ethical use of AI in collaborative settings. Integrating CQ into AI education and workforce development fosters the global competencies necessary for responsible collaboration across borders.

Soft Systems Methodology- a sociotechnical integration: Soft Systems Methodology (SSM), introduced by Checkland (1981), provides a systemic approach to addressing the ambiguous and multifaceted challenges associated with AI integration. SSM focuses on the interdependence between social and technical elements within organizations, making it well-suited for understanding the socio-technical nature of AI-enhanced collaboration.

Rather than viewing AI as a standalone tool, through SSM, we encourage stakeholders to see it as part of an evolving system involving people, values, processes, and technologies. Its participatory and iterative approach allows for the inclusion of diverse voices, designers, users, educators, and students, ensuring that AI adoption reflects collective needs and ethical standards. SSM helps identify hidden tensions in human-machine interaction and promotes solutions that are technically robust and socially legitimate.

Rethinking Educational and Collaborative Capacity in the Age of AI

The integration of artificial intelligence (AI) into education presents both a powerful opportunity and a complex challenge. As AI systems rapidly evolve, they are reshaping how individuals learn, collaborate, and prepare for the labor market. Yet this transformation is not without consequences. Scholars have raised concerns about ethical dilemmas, threats to academic integrity, job displacement, the urgent need for workforce reskilling, and the perpetuation of algorithmic bias(Chalutz-Ben Gal, 2023; Hughes & Davis, 2024; McLees et al., 2024; Roberto, 2024). These complexities underscore that the transformative promise of AI cannot be realized without strategic foresight and inclusive governance.

Within higher education, the implications are far-reaching. The University of Bridgeport (2023) highlights that equipping graduates for an AI-driven world necessitates rethinking educational policies, learning environments, and instructional models. In parallel, Shahzad et al. (2024) emphasize AI's potential to enhance student success and well-being, suggesting its role in fostering more equitable, globally harmonized learning experiences. These insights point to a broader imperative: integrating AI into education requires cross-sector collaboration to ensure that it advances, not undermines human development and societal equity.

A key response to these challenges is the growing emphasis on cross-functional and interdisciplinary collaboration. The

complexity of AI systems demands diverse expertise and collective problem-solving, making it essential to dismantle traditional silos between disciplines and professions(Ceurvorst et al., 2024; Ravasi et al., 2024). As evidenced in our own study, collaboration among faculty from varied regions and institutions fostered the development of critical competencies and adaptive learning. This mirrors a broader shift in organizational and academic contexts, where effective teamwork, especially under conditions of uncertainty, has become central to innovation and resilience (Salas et al., 2024). Tools such as Microsoft Applications (Teams), Zoom, Asana, and Google Docs exemplify this shift, offering integrated support for cross-functional and virtual collaboration. These platforms reduce traditional barriers by facilitating fluid communication and coordination among dispersed team members, enabling real-time knowledge sharing across disciplines and geographies, breaking down traditional silos.

Cross-functional collaboration and interdisciplinary collaboration are vital for generating novel insights and comprehensive solutions by leveraging diverse knowledge bases(Ceurvorst et al., 2024; Lawler et al., 2025; Ravasi et al., 2024; L. Thomas & Ambrosini, 2021). Collaboration between academia and industry further enhances this dynamic, bridging the gap between theory and application (L. Thomas & Ambrosini, 2021). Moreover, international, AI-enabled collaborations are reshaping education by promoting global competencies and cultural intelligence among learners.

Interdisciplinary engagement is essential for addressing AI's ethical, legal, and social dimensions, enabling the co-creation of frameworks grounded in transparency, fairness, and justice (Purdy, 2024; Rosani et al., 2024). For such collaborations to succeed, organizations must cultivate open dialogue, mutual respect, and shared understanding. Structured platforms for knowledge exchange and conflict resolution are vital for building resilient collaborative ecosystems, especially in navigating the complexity of the AI era(L. Thomas & Ambrosini, 2021; R. J. Thomas, 2011).

However, collaboration—particularly across global and interdisciplinary settings—is not without its challenges. Cultural and linguistic barriers, time zone differences, misaligned goals, and infrastructural disparities often hinder coordination and communication (Ceurvorst et al., 2024; Ravasi et al., 2024). In our own collaboration on this paper, we encountered technical issues and unequal access to resources. While tools like Microsoft Teams and OneDrive aided communication, underlying challenges persisted. Effective collaboration in such contexts demands cultural sensitivity, adaptability, and professionalism.

Further, juggling multiple teams and tasks can amplify collaboration difficulties. It may lead to conflict, perceptions of free-riding, and difficulty recognizing individual contributions (Bavel & Kriska, 2024; Ravasi et al., 2024). In hybrid teams, reduced social cues from digital interactions require new ways of interpreting team dynamics and sustaining engagement (Hughes & Davis, 2024). Online settings can also encourage transactional attitudes toward networking, limiting the development of trust and social capital.

To navigate these challenges, we as leaders and educators must implement clear communication protocols, promote regular interaction, and foster a culture of respect and shared purpose (Hincapie & Hill, 2024; L. Thomas & Ambrosini, 2021). Building cultural intelligence, understanding and adapting to different cultural contexts, is critical for effective global collaboration (Hincapie & Hill, 2024; Petriglieri, 2025). The COVID-19 pandemic reinforced the urgency of mastering virtual collaboration, highlighting the need for intentional, inclusive, and adaptive strategies to support remote teams(Hughes & Davis, 2024; Kuvshinikov, 2022; Muhdi, 2023).

A Multilevel Framework for AI-Enabled Collaboration and Strategies to Enhance Learning

As AI continues to shape education, it is essential to understand the multilevel dynamics of collaboration within this context. At the core of successful AI-enabled collaboration lies the need for integration across technological, institutional, and interpersonal levels. Cultural Intelligence (CQ) and Soft Systems Methodology (SSM) as complementary capacities account for these multilevel dynamics, which are critical in fostering environments where AI can enhance both collaboration and learning.

At the institutional level, universities and organizations must develop policies that support collaborative AI initiatives, including the infrastructure to facilitate seamless communication and resource sharing. The integration of AI tools, such as learning management systems, project management platforms, and AI-assisted tutoring, provides the backbone for these collaborations. These tools bridge geographic and cultural gaps, ensuring that diverse perspectives can be effectively integrated into the learning process.

At the interpersonal level, AI enhances collaboration by personalizing learning experiences and enabling global teamwork. AI supports collaborative projects by providing real-time feedback, organizing tasks, and suggesting resources, allowing students to engage deeply with the material (McLees et al., 2024). Educators should design strategies that integrate AI ethically, encouraging students to use technology to support, not replace, critical thinking and collaboration(Anthony et al., 2024; Roberto, 2024; Zeivots & Shalavin, 2024). Effective strategies include team-based projects, peer-to-peer learning, and engaged scholarships, which connect theory to practice. These methods encourage students to engage deeply with the material, hone critical thinking skills, and develop their problem-solving abilities (Bavel & Kriska, 2024; Hincapie & Hill, 2024), while AI tools ensure that no student is left behind by adapting to individual learning styles (McLees et al., 2024). AI also enhances collaboration by improving institutional operations, preparing students for an AI-driven workforce (Frey & Osborne, 2013).

To optimize AI's potential in educational collaborations, educators should also encourage ethical AI use by designing assignments and assessments that promote the responsible integration of technology (Anthony et al., 2024; Roberto, 2024; Zeivots & Shalavin, 2024). By fostering a culture of ethical AI usage, students learn how to engage with AI not as a crutch but as an empowering tool for intellectual growth. Moreover, the collaborative environment should focus on human-centered practices, emphasizing the development of socio-emotional skills such as communication, empathy, and adaptability.

In practice, engaged scholarship is one strategy that fosters deeper collaboration between researchers, practitioners, and students. This model connects theoretical knowledge with practical application, often through partnerships with industry, government, and community stakeholders (L. Thomas & Ambrosini, 2021). Engaged scholarship enhances the relevance of educational programs by ensuring that students are not only learning from textbooks but are actively involved in solving real-world problems with the help of AI.

Additionally, AI facilitates the development of cultural intelligence, enabling students to work across borders and engage in global collaborations. In this AI-powered landscape, educators must foster ethical AI use and focus on human-centered collaboration to build the skills students need for the future. Virtual platforms (such as Microsoft Teams, Zoom, Asana, and Google Docs) powered by AI allow students from diverse cultural and educational backgrounds to connect and work together in ways that traditional classroom settings cannot(Green et al., 2025). This cross-border collaboration fosters the development of cultural intelligence, a critical skill in today's interconnected world. It also helps students cultivate the adaptability required for future careers in an increasingly globalized, AI-driven workforce(Anthony et al., 2024; Green et al., 2025). In parallel with these conceptual frameworks, advances in collaborative technologies are reshaping how work and learning occur in practice.

Summarily, successful AI-enabled collaboration relies on a balance of technical tools, human interaction, and ethical practices. By implementing AI strategically, institutions can create dynamic learning environments that equip students for the challenges of a rapidly evolving world.

From Framework to Action: Human–AI Collaboration and Ecosystem Building

Building on the multilevel framework for AI-enabled collaboration, it becomes evident that technological advancement alone is not sufficient. The foundation of successful integration rests on the ability of humans and AI to work collaboratively, combining their respective strengths toward shared goals. While AI offers speed, efficiency, and data-driven insights, humans contribute critical thinking, ethical judgment, and emotional intelligence. This partnership must be purposefully designed. AI should augment, not replace, human capabilities. This human–AI collaboration is essential in academic and professional contexts alike.

As AI becomes more embedded in our daily operations and learning environments, resisting its adoption is no longer viable. Rather, we must embrace its benefits while mitigating its risks. Anthony et al. (2024) highlights how AI can enhance creativity, decision-making, and problem-solving when paired with human oversight. McLees et al. (2024) stress that clarity around the roles of both human and machine is key to realizing this potential. Educators and professionals must ensure AI is applied as a supportive tool while continuing to cultivate human-centered skills such as empathy, communication, and adaptability (Essential Skills for Managers: Develop Resilient Employees, 2025).

Even with AI's growing capabilities, human qualities remain irreplaceable for navigating complexity and fostering ethical decision-making. Developing soft skills has become more, no less, important in the AI era. Students must graduate with technical competencies and be deeply grounded

in critical human skills. This partnership model calls for a reconceptualization of system design, one that supports seamless interaction between humans and machines while upholding core human values.

Fostering Collaborative Ecosystems: Recommendations for Building Bridges

To fully harness the power of collaboration in the AI era, we must foster ecosystems that connect diverse stakeholders across disciplines, sectors, and geographies. These ecosystems must be intentional, inclusive, and grounded in ethical practice. The following recommendations offer actionable strategies to support this vision:

- **Implement AI Integration Frameworks Using Practical Case Studies**
  Institutions must move beyond experimental use of AI and adopt structured, context-specific frameworks that guide AI implementation across teaching, administration, and student support. These should be based on proven case studies, with clear timelines, resource allocation, and measurable outcomes (Hughes & Davis, 2024; Zeivots & Shalavin, 2024).

- **Strengthen Interdisciplinary Education to Bridge Knowledge Silos**
  Curricula should integrate technical and social dimensions of AI. Courses like "AI and Society" or "Technology and Ethics" prepare students to address real-world challenges holistically and work effectively in cross-functional teams (L. Thomas & Ambrosini, 2021).

- **Build Educator Capacity with Targeted AI Training and Ongoing Support**
  Educators need professional development on AI tools and pedagogy. Institutions should provide training, mentoring, and access to updated AI modules to ensure faculty remain current and confident in AI-enhanced teaching (Lawler et al., 2025; Petriglieri, 2025).

- **Create Cross-Institutional Collaborative Research Platforms**
  Universities should develop digital platforms for collaborative research across regions and disciplines. These platforms must prioritize the inclusion of underrepresented institutions to ensure equitable innovation (Purdy, 2024).

- **Promote Industry–Academia Hubs Focused on Responsible AI**
  Collaborative hubs where academia and industry co-create AI solutions ensure relevance and accountability. These spaces should emphasize ethical design and transparent deployment of AI (Gelfand et al., 2017; Kuvshinikov, 2022)

- **Shift Reward Systems to Favor Collaboration over Competition**
  Academic culture must evolve to value interdisciplinary and collaborative achievements. Promotion and funding structures should reward joint publications and shared impact (L. Thomas & Ambrosini, 2021)

- **Foster Urban–Rural Educational Partnerships on AI Projects**
  Urban institutions can share technical resources with rural counterparts through cloud-based platforms and joint research, helping bridge digital and knowledge divides (Kuvshinikov, 2022; Petriglieri, 2025).

- **Embed Socio-Digital Skills in Curriculum Design**
  Programs should intentionally include training in virtual collaboration, ethical tech use, and intercultural communication to prepare students for hybrid work environments (Hughes & Davis, 2024).

- **Invest in Digital Collaboration Infrastructure**
  Governments and institutions must ensure equitable access to high-speed internet, cloud storage, and virtual tools—particularly in underserved regions (Hincapie & Hill, 2024).

- **Mandate Cultural Intelligence Training for Collaborative Projects**
  Cultural intelligence is critical to successful cross-border teamwork. CQ training should be embedded into curricula and faculty development initiatives (Hincapie & Hill, 2024; Ravasi et al., 2024).

- **Institutionalize Ethical Frameworks in AI Research and Deployment**
  All AI development should be guided by ethics committees and governance frameworks that prioritize fairness, transparency, and inclusivity (Purdy, 2024).

- **Encourage Human-Centered AI System Design**
  Designing AI with users in mind—prioritizing accessibility, equity, and empowerment—is key to building trust and long-term adoption (Hughes & Davis, 2024; Zeivots & Shalavin, 2024).

- **Build a Culture of Lifelong Learning for Future Collaboration Readiness**
  Institutions must support modular learning, certifications, and AI literacy programs to ensure all stakeholders can adapt to rapid technological change (Green et al., 2025; Roberto, 2024)

Conclusion, Limitations, and Future Research

This study examined how collaboration can be optimized to navigate the rapid integration of artificial intelligence into academic and professional contexts, guided by the lenses of Cultural Intelligence (CQ) and Soft Systems Methodology (SSM). CQ provided the foundation for understanding and addressing the cultural complexities inherent in interdisciplinary and cross-border collaboration, while SSM offered a process-oriented framework for diagnosing problems, engaging stakeholders, and co-developing systemic, human-centered solutions. Our reviews highlight the importance of fostering culturally intelligent, ethically grounded, and structurally supportive collaborative ecosystems. We emphasized strategies such as interdisciplinary learning, digital infrastructure investment, ethical AI design, and educator capacity-building as vital enablers of responsible and inclusive AI adoption.

However, this study is not without limitations. As a conceptual and reflective piece, it lacks empirical testing. Future research should explore the practical application of CQ and SSM in collaborative educational settings, especially across diverse socio-economic and cultural contexts. Longitudinal studies could examine the sustained impact of AI on pedagogy, student learning outcomes, and the evolving role of educators in hybrid learning environments. The study offers practical recommendations, but these remain theoretical. Future research should assess their implementation and impact using measurable indicators.

Although we reflect on our own collaborative experience, the study does not empirically evaluate the effectiveness or pedagogical outcomes of cross-border collaboration in AI-integrated environments. Further investigation is needed into how cross-border collaborations influence teaching practices and how educators adapt to AI-augmented roles. Additionally, our analysis emphasizes student and institutional dimensions of AI integration, with less attention to the evolving role, preparedness, and support needs of educators in AI-enabled collaboration.

The future of education and work is not a binary of human versus machine but a dynamic collaboration between both. As we build bridges between cultures, disciplines, and intelligence, CQ and SSM offer critical pathways to ensure that these efforts are inclusive, adaptive, and ethically sound. Our hope is that these theoretical frameworks will continue to inform empirical research and guide institutions toward more resilient and human-centered AI integration.

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Beyond Content: Leveraging AI and Metacognitive Strategies for Transformative Learning in Higher Education

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Metacognition, process mastery, active learning, artificial intelligence (AI), personalized learning, adaptive learning, time management, spaced repetition, active recall, the forgetting curve, Growth Mindset, GRIT, Cognitive Load Theory, the Feynman Technique, interleaving, peer teaching, Cornell Notes, mind mapping, the Memory Palace Technique, the Pomodoro Technique, the Eisenhower Matrix, critical thinking, problem-solving skills

Abstract

Higher education is evolving from traditional content mastery to a paradigm that emphasizes metacognition, active learning, and the strategic use of artificial intelligence (AI). This paper demonstrates how AI-driven personalization and metacognitive scaffolding together shift higher education from content delivery to transformative learning. It begins with a review of the question of why data abundance demands new learner skills, and it next explores how AImetacognitive synergy delivers those skills. Special attention is given to how AI can be leveraged to create customized learning paths, provide targeted feedback, and promote selfquestioning. Ethical considerations, such as data privacy, algorithmic bias, and the evolving role of human instructors, are also addressed. The paper concludes with a call to action for educational institutions to embrace this paradigm shift, emphasizing the importance of preparing students for an AI-enriched future through adaptable learning skills and a commitment to continuous innovation.

Beyond Content: Leveraging AI and Metacognitive Strategies for Transformative Learning in Higher Education

While traditional universities once thrived on scarce content, today AI systems both generate and curate information—necessitating new learner skills. These emergent competencies will be augmented through AI assistance that will surface students' metacognitive patterns in real time. Higher education is rooted in a traditional model that emphasizes content mastery, characterized by lecture-heavy, memorization-focused approaches (Barr & Tagg, 1995). The focus was on delivering vast amounts of content through lectures, with students expected to absorb and recall this information for exams. While this approach was suitable in an era where access to information was limited, it has become increasingly inadequate in today's rapidly changing world.

Although innovative approaches like flipped classrooms, student-centered learning, and virtual education have emerged in recent years, much of higher education remains focused on the lecture-heavy, content-mastery paradigm. This persistence is understandable, as professors often teach in the same way they were taught. Research consistently shows the ineffectiveness of pure lecture-based approaches: "Despite their popularity, traditional lectures fail to provide faculty with feedback about student learning and fail to provide students with opportunities to practice using concepts" (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt, & Wenderoth, 2014, p. 8410). Additional research indicates only a 10% retention rate from lecture-only instruction, decreased student engagement and critical thinking, and limited development of higher-order cognitive skills, thus providing support for a new paradigm (Prince, 2004). The next section diagnoses that paradigm shift's drivers, and where AI is incorporated.

The Need for a Paradigm Shift – AI-Anchored Learner Skills

As Orlando (2024) states, "Our job is not to cover content but rather to produce learning" (para. 2). Moreover, AI systems now curate and amplify information streams, demanding that students master self-regulated, metacognitive strategies to navigate them. The modern information age demands that students obtain information literacy skills, critical analysis abilities, adaptive learning strategies, and self-regulated learning capabilities. "In an era where information is readily accessible, the ability to process, evaluate, and utilize information effectively becomes more crucial than success in any particular subject matter" (Flavell, 1979, p. 906).

The explosion of information, driven by technological advancements, has rendered the old model less effective. According to IBM, "90% of the world's data has been created in the last two years," highlighting the need for skills beyond mere memorization (Ahmad, 2018, para.

4). Employers now prioritize critical thinking and problem-solving skills over content knowledge (Hart Research Associates, 2015). This shift in workplace demands necessitates a transition to a process mastery paradigm that emphasizes active learning and metacognitive skills (Dweck, 2006; Siemens, 2005). Next is an outline of the four pillars of metacognition, active learning, time management, and AI support that operationalize this shift.

Components of the New Paradigm

The new paradigm rests on the four synergistic pillars of metacognition, active learning, time management, and AI support, each of which amplifies the others. The transition to college presents students with a dynamic and challenging learning environment. They face increased academic rigor, a wider range of subjects, and the need to develop effective study habits to succeed. Students can leverage a variety of learning theories, strategies, and tools to navigate this complex landscape. Each pillar will be examined first separately, then in combination with AI metacognitive integration. This will assist in emphasizing the importance of active learning, time management, metacognition, and the strategic use of technology to optimize the learning process. Next is a focus on metacognition which is the foundational pillar showing how AI feedback loops transform self-monitoring into strategic mastery.

One of the most significant shifts students encounter in college is the expectation of active learning. Unlike passive learning, where information is absorbed, active learning requires students to engage with the material, process it deeply, and apply it in meaningful ways. This approach aligns with cognitive learning theories, such as active recall and spaced repetition, which are key techniques for enhancing memory retention and understanding. Active Recall involves retrieving information from memory without looking at notes, forcing the brain to work harder and solidifying learning. Spaced repetition, on the other hand, emphasizes reviewing material at increasing intervals to combat the natural forgetting curve.

This new paradigm in higher education would integrate several key components to address these challenges. Metacognition is central to this shift as the development of metacognitive skills, which involves thinking about one's personal thinking processes. Metacognition enables students to become more self-aware and strategic learners, improving their ability to adapt and apply knowledge in various contexts (Schraw & Dennison, 1994). Effective learning strategies such as spaced repetition, interleaving, and retrieval practice are crucial for enhancing memory retention and comprehension. These strategies help students manage their learning processes more effectively, leading to better academic outcomes (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013).

AI tools like NotebookLM enhance metacognitive self-monitoring by summarizing source materials, generating keyword lists with definitions, and creating adaptive study

guides or mind maps. These outputs allow students to visualize their comprehension gaps and refine their reflection processes. For instance, AI-generated quiz questions prompt learners to actively assess their understanding, transforming passive review into strategic self-evaluation. Next is a showcase of AI-powered platforms that deliver these tactics in real student workflows.

Effective time management is another crucial skill for college success. Students juggle multiple responsibilities, from attending classes and completing assignments to participating in extracurricular activities and maintaining personal well-being. There are several time management techniques, including time blocking and the Pomodoro Technique, to help students structure their time effectively. These methods encourage focused work sessions interspersed with breaks, promoting productivity and preventing burnout.

In recent years, artificial intelligence (AI) has emerged as a powerful tool with the potential to transform the learning experience for college students. AI can play a significant role in several key areas, including personalized learning, automation of tasks, enhanced engagement, and accessibility. AI algorithms can analyze student data to create personalized learning paths, provide customized recommendations, and offer targeted feedback. This level of personalization can cater to individual learning styles and needs, making learning more efficient and effective. Additionally, AI can automate time-consuming tasks like note-taking and scheduling, freeing students' time to focus on higher-order thinking skills such as critical analysis and problem solving. AI-powered platforms can also enhance engagement by incorporating gamification, simulations, and interactive exercises, making learning more interactive and enjoyable.

Moreover, AI can provide support for students with disabilities by offering tools for text-to-speech, real-time captioning, and other accommodations.

This paper provides a comprehensive overview of the challenges and opportunities in college learning, setting the stage for a deeper exploration of how AI can support students in achieving academic success. By embracing this new paradigm, higher education institutions can better prepare students for the complexities of the modern world, equipping them with the skills needed to thrive in an AI-enriched future. Having outlined these pillars, the paper next examines how metacognition itself empowers students to navigate complexity.

Metacognition and Its Role in Learning With AI Monitoring

Defining Metacognition and Its Importance in Education

"Metacognitive knowledge is the knowledge of yourself as a learner—how you learn best; the strategies you have at your disposal; the tasks you have to complete and how you complete them" (Loveless, 2024, para 12). Metacognitive self-monitoring becomes far more powerful when AI feedback can visualize strategic usage by alerting learners to revisit concepts precisely when their performance dips below mastery thresholds. Metacognition, often described as "thinking about thinking," is a critical component of effective learning. It involves an awareness and control of one's cognitive processes, enabling learners to manage their learning experiences strategically. Metacognitive skills empower individuals to identify what they know and do not, choose effective learning strategies, monitor their understanding, and evaluate their learning outcomes. In higher education, metacognition is vital in helping students become more self-directed and efficient learners (Flavell, 1979).

Intelligent tutoring systems (ITS) like Carnegie Learning track students' problem-solving steps, alerting learners when they repeat unproductive strategies. This adaptive feedback encourages reflection, such as "Why did this step fail?", and strengthens metacognitive regulation though AI supported monitoring. Moreover, metacognitive awareness paves the way for cultivating a growth mindset, which underlies students' willingness to persist through challenges.

A Growth Mindset

A growth mindset is essential for effective learning. "Students who can internalize a growth mindset are better able to fulfill long-term learning goals rather than just 'make the grade" (Stump, Husman, & Corby, 2014). It promotes self-awareness and resilience, allowing learners to view challenges as opportunities for growth rather than insurmountable obstacles. The growth mindset is a powerful concept suggesting that dedication, effort, and perseverance can be develop our abilities, talents, and intelligence. In contrast, a fixed mindset believes that these qualities are fixed and, therefore, cannot be improved. Adopting a growth mindset allows us to embrace challenges, persist in the face of setbacks, and ultimately reach our full potential (Dweck, 2006).

A growth mindset, as conceptualized by Carol Dweck (2006), is closely linked to metacognition. Encouraging students to reflect on their learning processes fosters a belief that intelligence and abilities are developed through effort and persistence. This mindset is critical in an AI-enriched environment, where adaptability and continuous learning are key.

A growth mindset is important in the learning process because it changes a student's attitude towards learning, leading to the belief of potential growth and development. This belief motivates them to work harder, which, in turn, increases productivity and academic performance.

"In a growth mindset, failure is viewed as a chance to learn and develop talents. It's something to be embraced, not feared" (The Beanstack Team, 2023, para 14). Students with a growth mindset are more resilient when faced with failure, viewing it as a chance to learn rather than something to be feared. They also tend to have better communication skills, greater open-mindedness, and more creativity. Furthermore, they tend to have better relationships with adults and peers as they see others as encouragers and people they can learn from, rather than as adversaries or competition (Dweck, 2006). A Growth Mindset with AI-supported interventions provides for a powerfully effective learning framework.

GRIT

Grit combines of passion and perseverance, enabling individuals to commit to long-term goals, overcome obstacles, and recover from setbacks. It is a crucial factor in achieving success and can be developed, unlike innate talent or intelligence. Psychologist Angela Duckworth developed the Grit Scale, a self-assessment test, which can strongly predict success in various challenging situations. Studies using the Grit Scale found that grit is a better indicator of GPA and graduation rates than IQ, though IQ is predictive of standardized test scores. Grit is a learned skill and can be taught and strengthened through various strategies (Duckworth, 2016).

Grit is essential in the learning process because it helps students develop a growth mindset, which means believing that abilities can improve through effort and practice. Deliberate practice, involves setting specific goals and seeking feedback, which is vital for skill development. College students, for instance, can use grit to navigate challenges, build a supportive network, and align their studies with their interests. By reframing problems and viewing setbacks as opportunities for growth, students can persist in the face of adversity and achieve their academic goals (Duckworth, 2016).

Research supports the positive impact of metacognitive strategies on student outcomes. Sutton Trust and John Hattie's (2009) research highlight that metacognitive interventions can significantly improve academic achievement, with effect sizes comparable to other high-impact educational practices. Data-driven grit profiling through AI can greatly assist students in the motivation and encouragement to maintain and grow within their grit process.

Effective Learning and Information Retention

The Forgetting Curve

The forgetting curve is crucial in understanding how information is retained and lost over time. It illustrates the decline of memory retention in the absence of active recall or review. First described by German psychologist Hermann Ebbinghaus in the late 19th century, it is a concept that illustrates how information is lost over time when there is no attempt to review or recall it actively. This curve demonstrates that humans tend to reduce their memory of newly learned knowledge in a matter of days or weeks unless they consciously review the learned material. The rate of forgetting is initially rapid, with a significant amount of information lost within the first few hours or days after learning. However, the rate of loss slows down over time (Ebbinghaus, 1913; Marousis, 2023). AI algorithms optimize spaced repetition intervals and sharpen active recall prompts to combat the forgetting curve.

Understanding the forgetting curve is crucial in learning because it highlights the importance of spaced repetition and active recall in long-term retention. By recognizing that our brains naturally tend to forget information over time, learners and educators can implement strategies to combat this natural memory decay. These strategies often involve reviewing material at increasingly spaced intervals, which helps to reinforce neural pathways and transfer information from short-term to long-term memory more effectively (Marousis, 2023).

AI-Tuned Spaced Repetition

The practice of spaced repetition is an effective strategy for combating the forgetting curve. Platforms like Anki use performance-based algorithms to schedule each review just before predicted forgetting, boosting long-term retention by up to 50%. It involves revisiting information at intervals to reinforce memory. It involves reviewing information at increasing intervals over time, which has been shown to improve long-term retention (Marousis, 2023;

Wozniak, 1990). Revisiting information at intervals reinforces memory. "It's also important to revisit old information, asking students to retrieve information a few days, weeks, or even months after they learned it" (Gonzalez, 2019, para 18). Science supports the fact that retention and long-term memory can be improved by a process of reviewing information multiple times. This is further improved by extending the time between reviews or waiting until you are about to forget the information.

AI-Tuned Active Recall

Active recall is a learning technique involving the active process of retrieving information from memory without cues or prompts rather than passively rereading or reviewing material. AI-driven flashcard apps generate custom quizzes based on error patterns, forcing retrieval practice exactly where students struggle. This process of retrieving information strengthens the neural pathways in the brain, making it easier to recall the information later. The act of attempting to remember information, rather than simply reading it, is what makes active recall so effective for learning (Beckman, 2024)

Active recall is important because it is more effective for retaining information than passive review or note-taking alone. When individuals actively retrieve information from their memory, they engage with the material at a deeper level. This deeper engagement promotes a better understanding of the material by forcing them to make connections between different pieces of information (Endres, Kranzdorf, Schneider, & Renkl, 2020). Generative AI streamlines retrieval practice by automating flashcard creation for platforms like Anki and Quizlet. Students can input lecture notes or readings into tools like ChatGPT or Claude to generate context-aware flashcards, which are then optimized via spaced repetition algorithms. This integration reduces cognitive load, allowing learners to focus on high-yield recall exercises aligned with Ebbinghaus' forgetting curve.

Active recall also enhances critical thinking skills, as it requires individuals to analyze and evaluate the information. Studies have shown that students who use active recall techniques perform significantly better on exams than those who rely solely on passive review methods. Combining active recall with note-taking can also be very effective. For example, writing questions alongside notes or using the "look, cover, write" technique promotes active engagement with the material (Endres, et al., 2020).

The Pareto Principle

The Pareto Principle, also known as the 80/20 rule, can be applied to learning by focusing on the most critical 20% of content that yields 80% of the results. In the context of learning and productivity, 80% of our results often come from 20% of our efforts or inputs. By concentrating on the vital 20% of content or practice that yields the most significant results, learners can achieve a disproportionate amount of progress in a shorter time. This approach allows for more efficient use of study time and resources, enabling learners to grasp core concepts and fundamental skills before delving into more nuanced or specialized areas (Serradell-Lopez, Lara-Navarra, & Martinez-Martinez, 2023).

The Pareto Principle is particularly important in learning because it encourages prioritization and strategic thinking. By recognizing that not all information or practice is equally valuable, learners can make informed decisions about where to invest their time and energy. This principle helps avoid the common pitfall of trying to learn everything at once, leading to being overwhelmed and inefficient (Serradell-Lopez, et al., 2023).

The Cognitive Load Theory

The Cognitive load theory emphasizes managing the amount of information processed simultaneously. Instructional materials and teaching methods should avoid overwhelming students' working memory. Educators can reduce cognitive load and facilitate learning by presenting information in manageable chunks and using clear, concise language (Sweller, 2022).

Cognitive load refers to the amount of information that the working memory can hold at any given time. The working memory is where the brain processes new information, filtering out what is irrelevant and deciding what to keep. It has a limited capacity. When too much or irrelevant information overwhelms the working memory, it disrupts the ability to learn. Cognitive load theory emphasizes that effective learning requires maintaining the amount of information in the working memory at a manageable level (Williams, 2023).

Cognitive load is important to the learning process because it directly affects how well information is encoded, stored, and retrieved from memory. Learners can actively manage cognitive load during the learning process by using several strategies. These include activating prior knowledge, organizing new information, deeply processing information and making connections to existing knowledge, distributing

learning over time, simplifying complex topics into smaller parts, using worked examples, creating questions, and filtering information to prioritize what is most important for the learner to know. These strategies can help learners to optimize their cognitive load, leading to more effective and efficient learning (Williams, 2023). Building on these retention tactics, the next section shows how AI tailors them in real student workflows.

The Expanding Role of AI in Assisting College Students – Operationalizing the Pillars

This section bridges theory to practice by exploring how AI's data analytics deliver personalized paths, feedback, and prompts that embody these strategies. AI has a significant potential to revolutionize the learning experience for college students. AI personalizes learning by adapting content to each student's needs. It also automates routine tasks, freeing time for deeper critical thinking, while boosting engagement through interactive exercises. There are a growing number of options available to students. Several methods serve as examples of this integration.

AI-Powered Personalized Learning

Teachers and students can utilize AI-powered adaptive learning platforms to tailor educational experiences to individual needs. Individuals grow, learn, and mature at different rates. Individual comprehension varies greatly; what one person finds simple, another may struggle to understand. The standardized education process, with its set routines and time allocated topics, often fails to address these individual differences. Instructors face significant challenges in tailoring guidance to each student's unique needs.

Generative AI provides dynamic scaffolding: tools like Grammarly and Quillbot offer real-time feedback on writing mechanics, while Gemini and ChatGPT explain complex concepts in simplified terms (e.g., "ELI5" explanations) and progressively deepen explanations as mastery improves. This mirrors Vygotsky's Zone of Proximal Development, enabling students to self-correct and refine their understanding iteratively. Another example is Duolingo's neural-network coach which adjusts lesson difficulty in real time, lifting average learner accuracy by 25% within two weeks (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019).

Customized AI Learning Paths

AI can analyze a student's strengths, weaknesses, and learning preferences to create a customized learning path. This path can adapt as the student progresses, ensuring that they are always challenged at the appropriate level. AI chatbots can serve as great tutors by providing access to subject matter content. Open-source textbooks can be linked to AI, and students can ask for testing on specifics content and coached on whether or not the answers are wrong or incomplete. These paths continuously recalibrate as AI detects knowledge gaps via quiz performance.

Personalized AI Recommendations

AI can recommend relevant resources such as articles, videos, and practice exercises based on a student's learning history and goals. These recommendations help students deepen their understanding and explore areas of interest. Most textbooks and lectures are a stiff, essential review of facts and concepts. Short articles and video clips serve as excellent reviews, providing diverse approaches, voices, and perspectives. Platforms like NotebookLM and Gemini (DeepMind) curate personalized learning pathways by analyzing student interactions. For example, Gemini can reorganize course materials into micro-modules based on individual progress, while Google AI Studio-powered tools adapt content delivery formats (e.g., visual vs. textual) to align with learner preferences, optimizing cognitive load.

AI-Powered Targeted Feedback

AI can provide students with immediate feedback on their work, identifying areas for improvement and suggesting specific strategies. This timely feedback loop allows students to address misconceptions and refine their understanding as they learn. AI-powered platforms can offer adaptive assessments that adjust the difficulty based on student performance, ensuring the appropriately challenge for learning. Intelligent tutoring systems can also provide personalized feedback and guidance, helping students overcome learning obstacles.

AI Enhanced Self-Questioning

The self-questioning method encourages students to ask questions about their understanding of a topic before, during, and after learning. Working with AI with the development of questions supports a student's ability to enhance his or her own questioning processes. This is similar to elaborative integration in that they both focus on creating questions, but the self-questioning method is more focused on what, and how much, the students understands about a specific topic.

AI Assisted Planning and Goal-Setting

Educators should guide students in setting specific, measurable learning goals and developing actionable plans to achieve them. Many college students lack experience in independently planning, organizing, and completing assignments due to their previous educational experiences, where they primarily followed teacher-led instructions. For many students, the process of, mapping out semester assignments, managing class schedules, and balancing academic responsibilities with other life activities is unfamiliar and challenging.

Fortunately, numerous resources are available to help students develop these crucial skills. These resources include both traditional tools and AI-powered solutions, offering students a range of options to enhance their organizational and planning abilities. By teaching these skills explicitly, educators can empower students to take control of their learning journey and better prepare them for the demands of college life and beyond.

AI Supported Monitoring

AI systems offer real-time feedback on student work, swiftly identifying areas for improvement. This immediate response fosters a growth mindset and promotes continuous learning. For educators, AI-powered assessment tools not only streamline grading but also provide in-depth insights into student performance patterns and can detect potential learning obstacles before they escalate. This early warning system enables teachers to implement timely, targeted interventions.

Proactive monitoring significantly enhances student retention. Many students hesitate to seek help until it's too late, often leading to academic struggles and increased dropout rates. AI-assisted progress tracking allows for earlier, more effective interventions. The monitoring process allows educators to gain a more comprehensive understanding of each student's learning journey. This deeper insight allows for more personalized and effective teaching strategies. Simultaneously, students benefit from tailored support and a learning experience that adapts to their individual needs and pace. With AI's toolkit defined, let's explore hands-on active-learning techniques, enriching them with AI scaffolds.

Active Learning Techniques

The Feynman Technique

The Feynman Technique aligns with the concept of retrieval practice. This technique involves explaining a concept in simple terms as if teaching it to someone else, which helps reinforce understanding and identify knowledge gaps (Feynman, 1985). This technique encourages a deep understanding by requiring students to explain concepts in simple terms. "Systematic scaffolding is essential for developing metacognitive skills" (Collins, Brown, & Holum, 1991, p. 38).

The Feynman Technique is a powerful learning method designed to enhance understanding and retention of complex subjects. Developed by Nobel laureate Richard Feynman, this technique involves four key steps: selecting a concept to learn, teaching it to a child (or explaining it in simple terms), reviewing and refining one's understanding, and organizing notes for future review. The core principle behind this method is that if you can't explain a concept in simple terms you don't truly understand it. As an example, students could use an AI tutor to quiz on their explanations, identifying logic gaps and updated summarizes before their exam to improve their overall understanding and score.

This technique is important in the learning process because it promotes active engagement with the material, rather than passive memorization. By attempting to explain concepts in simple language, it forces learners to confront gaps in their knowledge and identify areas that require further study. This process deepens understanding and improves long-term retention of information, as it encourages learners to connect new concepts with existing knowledge (Adegbuyi, 2024).

Furthermore, the Feynman Technique enhances critical thinking skills and improves communication abilities. As learners simplify complex ideas, they develop the capacity to articulate their thoughts more clearly, which is valuable in academic and professional settings. This method also boosts confidence and motivation for lifelong learning, as successfully explaining complex concepts reinforces one's belief in his or her ability to master new subjects (Adegbuyi, 2024). AI enriches practice dynamically generating Feynman-style quizzes techniques, enriching them with AI scaffolds.

Interleaving

Interleaving is a learning technique that involves mixing different topics or subjects within a single study session, rather than focusing on one topic at a time. This approach challenges students to switch between related concepts, forcing the brain to actively retrieve information and apply it in various contexts. By alternating between topics, interleaving helps students develop better problem-solving and categorization skills, leading to improved long-term retention and knowledge transfer.

The importance of interleaving lies in its ability to enhance learning outcomes significantly. It improves students' ability to discriminate between different types of problems and select appropriate problem-solving strategies. It also deepens long-term memory associations and trains the brain to adapt to different concepts, resulting in more flexible and durable learning.

This approach ensures that students receive an optimized learning experience tailored to their needs. With AI support, interleaving can help reduce cognitive load, improve organization of study materials, and implement evidence-based strategies like spaced-repetition and active recall alongside interleaving, ultimately empowering students to become more efficient and independent learners (Birnbaum, Kornell, Bjork, & Bjork 2013).

Cornell Notes

The Cornell Note-Taking Method is a systematic approach to organizing and reviewing notes, developed by Walter Pauk, an education professor at Cornell University in the 1950s. This method divides a note page into three sections: a main note-taking area, a left-hand column for keywords and questions, and a bottom section for summarizing. Students write lectures or reading notes in the main column, using concise sentences and abbreviations and leaving space between ideas (Cornell University, 2025).

The method's effectiveness lies in promoting active learning and engagement with the material. After taking initial notes, students are encouraged to review them quickly, adding keywords, questions, and a summary in the designated columns. This process helps students reflect on the content, create their study guide, and practice active recall, which moves information from short-term to long-term memory. The left-hand column allows students to quiz themselves, helping them identify areas that need further study and improving overall comprehension (Cornell University, 2025).

Cornell Notes offers several key benefits for students: it encourages intentional notetaking, creates revision-ready notes, and helps students develop better study habits. The method increases the likelihood of retaining information by forcing students to think critically about key concepts and explain them in detail. Moreover, the structured format makes it easy to review notes, prepare for exams, and quickly find specific information when writing papers or studying (Cornell University, 2025). Next is a look at AI-assisted concept mapping and semantic trees that link back to these active practices

Information Processing and Organization

AI-Assisted Mind Mapping

Mind mapping is a powerful visual technique that transforms how individuals process, organize, and communicate complex information. By creating a graphical representation of ideas, mind maps allow learners to capture thoughts in a non-linear, interconnected manner. This approach leverages visual thinking, enabling people to explore concepts more dynamically than traditional note-taking methods. Mind mapping tools can auto-cluster lecture transcripts into map nodes, prompting learners to add metacognitive annotations at each branch.

By encouraging connections between ideas, mind mapping enhances memory recall, facilitates meaningful learning, and integrates both left and right brain thinking. It helps individuals to simplify complex information, see relationships between concepts, and approach problem-solving more creatively (Buzan & Buzan, 1993; Novak & Cañas, 2008). It also supports multimodal learning by visualizing relationships, students can approach concepts through both verbal and spatial channels which, in turn, strengthen neural connections. AI-driven concept-mapping tools can auto-cluster ideas, enabling mind maps and semantic trees that adapt as understanding grows.

Dynamic Semantic Trees

The Semantic Tree approach involves breaking down complex topics into smaller, interconnected subtopics, creating a hierarchical structure of knowledge. Rather than focusing on each or several smaller components, individuals try to gain an understanding of the whole or big picture. Creating a structure or outline makes adding more minor details to the established framework easier. This process is typically the

opposite of how education approaches subjects by guiding students from multiple smaller steps or components toward developing the whole or more significant picture (Ausubel, 1968). Adaptive trees feed real-time into AI-tuned retrieval schedules. These frameworks prime the brain, and our memory strategies, for optimal retention.

Memory Enhancement Strategies

AI-Orchestrated Adaptive Retrieval Practice

Retrieval practice is a powerful learning strategy that significantly enhances student learning and retention. This technique involves actively recalling information from memory rather than simply reviewing or rereading material. By doing so, retrieval practice strengthens neural connections, improves memory retention, and deepens understanding of the subject matter. It also helps identify knowledge gaps, benefits long-term retention, and develops metacognitive skills. Research has shown that retrieval practice can dramatically improve academic performance.

Retrieval practice can be encouraged through various methods, including think-pair-share activities, quizzes, mind mapping, flashcards, interleaving, and spaced practice. These techniques encourage students to actively engage with the material, reinforcing their learning and improving their ability to recall information when needed (Roediger & Karpicke, 2006).

The Memory Palace Technique

Also known as the method of loci, this mnemonic device involves associating information with specific locations in an imaginary space (Yates, 1966). Individuals are very familiar with rooms in their homes or favorite scenic locations. By visualizing these familiar locations in their mind, they can associate specific ideas, concepts, or words to the items they see in an attempt to recall the location with the connected components. AI tools can automatically cue palace reviews at optimal intervals, ensuring no locus goes unpracticed. With organized knowledge in place, AI schedules memory palace reviews and retrieval practice sessions when they're most needed.

By incorporating these techniques and leveraging AI technologies, there is an opportunity to create a more effective and personalized learning experience for students. Moving forward, it's crucial to consider how these learning strategies can be enhanced and supported by AI technologies while maintaining a focus on ethical use and academic integrity. Finally, the paper shows how disciplined time management, augmented by AI, ties all these strategies into students' daily routines. Next is a view of how AI can integrate these memory routines into daily schedules.

Time Management and Productivity

Smart Pomodoro Scheduling

The Pomodoro Technique is a time management method that can assist students in maintaining focus and productivity. It uses focused bursts of 25-minute intervals with short breaks of 5-minutes to boost productivity and prevent burnout (Cirillo, 2006). AI timers can adjust pomodoro lengths based on real-time focus metrics, detected via metrics such as webcam posture analysis. While AI has the potential to support and assist students in their learning journey, all technology includes challenges and potential bad habits. AI-enhanced tools like RescueTime and Forest combat procrastination by blocking distractions during scheduled Pomodoro sessions. Google Calendar and Outlook integrate AI to predict optimal study times based on historical productivity data, while tools like Flora gamify focus sessions to reinforce disciplined habits.

Automated Eisenhower Matrices

The Eisenhower Matrix is a practical and effective tool for students to enhance their time management, productivity, and overall academic success. By categorizing tasks based on urgency and importance, the matrix helps students prioritize their responsibilities and focus on what truly matters. It divides tasks into four quadrants: Quadrant 1 (Urgent & Important) for immediate actions like meeting deadlines, Quadrant 2 (Important but Not Urgent) for long-term goals such as studying for exams or working on projects, Quadrant 3 (Urgent but Not Important) for interruptions like non-essential messages, and Quadrant 4 (Neither Urgent nor Important) for unproductive activities such as excessive social media use (Covey, 1989).

For students, this framework offers several benefits. It reduces procrastination by encouraging early completion of important tasks before they become urgent, thus minimizing last-minute stress. It also promotes better decision-making by providing a clear overview of priorities and enabling students to allocate their time effectively. Ultimately, the Eisenhower

Matrix empowers students to take control of their schedules, reduce stress, and balance shortterm demands and long-term aspirations (Covey, 1989). AI can implement Pomodoro cycles and Eisenhower prioritization automatically which ensures habit formation by auto-reclassifying tasks as urgency/importance shifts over time.

Time Blocking

Time blocking is a powerful time management technique that can significantly enhance students' academic performance and overall well-being. This method creates a structured approach to managing daily and weekly schedules by allocating specific time slots to different activities. For students, time blocking offers many benefits that directly address common challenges in academic life. It improves focus by allowing students to concentrate on specific topics, reducing distractions and increasing productivity. By providing a clear schedule, time blocking can effectively combat procrastination, as students have already committed to working on specific tasks during designated periods (Newport, 2016). AI assistants like Microsoft CoPilot and Perplexity analyze academic workloads to recommend personalized study schedules. For example, NotebookLM assists students in organizing research materials and prioritizing tasks based on deadline proximity and course requirements, while AI-driven calendars (e.g., Google Calendar) automate time-blocking strategies to balance academic and personal commitments.

This approach also enhances time awareness, helping students better understand how they spend their hours, which is crucial for long-term time management skills. When combined with other productivity techniques like the Pomodoro Method, time blocking can help students maintain high concentration levels while avoiding burnout. By adopting this technique, students can take control of their time, improve their academic performance, and achieve a healthier balance between their studies and personal life (Newport, 2016).

Emerging tools like Make.com, Zapier, and n8n enable students to automate repetitive tasks (e.g., citation formatting, lecture transcription), freeing cognitive resources for higher-order thinking. For instance, Google Firebase-powered apps can auto-generate study reminders or compile research summaries, exemplifying AI's potential to streamline academic workflows. Moving forward is a synthesis of all four pillars into a unified call to action.

Conclusion

Recap of the Importance of Metacognition and Effective Learning Strategies

By now the AI-metacognition synergy is clear: self-monitoring, active practices, memory routines, and time management form one continuous engine for transformative learning (Flavell, 1979; Aoun, 2017). The transformative potential of a learning-focused, AI-integrated approach in higher education by embracing AI and focusing on developing adaptable learning skills, higher education institutions can create more engaging, personalized, and effective learning experiences that better prepare students for an AI-enriched world (Zawacki-Richter et al., 2019; Zhu, Sari, & Lee, 2021). By now the process is becoming clear that metacognitive practices, active strategies, time management, and AI form a single, coherent engine for learning.

Call to Action for Educational Institutions to Embrace this Paradigm Shift

Institutions must now rewire curricula, policies, and pedagogies around AI-metacognitive frameworks while upholding ethics and integrity (Gasser & Almeida, 2017). This transformation will require collaboration among all stakeholders and a commitment to continuous learning and innovation.

There are additional areas of consideration when combining metacognition components and teaching and learning techniques. A more complete list can be found in the Appendix (See Appendix). Many of these concepts, theories, and techniques have been researched and supported, but few have attempted to combine these into a more comprehensive whole or framework. One resource is the book by Peter Brown, Henry Roediger, and Mark McDaniel (2014), Make it Stick, but even their work only addresses a few of the metacognition concepts, and it was before the AI revolution of 2022.

Integrating AI in higher education, coupled with a focus on metacognition and adaptable learning skills, presents a powerful opportunity to revolutionize the educational landscape. By embracing this paradigm shift of AI-metacognition synergy rather than AI or metacognition, institutions can lead the way in preparing students for success in an AI-driven future while fostering a culture of innovation and continuous improvement and essential for preparing students for future challenges. By embracing this approach, educators can foster a generation of adaptable, reflective learners who can leverage technology to enhance their learning experiences. Continuous adaptation and innovation in teaching practices are crucial to realizing the full potential of this new educational paradigm.

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Appendix

A Comprehensive List of Learning Categories

I. Learning Strategies

- Metacognitive Techniques
  - *Understanding Thinking*
    - Metacognition
    - Self-Explanation
  - *Learning by Explaining*
    - The Feynman Technique
      - Active and Engaged Learning
  - *Interactive Learning*
    - Active Learning
    - Peer Teaching
    - Enquiry-based Learning

- *Incorporating Play*
  - Gamification
  - Role-playing
    - Narrative and Character-Based Approaches
- *Storytelling in Learning*
  - Narrative Creation
  - Digital Storytelling
- *Personality and Learning*
  - Character-Based Learning
  - Persona Development
    - Personalized Approaches
- *Adaptive Learning*
  - Personalized Learning
  - Adaptive Learning Systems
- *Learning Pathways*
  - Prospective Study Plan
  - Retrospective Learning Method

II. Study Methods

- Recall and Review Techniques
  - *Spaced Learning*
    - Spaced Repetition
    - The Leitner System
  - *Active Review*
    - Active Recall
    - PQ4R Method
    - SQ3R Method
  - *Testing as Learning*
    - Flashcards
    - Quizzing
      - Information Organization
  - *Mapping Concepts*
    - Concept Mapping
    - Mind Mapping
  - *Structuring Information*
    - Outlining
    - Note-taking
    - Cornell Note-Taking
  - *Annotation Techniques*
    - Annotating
    - Highlighting
    - Summarizing
      - Deep Processing Techniques
  - *Interrogative Learning*
    - Elaborative Interrogation
  - *Integrated Learning Methods*
    - Dual Coding
    - QEC Method
    - The Cross-Linking Method

III. Memory Aids

- Visualization and Spatial Techniques
  - *Visual Memory Tools*
    - Memory Palace
    - Visualization
      - Mnemonic and Chunking Methods
  - *Mnemonic Creation*
    - Mnemonic Devices
    - Acronym Method
  - *Segmentation Strategies*
    - Chunking
    - Pattern Recognition

IV. Time Management Techniques

- Prioritization and Planning
  - *Task Prioritization*
    - The 1-3-5 Rule
    - The Eisenhower Matrix
  - *Scheduling Techniques*
    - Time Blocking
    - The Ivy Lee Method
      - Efficiency Maximization
  - *Work/Break Cycles*
    - The Pomodoro Method
    - The 90/20 Rule
  - *Quick Tasks*
    - The Two-Minute Rule
    - The Seinfeld Strategy

V. Cognitive Approaches

- Analytical and Reflective Techniques
  - *Reflective Practices*
    - Reflective Journaling
  - *Analytical Methods*
    - The Five Whys Technique
    - Root Cause Analysis
  - *Comprehension Techniques*
    - Paraphrasing
    - Analogies
      - Awareness and Correction of Misconceptions
  - *Misconception Identification*
    - Illusion of Competence
    - Bias Recognition
  - *Comprehension Verification*
    - Reading Comprehension Analysis
    - Concept Checks

VI. Engagement and Efficiency Techniques

- Optimization Methods
  - Efficiency Tools
    - The Pareto Principle
    - Increased Productivity and Efficiency
      - Project and Resource Management
  - Project Planning
    - The MoSCoW Method
    - The Critical Path Method

Exploring Micro-Business Enterprises in Nicaraguan Barrios

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entrepreneurship, microbusiness enterprise (MBE), faith-based entrepreneurship, community resilience, poverty alleviation, rural communities, economic development

Abstract

Many undergraduate students begin their academic journey with aspirations to launch entrepreneurial ventures. Integrating entrepreneurship into undergraduate programs offers to develop practical skills and critical thinking. This study engaged business students as observers, providing firsthand insight into running a small business in different cultural settings, specifically through the experiences of micropreneurs in Nicaragua. Small business ownership in this context offers a modest livelihood amidst the challenges of poverty; however, such ventures often face significant obstacles. The research, conducted alongside an entrepreneurial seminar, aimed to investigate the challenges, successes, economic contributions, opportunities, and strategies experienced by microbusiness owners. Using a phenomenological case study approach, the study engaged a focus group of 20 micropreneurs in Nicaragua, contributing to the limited body of research on microbusiness enterprise (MBE) activities in this region. The findings underscore the critical role of cross-border academic collaborations in empowering microbusinesses through training, faith-based support, and community resilience.

Overcoming years of dictatorship, civil war, and other natural disasters has been difficult and Nicaragua continues to be one of the most economically challenged countries in the Western Hemisphere (BBC, 2023). With a population of more than 6 million, the distribution of income is disproportionate, and the country is classified as a low-income economy in Central America. Recent economic challenges have been intensified by factors such as COVID-19, political instability, and the impact of hurricanes (Central Intelligence Agency, 2024). The economic forecast for the country is considered uncertain, minimum wages are low, and there are growing challenges of poverty and food availability (Central Intelligence Agency, 2024, U.S. Department of State, 2022). Pisani (2018) writes that even during economic challenges, business enterprises can be developed and may flourish. Sharma (2019) indicates that enterprises can create significant economic advantages for individuals. Quingco and Leonoras (2020) underscore the pivotal role that micro-business enterprises play in sustaining and fostering economic growth. Ukanwa et al. (2022) discovered the critical socio-economic role micropreneurship plays in offering an income source for families where poverty management and survival create extreme circumstances.

Entrepreneurship and micro business activity are niche opportunities in rural and impoverished areas of Nicaragua, and connecting academic experiences to micropreneur practices benefits both collegiate exploration and micropreneur growth. The study aims to examine the challenges and opportunities encountered by micro business owners and entrepreneurs operating within Nicaraguan barrios, providing insight into the unique circumstances that impact these ventures. The study objectives were as follows:

1. Investigate and understand the challenges faced by micro business entrepreneurs in Nicaraguan barrios.
2. Assess the strategies employed by micro business owners to overcome the challenges inherent to their ventures.
3. Explore and analyze the impact of micro business ownership and entrepreneurship on the economic development of Nicaraguan barrios.
4. Evaluate perceived opportunities available to micro business entrepreneurs in the barrios of Nicaragua.

Rashid and Ratten (2020) indicate that more qualitative research in developing countries will help to understand the phenomena better. While studies on micro business entrepreneurship are scarce, business research in Nicaragua is even more limited and this study aimed to address the existing gap.

This study employed a phenomenological case study approach, which seeks to explore participants' lived experiences within a specific context. This approach was appropriate for capturing personal motivations and business practices. This study sought to gain a better understanding of the unique challenges and opportunities faced by micro business entrepreneurs in the barrios of Nicaragua. A focus group of 20 microbusiness owners was conducted to gather detailed narratives about their entrepreneurial journeys. The phenomenological method allowed the study to emphasize the perceptions of the participants, contributing to the limited research on microbusiness enterprise (MBE) activities in this region. Undergraduate business students investigating the daily struggles and successes of these entrepreneurs, provided insight on how to navigate obstacles, manage businesses, and perceive success. The research also explores the broader economic impact of these ventures on local communities, examining how micro businesses contribute to the region's development and growth. Moreover, the study highlights the strategies that entrepreneurs use to overcome adversity, shedding light on the resilience and resourcefulness required for sustaining small businesses in challenging environments. The implications of this study are significant; it provides valuable insights into the support needed for these businesses to thrive, offering recommendations for targeted training, resource allocation, and community-driven initiatives that could empower micro entrepreneurs, enhance their economic contributions, and drive long-term sustainability in Nicaraguan barrios.

Literature Review

The World Economic Forum (2021) indicates small and medium sized businesses make up more than 90% of business worldwide. The multifaceted nature of microbusinesses offers insight into its economic contributions, entrepreneurial characteristics, challenges, and opportunities. By examining these dimensions, this review seeks to provide an understanding of the vital role microbusinesses play in fostering economic resilience, both in developed and developing economies. Through an analysis of existing literature, this study highlights the challenges, successes, opportunities, economics, motivation, and the impact of faith that define the microbusiness landscape.

Microbusiness

Microbusinesses play a vital role in shaping economies worldwide, serving as a cornerstone of the business landscape in every region (Henley & Song, 2020). These small enterprises contribute to economic growth by creating jobs and reducing poverty (Eze & Lose, 2023). Many entrepreneurs start microbusinesses to achieve personal and financial success or to cope with external pressures like unemployment (Ly-Le, 2023).

In the aftermath of the pandemic, countless individuals embraced small business ownership to recover from job loss, pursue personal passions, or enjoy freedom from traditional workplaces (Caplan, 2021). In the United States, microbusinesses—businesses with fewer than 10 employees—make up most employer firms and are crucial in driving economic progress (Caplan, 2021; Han et al., 2024; Xu et al., 2020). Globally, these businesses often provide disadvantaged groups with employment opportunities and a chance to break cycles of poverty (Ergo et al., 2024).

Microbusinesses often require resources to foster growth and generate wealth, particularly in underserved populations ("Survey Reveals Key Opportunities and Challenges," 2024). While microbusiness owners frequently face resource challenges, many remain optimistic, inspired by the possibility of improving their lives and supporting marginalized communities through entrepreneurship (Parkinson, 2024). Additionally, Eze and Lose (2023) emphasize that smaller businesses often thrive due to their agility, enabling them to adapt more swiftly than larger companies. Overall, microbusinesses play a crucial role in both developed and developing economies, driving job creation, economic growth, and poverty alleviation.

Entrepreneurship

Microbusiness leaders are described using various terms, including solopreneurs, micro-entrepreneurs, rural entrepreneurs, and simply entrepreneurs. Xiong et al. (2018) define micropreneurship as entrepreneurial activities constrained by resources and scalability, primarily aimed at the owner's survival. Anderson (1995) emphasizes that entrepreneurship involves a combination of hard and soft skills, along with personal values, which enable individuals to identify and seize opportunities. There is also an influence of social context on the entrepreneurial process. In many parts of the world, entrepreneurship is a vital survival strategy for impoverished people. Li and Setiawan Sanusi (2023) distinguish entrepreneurs based on their motivation, whether driven by necessity or opportunity.

Kimmitt et al. (2020) note that while many pursue entrepreneurship for freedom, this is just one aspect of its broader benefits. As entrepreneurship has expanded significantly in recent years, its success largely depends on the ability of entrepreneurs to transform ideas into thriving businesses (Alawamleh et al., 2023). However, despite its appeal and potential rewards, entrepreneurship—especially in the context of microbusinesses—remains fraught with numerous challenges that can hinder growth, sustainability, and long-term impact.

Challenges

Although many factors challenge owners, several have implications for small business ownership in developing countries, including marketing, limited access to capital, insufficient entrepreneurial education and training, inadequate business support, and restricted access to necessary resources (Sarmah & Saikia, 2023). Parkinson (2024) highlights that poverty in any form presents a significant barrier to entrepreneurship. Most small businesses require capital but struggle to attract investors, while investment companies find it challenging to contribute to these ventures for various reasons (Ndlovu & Takawira, 2023). In the context of this study, these challenges are even more pronounced, as many micropreneurs live in extreme poverty and have little to no access to startup capital or formal financial resources.

Alawamleh et al. (2023) further emphasize that entrepreneurs often face challenges due to a lack of practical experience and skills. Since entrepreneurship requires navigating unfamiliar territory and fostering innovative thinking, insufficient education, resources, and opportunities exacerbate these difficulties. Dzingirai and Ndava (2022) note that small family-owned businesses often struggle with cash flow issues, insufficient cash reserves, and a lack of financial expertise, with cultural factors also influencing poor financial management. Quezada-Flores et al. (2022) found that training is a critical investment in small business ownership but most lack access to resources and finances to invest in this endeavor.

In emerging economies, public policies, educational initiatives, and academic preparation for entrepreneurs can create pathways to economic opportunities. However, in low-growth economies, such support systems are often unavailable (Abreu et al., 2024). Ly-Le (2023) found that new entrepreneurs frequently struggle with managing day-to-day operations, overseeing business functions, juggling multiple responsibilities, and securing adequate working capital and cash flow support. Kindström et al. (2024) suggest that small businesses often struggle due to a lack of training, knowledge, and experience, and the added difficulty of adjusting to constant changes. Despite facing numerous challenges, entrepreneurs demonstrate resilience and adaptability, often finding innovative solutions to overcome these obstacles.

Successes and Opportunities

As entrepreneurship evolves, the importance of resources such as microfinance, training, and financial management workshops becomes increasingly evident in fostering business success. Haq et al. (2021) state that success can equate to survival, which can be achieved by meeting customer needs and implementing a customer-centric approach to business practice. Kaes et al. (2024) determined that entrepreneurial

grit contributes to both nonfinancial societal and financial success. Additionally, learning from rival firms can enhance entrepreneurial capabilities and contribute to firm success outcomes (Zulu-Chisanga et al., 2023). Munawaroh et al. (2023) found that entrepreneurial failure can serve as a foundation for future success and enhanced business performance. Arslan et al. (2022) found agility and adaptability contributed to small business survival and success. Ranabahu and Farzana (2022) found that microfinance successfully empowered women and led to the creation of new businesses.

Moreover, the broader economic impact of small businesses is undeniable, as they contribute significantly to GDP growth, employment, economic stability, and create an abundance of prospects. Opportunities for entrepreneurial growth include acquiring fundamental knowledge and skills, as well as receiving general support (Lose & Ikenna, 2023). Dzingirai and Ndava (2022) suggest that financial institutions and governments should provide targeted workshops on financial management, which would help family business owners make informed decisions to improve their financial practices.

According to Ndlovu and Takawira (2023), investment firms have substantial opportunities to support and benefit from the growth and development of small businesses. Kindström et al. (2024) note that most small business owners seek growth, and there are opportunities to assist owners in understanding business modeling, leadership elements, and the management of people and resources. Entrepreneurs should consider opportunities for attracting new customers and pursuing growth, particularly in the face of environmental distress (Gambirage et al., 2023).

Economics

Across the globe, many countries recognize the crucial contribution of small businesses to economic expansion (Eze & Lose, 2023). Small and medium enterprises (SMEs) serve as the backbone of developing economies, playing a critical role in driving growth and stability (Ly-Le, 2023; Ndlovu & Takawira, 2023). By 2024, small businesses were projected to contribute over $2.3 trillion to the global GDP, emphasizing their economic significance (CISCO, 2020). Furthermore, the number of family-owned businesses has been steadily increasing (Dzingirai & Ndava, 2022).

Entrepreneurship serves as a sustainable solution to address economic challenges (Bruton et al., 2013). However, entrepreneurs in developing countries often face weak and unstable institutions, which create additional obstacles (Xiong et al., 2018). Despite these challenges, entrepreneurs in low-income situations demonstrate resilience by finding creative solutions and utilizing available resources (Santos & Neumeyer, 2023).

Eze and Lose (2023) emphasize that small businesses not only reduce high unemployment rates but also serve as mechanisms to address economic disparity and uplift the underprivileged. Rural entrepreneurs adapt their processes to operate within lean economic environments, responding flexibly to dynamic conditions (Anderson, 1995; Anderson, 2000). Access to financial support during the early stages of business creation remains a critical factor in motivating and sustaining entrepreneurship (Naser et al., 2009). Whether driven by necessity or opportunity, entrepreneurship is a powerful path for personal empowerment and societal progress, providing chances for growth and resilience.

Motivation

Entrepreneurial motivation is the internal drive that propels individuals to achieve specific goals (Saoula et al., 2023). Exploring the factors that motivate individuals to pursue business ownership is crucial, especially in challenging environments. These motivations help shape an entrepreneur's resilience, decision-making abilities, and long-term success. Ly-Le (2023) identified several motivating factors, including dissatisfaction with employment, family support, and the necessity to provide self or family. These factors were categorized as either push or pull motivations. Entrepreneurs often start businesses out of necessity, driven by limited job opportunities or the need to enhance personal income, while others are motivated by a desire to contribute to societal well-being or improve economic conditions for their communities (Saoula et al., 2023). Entrepreneurs who are motivated are more likely to sustain their business. Motivating factors are diverse and provide valuable insight into the entrepreneurial journey, including the internal and external factors that influence the creation and maintenance of a business in the face of economic and social challenges.

Faith-Based Entrepreneurship

Faith-based entrepreneurship incorporates spiritual values into business practices, shaping the motivations, decisions, and objectives of entrepreneurs who aim to create economic and

social value within their communities. This approach is deeply influenced by the founders' religious beliefs, which guide their business practices and long-term aspirations. Religion continues to shape not only entrepreneurship but also founder identity (Delichte et al., 2024). Entrepreneurs with strong religious identities often prioritize a customer-centric approach, trusting that their faith offers protection and guidance in their ventures. These religious values not only influence their business decisions but also mold their entrepreneurial journeys. Religious beliefs provide a moral compass that helps guide decisions in business (Rietveld & Brigitte, 2022). The idea of faith-based entrepreneurship connects the importance of spiritual values and an ethical framework that shapes how entrepreneurs approach their ventures. Understanding how values affect business decisions provides insights into balancing economic goals with community-centered objectives.

Methodology

A focus group of purposively chosen micropreneurs in Masaya, Nicaragua was convened on December 12, 2023. The administration team comprised three faculty members, six student researchers from Truett McConnell University, and one local translator. The focus group had 20 participants; the process lasted approximately 120 minutes and was recorded in English with speech-to-text transcriptions completed using software developed by Otter.ai. In preparation for the study, an independent institutional review board (IRB) was created to ensure that the participants were treated ethically and with care, as with any other research in which the lives of individuals are examined (Health and Human Services [HHS], 2021; Koro-Ljungberg et al., 2007). The IRB reviewed Title 45 of the Code of Federal Regulations Part 46—also known as the Common Rule—and approved the research aims and objectives of this study.

The approach to the focus group study was to undertake what Kidder and Fine (1987) called the "Big Q" approach to qualitative phenomenological research. The reflective process emphasizes an unstructured inductive development of the questions asked during the focus group and the elucidatory process of thematic coding (Braun & Clarke, 2019; Kidder & Fine, 1987). The reflexive thematic analysis (RTA) by design differs from the positivist approach to thematic analysis, where triangulation, codebooks, multiple coders, and saturation are necessary (Braun & Clarke, 2019). Instead, the emphasis of RTA is on a more profound and critical application focusing not on a singular truth but on the recognition of multiple situated truths (Braun & Clarke, 2019). The goal of phenomenological research is to produce a rich, nuanced, and reflective account of the lived experience of participants. The RTA coding process used MaxQDA qualitative software and required multiple coding passes, creating over 70 initial codes.

Reflective Themes

In this section, the concentrated themes produced in preparation for the discussion comparing the themes to the study objectives will be presented with clarifying refinements based on the literature. The aims of the study were primarily ignored for the first two rounds of coding to avoid influencing the direction of the analysis. In later rounds, notions of challenges, impacts, opportunities, and strategies were introduced to understand the deeper trends better. As with the RTA, the themes at first glance do not seem to align directly with the initial tones of the research until both the reader and investigator are reconciled in a hermeneutic sense, cocreating the impressions of truth (Ricoeur, 1981).

The Motivation of Necessity

The first concentrated theme distilled from the initial codes was the motivation of the micropreneurs behind creating their micro-businesses. It was often unclear if the business was a remnant of a family tradition, but there was a collective sense behind necessity. As noted earlier, SMEs make up most companies in Nicaragua and contribute significantly to its workforce stability (Ly-Le, 2023; Ndlovu & Takawira, 2023). The traditional notions of why individuals take advantage of the low barrier to entry to create and sustain a micro-business, as in the U.S., for instance, may be motivated by opportunity (Caplan, 2021); however, the group sentiment was that it was more out of necessity, noted by Subject 4's almost pleading frustration: "I changed locations. I started from zero. And I had 15 days where my business just stalled? It wouldn't go down. It wouldn't go up. It was stalled" (para. 69). As a negative case, none of the subjects mentioned any formalized process of taxation or the need for business approvals, indirectly confirming the large size of the informal economy common to the region (Dzingirai & Ndava, 2022).

The motivation also manifests in selecting business niches, often described as essential goods and services based on the social impact on the local community, as expressed by Subject 15 focusing on the social aspects based on low prices: "They

tell me your prices are too low compared to the competition. We've been competing for price, and people there know that we love God, and we also talk a lot about God. We share the Word of God in our business" (para. 46). The selected niches also seemed to preserve the local culture based on fears of assimilation by alternative larger cultural forces competing in the same market, as described by Subject 11 who indicated business differentiation in a large grocery store by offering homework assistance to children, echoing the significance of family and church culture ignored by outsiders and more extensive commercial operations (para. 34).

Another motivational area uncovered by the literature that was not mentioned directly by the focus group discussions was gender, as gender is often cited as a motivator to create a micro-business because of ease of access (Ranabahu & Farzana, 2022). Microbusinesses can offer more accessible opportunities for women who face barriers in formal employment. In the case of Nicaragua, this insight is especially relevant: many women, often unmarried or the primary caregivers in their households, lack the formal education needed to secure employment outside their communities. Consequently, they are motivated to create microbusinesses as a means of contributing to their family's income, using entrepreneurship as both a necessity and a form of empowerment in the face of limited options. It is assumed, based on the gender heterogeneity of the group, that the marginalization of the community outweighed the importance of individual access. Additionally, the competition was sometimes identified as female (and family relation) by Subject 2, "So, my stepmom has another store and that is my competition … [but she isn't] social with people" (para. 18).

Isolation Prompts Imitation

The second concentrated theme is a combination of isolation and imitation that became equally apparent in several contexts of the focus group discussion. Kim (2013) discusses the importance of geographic isolation and the opportunity for outside innovation, as the isolation becomes acutely susceptible to external influence based on homogeneity and imitation. Subject 17 sums up the everyday experience, "In Nicaragua, there's a lot of envy. I don't know if it is the same in other countries. Some people, if they see that you're selling something and these people aren't really creative people, they sell what you are selling. They sell what you sell. A solution though that I have come up with is that this competition represents a challenge" (para. 22). Complementary to Kim (2013) noted the improbability of innovation in isolation and all note that innovation in isolation, when possible, makes the process challenging to replicate the unique value proposition crafted, unlike in local commodities transactions.

The isolated knowledge also becomes evident in the discussions over price, customer service, and value-added to understand competition and potential business strategies to sustain or grow their business. Subject 3 described their pricing approach, "… we have our business with a lot of variety and [because our prices are a little lower, other businesspeople] come to us to buy when they need the same product that we sell. In one sense it helps the customer because we give them a better price" (para. 6). The focus was almost entirely on pricing; however, when prompted by the interviewer, the subjects were unable to provide the names associated with value-added service or differentiation (para. 36). As indicated by several participants, the difficulty is the limitation of knowledge transference outside of what is available within the isolated community.

Again, pricing became a dominant issue when discussing a subject's business at first glance. This focus on pricing is not surprising as similar markets have several critical factors: limited financial resources, economic survival strategies, systematic inequities, lack of safety nets, and cultural norms curated by practical realities (Lederman & Porto, 2016). What was missing was a single niche that offered significant profit or success, even in the downtrodden community. The reason for this exclusion is unknown, as the focus group format may have prevented some descriptions of novel business success based on fear of local imitation or pressure to conform based on familiar or church mentorship. An interesting note is that the subjects feel they are being innovative based on a narrower view created by the isolation akin to Subject 1 noting, "I make wine, there was a group of workers that came once, and [I] gave them wine [to taste sample]. Then they told me they needed three bottles of my wine" (para. 63).

Community Relationships

The relationships between competition, customers, and other business owners within the community also create a critical theme in several ways. Most of the subjects knew about the competition and, in one case, even had a familial relationship with the competition, as mentioned by Subject 2 (para. 18). In one case, a humblebrag, meaning self-promotion disguised as a complaint, was used as the subject described the competition purchasing clothes from her based- on quality (Sezer et al., 2018). Subject 13 boasted, "I have competition about a block

away. I sell used clothing. I do okay, but my competition comes to my business to buy my clothing [to resell but to wear them herself]. I have a better-quality product" (para.16). Based on the isolated community, the relationship is as expected and potentially has even deeper roots if the individual's families and histories were assessed by going back several generations (Allan, 2021).

The Christian aspect of relationships also seemed prevalent in many areas where subjects professed Christian views and strong ties to the local church community, in addition to having businesses and providing a relationship for prayer and fellowship. For example, Subject 17 stated, "I am a pastor. My business glorifies God. I have to be an example for the church and for men. How and in what way? Well, when you talk about the faithfulness of God to people, and you can tell them God is faithful, and I can prove it with my business" (para. 75). Werner (2008) noted a geographic distinction in the manifestation of Christian views among business owners, including the additional linguistics associated with Christian businesses, also found in several discussions across the focus group. Curiously, Lu et al. (2024) discussed cultural fit being driven by linguistics that assists with some of the understandings noted by the subjects and the customer base seeking sameness outside of routine transactions. For clarity, the church community added word-of-mouth publicity and attracted like-minded customers.

The culture fostered by the church community seemed to transcend their spiritual mission. They become centers of hope, resilience, and transformation, addressing not only the spiritual needs of the focus group but also the economic, educational, and social challenges the subjects face. Subject 15 explained how the Christian clients supported the church community, "We've been competing for price, and people there know that we love God, and we also talk a lot about God. We share the Word of God in our business. And in that way, we've had a peak in our growth and in the name of Jesus will reach further—[with] further growth" (para. 46).

An interesting note was made when the interviewer asked if the participants worked on Sundays. The debate on Sunday work has been a global phenomenon for Western countries for a significant period, and it is well-known that the social context is beneficial from both Christian and secular perspectives (Charles et al., 2021). The challenge with Sunday work is that the incentive must be high enough to justify the social and spiritual opportunity costs (Martin et al., 2011). The larger question of the subjects that are always open is whether the motivation is more loss of revenue and missing a transaction as a function of a heuristic strategy, expectancy by family or group, or financial struggle. One would expect non-verbal or tonal shifting during the interview, but it is unclear whether the participants, being Christians, felt some guilt when the question was asked.

Visions for a Better Future

The subjects did not complain, mention any notion of poverty, or being somehow victimized in their community, as there was an overall sense or vision of a better future - a shared vision that could quickly become a catalyst for economic, social, and cultural transformation. The hope is to improve immediate living conditions and become the impetus for long-term community resilience and prosperity. The evidence can be seen precisely through two sections of the original codes: the desire to understand and acquire strategic business skills and strengthen social networks through family and church construction.

As mentioned earlier, the desire for new understanding and skills started with the interviewer explaining strategies described by the subjects as value-added services and differentiation. Going beyond transactions and focusing on customer experience resonated with the subjects. For example, as Subject 5 put it, "It's not, it's not just about having a big business. It's about a good environment. There needs to be a good environment and good service" (para. 51). The desire for new skills and understanding of the subjects was overwhelmingly positive.

The discussion continued with the interviewer explaining that sharing ideas within the community also assists with better business strategies and strengthens the community, "One of the best things, as an entrepreneur, is you don't operate alone. You work with other entrepreneurs and share experiences with each other. You can hear ideas, successes, challenges, and that will help you grow your business. I would also encourage you to root for your rival. Root for them. We all want to beat our competition, right?" (para. 67). The resonance of this message was also positive because the group felt that the strength of the Christian community was equally crucial to the success of the individuals, and, despite the necessity, the subjects give to the church, as described by Subject 8, "I do feel like my business glorifies God because out of every shoe, [I put] money apart to give to the church" (para. 87).

In summary, four complementary reflective themes were created from the focus group. Necessity motivated the participants, who often focused on essential goods and services within the local community. The choice of the business niche was determined by imitating other businesses within an isolated market. The intense focus on competitive pricing and limited knowledge transfer indicated the isolated but community-driven focus. Community relationships fostered a support network based on shared values, particularly with family and church members. Lastly, the subjects' vision of a better future was predominant despite the challenges, as they expressed the importance of business skills, strategies, and strengthening the local social network.

Discussion

To restate the focus of the study, the goal was to have a greater understanding of the unique challenges and opportunities faced by micropreneurs in the barrios of Nicaragua—the lived experience centered on the daily struggles, navigating obstacles, managing a business, and perceiving success. The significant outcome of the study was valuable insights into training recommendations, resource allocation, and community-driven initiatives that impact the lives of micropreneurs and the communities they serve. This section will address the research questions and provide the context to reconcile the thematic findings to realize the finality of the study and inspire the next generation of cross-cultural research.

Challenges of the Micropreneur

The literature discussed general challenges across access to capital, education and training, business support, and essential business resources, in addition to more regionally based concerns regarding political or environmental instability, market demand, and cultural factors. The thematic findings noted the source of challenges, from the motivation of necessity to the process of finding a quick yet sustainable business that offers revenue for the family. Based on the need and context of the market, the chosen businesses are not innovative in the broader environment. So, by design, the primary singular challenge is the business niche and whether the chosen business is correct for long-term investment. Yet, the decision may be best based on factors such as economic volatility, infrastructure deficiencies, or bureaucratic hurdles. Thus, the micropreneur may be marooned and seek the best refinement despite the threat of imitation.

The other thematic observation is in the context of pricing and transactional focus. As noted, almost all subjects stated that lower pricing is a significant strategy in the local market. The challenge becomes the transcendence of low-cost transactional business to value-added service coupled with product, allowing for differentiation and higher profitability. Despite not knowing the popular business parlance, many subjects understood the need for value-added services, customer experiences, and differentiation heuristically. Therefore, the significant challenges for the Nicaraguan micropreneur are to gain profit in a highly imitative and transactional market.

Opportunities and Strategies of the Micropreneur

According to the literature, opportunities start with access to microfinancing and some semblance of regional and community support for SMEs but broaden into areas directly and indirectly addressed by the subjects. However, thematically, the opportunities almost entirely focus on bridging the skills gap and strengthening the local community. The skills gap was addressed to some extent by the questions asked during the focus group to gauge the knowledge of business acumen, networking, and marketing. Many subjects understood the basics, but the refined application eluded the group. Opportunities in vertical markets such as tourism, agriculture, artisanal products, or the digital economy were never discussed but offered possibilities fostered through bridging the noted isolation of the local market.

Additionally, notions about learning from rivals and the influence of cross-cultural interactions from the literature were indirectly discussed with the group, specifically with the interviewer explaining business concepts. The notion of having a family relationship with the competition did not seem shocking to some, as some relatives were considered rivals. Still, the thought of sharing information and ideas was novel for others. The influence of cross-cultural interactions was welcomed, and the creation and administration of the focus group was the first step into future collaborations.

The primary strategy for existing businesses was to adapt from a customer-centric focus. As noted, the niche, micropreneur, and community are somewhat fixed in the local market based on previously discussed factors in the short term. The networking and marketing aspects begin by understanding what drives customer engagement, satisfaction, and loyalty. Three main areas were discussed with the focus groups: first,

customer feedback and insight, offering an adjustment to current practices; second, the ability to engage customers through relationships, potentially obtaining customer referrals by expanding the network, primarily through the church and family; and, lastly, collaboration with others in the community that could offer joint promotional opportunities. The short-term strategies provide an opportunity to move away from some of the purely transactional commerce and focus less on price, which is identified as a sound theme.

In the long-term strategy, the notions of innovation bridging the isolation of the local market is paramount to fitness, but it should also include training and knowledge transference. The understanding is that each micropreneur becomes their brand, and the brand identity must be strategically fostered. In this case, many in the focus group span generations of family business, including past maladaptive behavior that must be corrected. The strong brand also originates from focusing on short-term goals of customer-centric focus, as customer loyalty is foremost. Diversification of revenue streams was again alluded to in the thematic analysis. Still, it was based on necessity, not a long-term strategy to protect against shifting market demand. The diversification also leads to the addition of technology such as e-commerce and mobile "gig" in terms of service opportunities as the market changes.

Economic Development of the Community

The fitness of the micropreneur has a significant social impact on the development of the local community in many ways. The thematic analysis complemented the literature review by illustrating an almost symbiotic nature to the micropreneur family and community, specifically through the church. The first impact would be the continued support of easy access to opportunities for women and marginalized communities; equally important would be the preservation of the cultural heritage embodied by the relationships across the community.

The long-term success of the micropreneur strengthens the community through economic development through job creation; community infrastructure built with financial support provided to the church, and fostering education outreach becoming a normative behavior, lessening the isolation of the community and thus exposing its members to greater possibilities. The themes all supported the idea that despite the necessity of being a micropreneur, the positivity of attitude and success has a ripple effect, uplifting the community while achieving individual goals.

Conclusion and Call for Future Research

The study highlights the resilience and resourcefulness of micropreneurs in Nicaragua. It emphasizes the critical role of community networks, microfinancing, agency support, and particularly family and church, in supporting business endeavors. Despite the challenges posed by limited access to capital, market isolation, and imitative competition, micropreneurs show a strong commitment to improving their local communities through economic development. Given the findings, policymakers, NGOs, or business development agencies that work with microbusinesses in developing regions should consider accessible microfinancing, developing and offering training programs to close the skills gap, and fostering collaboration among micropreneurs through community-based seminars and networks. The study also stresses the importance of bridging the skills gap and fostering cross-cultural collaborations to empower microbusinesses.

Future research should explore the long-term impacts of cross-cultural entrepreneurial training on microbusiness sustainability and growth. Additionally, further studies could examine how faith-based entrepreneurship influences business strategies, community engagement, and overall business success. A comparative analysis of micropreneurs in different regions or countries could offer deeper insights into the universal and unique challenges they face. The academic literature contained several studies on women entrepreneurs, but a further exploration of marginalized communities and gender dynamics of microbusiness ownership would contribute to the body of knowledge.

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Is ChatGPT a Free Alternative to the Bloomberg Terminal for Undergraduate Experiential Learning?

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Abstract

This is a comparison of active learning-based assignments for basic stock analysis in an introductory finance class using the Bloomberg Terminal and ChatGPT from both faculty and student perspectives. I undertook this analysis at the end of Spring of 2024 after learning that my College would be terminating its Bloomberg contract at the end of semester. The results indicate that the DDM output can be replicated using Yahoo finances API and Python with coding assistance provided by ChatGPT, and doing so will likely improve students understanding of the learning objectives. However, ChatGPT/Python assignment will be significantly more difficult than the Bloomberg version, thus placing the weight of the cost savings on the shoulders of the weakest students.

Introduction & Literature Review

This analysis was carried out in the Spring semester of 2024 in the business department at Albright College, a small Liberal Arts College in Pennsylvania. The primary sample drew from students in the introduction to finance class required for all business majors which is known as "Financial Management. It is a 300-level class taken after students have completed prerequisites in economics, accounting, and statistics at the 100 and 200 levels. The course uses the 16th edition of "Fundamentals of Financial Management" by Brigham and Houston as the primary text. All 26 students in that course were offered the opportunity to participate in this study as extra credit, 12 (46%) chose to participate. An additional convenience sample of 10 students enrolled in upper-level finance courses also completed this comparison study for extra credit. In total 22 students completed the comparison study. This analysis reports both student and faculty feedback directly comparing an assignment based on evaluating Bloomberg's DDM function with the steps necessary to mimic that output using Yahoo finances API and Python with coding assistance provided by ChatGPT.

Active and Experiential learning

Active learning-based assignments are common in both AACSB and ACBSP accredited programs. Experiential learning is defined as a structured educational process in which learners gain knowledge and skills by engaging in real-world or simulated activities that mirror professional scenarios, often followed by reflection, analysis, and integration of theory and practice (FINSIMCO, 2025). Examples include managing investment funds, participating in trading competitions, conducting client-based projects, and performing financial analyses for real companies (Elliot Davis, 2016). Active learning, on the other hand, emphasizes the importance of student engagement during the learning process, often through collaborative problem solving, discussions, applied exercises, group work, and use of technology-driven tools. Both approaches shift the focus from passive absorption of content to active knowledge construction, critical thinking, and hands-on skill development as promoted by ACBSP and AACSB. The original Bloomberg active learning assignment that this ChatGPT version is meant to replace was designed as a stepping stone to help students progress to experiential learning exercises in portfolio construction and evaluation. Many AACSB-accredited institutions have built finance labs equipped with industry-standard technologies such

as Bloomberg Terminals, enabling students to participate in trading simulations, analyze real-time market data, and engage in investment competitions using professional tools (Bloomberg for Education, 2025). These labs offer scenarios where students manage investment portfolios, make real trades using notional capital, and compete in global trading challenges, thereby bridging the gap between theoretical knowledge and practical application (Bloomberg for Education, 2025).

Bloomberg's integration into the finance curriculum

At the time that I was brought into the College in 2016, it was estimated that there were more than 6000 Bloomberg terminals at colleges and universities around the world (Athavale, Edwards & Kemper, 2016). The College had recently acquired a terminal, and I was hired with the intention of integrating the terminal into the undergraduate business curriculum. Over the next few years, I did so by developing an integrated series of active learning-based Bloomberg application assignments, across the entire finance curriculum as well as the capstone business required for all management majors.

The original Bloomberg DDM assignment that I focus on here was developed as part of this integrated series of projects in the introductory finance course. It was created based on several pedagogical papers including Lei & Li (2012), Johnson & Shagnea (2012), Scott (2010); Tan & Tuluca (2017). Over the years I experienced the same stumbling blocks as many of my colleagues at other colleges and universities regarding student "buy-in" and difficulty with the terminal interface. Payette & Libertella (2012) found that less than 1/3 of the students thought this software was easy to use. My students experienced similar difficulties. I do not have data on student feedback for this assignment alone, outside of this small comparison study, but over the past 16 semesters that this assignment was included as part of the series of project was run in the course, 40% percent of students on average complained about Terminal-based assignments in their native responses. However, student views of the Terminal seem to improve over time. In the most recent 3 semesters, there has not been a single negative narrative comment about the terminal from students in the Senior Finance seminar.

Despite some negative feedback from students, the overwhelming majority of finance faculty and industry professionals see the value of integrating Bloomberg Terminal applications into the finance curriculum. The Bloomberg education portal now includes 100 syllabi samples,19 terminal activities, 15 separate student assignments, and 13 professional guides, 8 terminal based case studies and three certifications offered via Bloomberg for Education.

ChatGPT's integration into the curriculum

While the cost of a Bloomberg Terminal may be becoming an increasingly hard sell for today's small liberal arts colleges, one can certainly not deny that these same colleges are grappling with the effects of free LLMs such as ChatGPT! As Dong et. al. (2023) notes, between Spring 2022 and Fall 2023,195 papers related to ChatGPT and other LLM's were uploaded onto SSRN within the accounting finance and economic networks. Despite this there are relatively few papers on the use of ChatGPT for financial pedagogy and those papers that do exist tend to focus on its ability to write code for data analytics software such as Python and R. For example, Lui et. al, (2024) present two projects showing how ChatGPT can write code to access publicly available financial data through Yahoo finances API. This information is then used in sample assignments for portfolio optimization and the factor loadings for the Fama and the French three factor model. While the instructions for both assignments are very clear, they did not provide any evidence of students' impressions or feedback. Lan (2023) also proposes Python based ChatGPT assignments, describing how to use API to download data and provides links via GitHub to programs which will help students analyze mortgages, determine which asset pricing model meets their requirements, evaluate their risk tolerance, and optimized portfolios. While the literature here is not as robust and does not include a good deal of student feedback, its simplicity and cost are very promising! This paper fills the gap by providing both student and faculty feedback directly comparing an assignment based on evaluating Bloomberg's DDM function with the steps necessary to mimic that output using Yahoo finances API and Python with coding assistance provided by ChatGPT.

The remainder of this paper is organized as follows. First, the learning objectives of the assignment are presented, followed by the two versions of the assignment designed to meet those objectives. Next, the results of the student feedback questionnaires are evaluated. These questionnaires assessed students' familiarity with both the Bloomberg Terminal, ChatGPT, and Python both pre and post assignment. They also asked students to rate how well they thought each assignment

helped them to meet the learning objectives. Finally, I will share my thoughts from the faculty perspective.

DDM Assignment Learning Objectives:

After completing this active learning-based assignment, students will not only grasp how to use the Dividend Discount Model but will also develop critical thinking skills about its practical application and limitations in real-world financial analysis.

Project Learning objectives with formula references	
Estimate Future Dividend Projections: Based on calculated growth rates, students should project future dividends, recognizing how changes in growth assumptions can affect stock valuation.	$DIV^{1} = DIV^{0}(1 + g)$
Determine the Required Rate of Return Using CAPM: Students must calculate the required rate of return using the Capital Asset Pricing Model (CAPM).	$R_i = R_f + \beta \underbrace{(R_m - R_f)}_{R_{mp}}$
Understand and Apply the DDM: Students should be able to apply single and multiple stage Dividend Discount Model stock calculate the theoretical value of a stock as the present value of its future dividends.	$P_0 = \frac{DIV_1}{r-g}$ $P_0 = \frac{Div_1}{(1+r)^1} + \frac{Div_2}{(1+r)^2} + \ldots + \frac{Div_H + P_H}{(1+r)^H}$

Bloomberg DDM Assignment

Note: For brevity, only the Commands, calculations and analysis instructions are shown here.

1. Enter your Ticker <Go>, Use the DES (Description) page to find the current stock price, beta, most recent dividend, dividend growth rate and earnings per share.
    - a. Click on DVD to explore your company's dividend history.
        - i. How often does your company pay dividends?
            1. Calculate DIV0 (your firm's most recent ANNUAL dividend)
        - ii. What is your company's 1 year dividend growth rate? (Look at "1 YR Dividend Growth")
            1. Assuming your growth rate remains constant, use your current ANNUAL dividend and 1 year dividend growth rate to estimate the dividend next year (DIV1)
        - iii. Has your company's dividend growth rate remained stable over the past few years? (Compare dividend growth rates over the past 3 years)
            1. Based on this analysis, do you think it is reasonable assume that your DIV1 calculation above is an accurate estimate of next year's dividend? Why or why not?
2. Type DDM to bring up Bloomberg's theoretical price for your company using a 3-stage dividend discount model. The forecasted future growth rates, dividends and price in the horizon/terminal year have already been calculated for you in this model.
    - a. What required rate of return is Bloomberg using in its calculation?
        - i. Use CAPM to calculate this based on the Bond rate (Rf), Country/Region Premium (Rm-Rf), and beta fount on the left-hand column on the DDM output)
    - b. Identify the components of Bloomberg's multistage dividend discount model.
        - i. How does your DIV1 estimate in part a above compare to Bloomberg's "Dividends per share FY 1"?
        - ii. What is Bloomberg using as the "horizon year"?
        - iii. What is Bloomberg's terminal growth rate?
    - c. Is your company currently over or undervalued by the market according to Bloomberg?

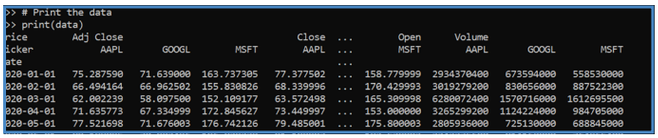
ChatGPT based DDM assignment.

The assignment motivation, learning objectives and formula references are the same.

Note: For brevity, only the ChatGPT prompts, abbreviated output/ directions, calculations and analysis instructions are shown here.

1. Download Python and install the Yahoo Finance API integration to allow you to download data directly from Yahoo finance into Python for analysis
    - a. ChatGPT Prompt: "Write Python code that will directly download monthly stock data for a list of stocks from Yahoo finance using the y finance library in Python. Assume that this is my very first time ever using Python. Please include instructions on how to download Python and install pandas."
        - i. Output from ChatGPT: To download monthly stock data using the yfinance library in Python, follow these step-by-step instructions, assuming this is your first-time using Python:
            1. Step 1: Install Python
            2. Step 2: Set Up Your Environment
            3. Step 3: Write the Python Script

You should see:



```
>> # Print the data
>> print(data)
rice        Adj Close                                  Close  ...       Open     Volume
icker            AAPL       GOOGL        MSFT         AAPL  ...       MSFT       AAPL       GOOGL       MSFT
ate                                                          ...
020-01-01   75.287590   71.639000  163.737305   77.377502  ...  158.779999  2934370400   673594000  558530000
020-02-01   66.494164   66.962502  155.830826   68.339996  ...  170.429993  3019279200   830656000  887522300
020-03-01   62.002239   58.097500  152.109177   63.572498  ...  165.309998  6280072400  1570716000  1612695500
020-04-01   71.635773   67.334999  172.845627   73.449997  ...  153.000000  3265299200  1124224000   984705000
020-05-01   77.521698   71.676003  176.742126   79.485001  ...  175.800003  2805936000   725130000   688845000
```

Once you see this, you will know that you have everything correctly set up.

1 Use ChatGPT and your knowledge of the dividend growth formulas to estimate DIV1 for your company.

   a ChatGPT Prompt "Write python code to find the annual dividends for (Insert your ticker here) for the past 5 years. Use that data to calculate the annual dividend growth rate for (Insert ticker here). Calculate next year's expected dividend for (Insert ticker here) based on the most recent annual dividend and the growth rate calculated above."

      i What is your company's 1 year dividend growth rate?

         1 Assuming your growth rate remains constant, use your current ANNUAL dividend and 1 year dividend growth rate to estimate the dividend next year (DIV1)

2 Use ChatGPT and your knowledge of the Capital Asset Pricing Model (CAPM) to calculate the required rate of return on your stock.

   a Ask ChatGPT to find the current risk-free rate (10-year Treasury rate) (No coding needed)

   b Ask ChatGPT to find the market risk premium (no coding needed)

   c ChatCPT Prompt: "Write Python Code to find the beta of (Insert Ticker here)"

   d ChatGPT prompt: "Write python code to calculate the required rate of return on (Insert your ticker here) when beta=(Insert reply from part 3c above), Rf=(Insert reply from 3a above) and Rmp=(insert reply from 3b above)"

3 Use ChatGPT to calculate the theoretical price of your stock according to the dividend discount model.

   a ChatGPT Prompt: "Write python code to calculate the theoretical price of (Insert Ticker Here) when Div1=(insert from part 2a above), g=(insert answer from part 2a above) r=(insert answer from part 3d above)"

      i Is your stock currently over or undervalued according to the single stage dividend discount model?

4 Use ChatGPT to calculate the theoretical price of your stock using the 3-stage dividend discount model.

   a ChatGPT Prompt: "Write python code to calculate the theoretical price of a stock using the 3-stage dividend discount model." This will produce generic code requiring you to input:

      i D0- The most recent annual dividend

      ii g1 – The current growth rate

      iii g2- The transitional growth rate (which can be higher or lower than g1 based on the company's growth prospects)

      iv g3 is the growth rate at maturity (which can be higher or lower than g1 and g2 based on the company's growth prospects)

      v T1- The length of time the company is growing at g1

      vi T2-The length of time the company is growing at g2

      vii R= required rate of return

   Thus far the only inputs you know from the analysis above are D0, g1 and r. You will need to predict the rest based on analyst reports.

   b Use ChatCPT to help analyze your company's earnings announcements, 10Ks, and/or analyst predictions for your firm and industry. Based on this analysis provide estimates of g1, g2, g3, T1& T2.

      i Estimate these values and explain your estimates. I am not expecting estimation quality on par with Bloomberg, but your inputs should at least be consistent (For example if your industry has been contracting and your firm isn't touting a new product that will turn things around over the next few years than g1<g2<g3 and T1 and T2 may be only a few years apart, but if they're reporting a new product currently under R&D which is expected to go into production in four years from now and lead to a large new full of clients over the coming years, then g3>g2>g1 and T2=4, T2=3? Etc.)

Analysis of Comparison results:

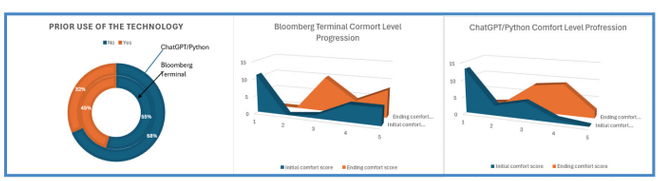
Study participants were recruited via Canvas message and announcements to complete this comparison analysis for extra credit. The primary sample pool was the 26 students enrolled in the introductory finance course during the Spring Semester of 2024. Unfortunately, only 12 students in the introductory finance course participated so the study was opened up to the two other finance upper level courses running that semester which resulted in 10 more participants. In total 22 students completed this comparison study. Since the submissions were not anonymous, this allowed me to also include the students'

scores in the introductory finance class for comparison purposes. Grades were coded 1 to 4 with corresponding to a D or F and 4 representing an A. Grades were well dispersed throughout the sample with 18% having earned either a D or F, 18% Cs, 36% Bs, and 27% As.

Student feedback on the two projects was evaluated using a questionnaire that assessed their familiarity with both the Bloomberg Terminal, ChatGPT, and Python both pre and post assignment and asked to rate how well they thought each assignment helped them to meet the learning objectives.

Student Feedback:

Sixty-eight percent (15) of them self-reported no experience with ChatGPT for Python coding prior to the start of the project. Likewise, 55% (12) of the subjects had no exposure to Bloomberg prior to the start of this semester, although at this point in the semester they had used it for several projects. Students were asked to rate their comfort with both technologies. Since the Bloomberg Terminal was used all semester, this comparison is based on recalling their initial comfort with the terminal at the start of the semester they took the introductory course versus rating their comfort at this point in the semester. For ChatGPT assisted Python coding, students were asked to rate their comfort with the process at the start and end of the assignment. The comfort rating scale was 1 through 5 where 1 is "very uncomfortable" and 5 is "very comfortable". All students self-reported increased comfort levels with both technologies; though, the increase was most dramatic for the Bloomberg Terminal with 36% rating themselves "very comfortable" at the end of the semester, compared with only 9% ChatGPT/Python. However, this result should be taken with a grain of salt given that we are comparing use of the technology for the entire semester versus a single project.

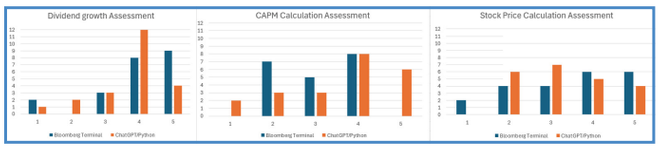


Next the students were asked to evaluate the degree to which they believe each of the assignments met the learning objectives. As explained above, the first learning objective was to understand and apply the multistage dividend discount model to calculate the theoretical price of the stock as the present value of its future expected cash flows. The other learning objectives were to estimate future dividend projections based on projected growth rates, and to determine the required rate of return for the company using the capital asset pricing model. The rating scale was 1 through 5 with 1 being "I did not understand the learning objective any better after completing the assignment" and 5 "the assignment improved my understanding of the learning objective greatly."

With respect to the projected dividends, 73% of respondents rated ChatGPT/Python as a 4 or 5, while 14% indicated that it did not improve their understanding (rating=1). The Bloomberg version faired a bit better, with 77% rating it was a 4 or 5 and only 9% rating it as a 1. The only substantive difference between the two versions for this learning objective was that students need to calculate the one-year growth rate using ChatGPT/Phyton, whereas it is reported directly on screen with Bloomberg.

For the CAPM calculation on ChatGPT/Python version, students were required to look up the values of the proxies for the market return and risk-free rates, calculate the beta and finally calculate the stocks estimated return using the model, whereas in the Bloomberg Terminal version, they simply needed to identify the variables on screen. These extra steps seem to have been beneficial for student understanding because 64% of students rated the ChatGPT/Python as a 4 or 5 vs. only 36% for the Bloomberg version.

The calculation of the stock price using the multistage dividend discount model is where the differences between the two projects are most visible. The Bloomberg Terminal calculates the intrinsic value of the stock automatically using the DDM command, so students are simply asked to identify the components of the model and compare the result with the current market price. Without access to the Terminal, the students need to take the role of the analysts and estimate all components. Theoretically, these extra steps should help students gain a deeper understanding of the model, this may explain why none of the respondents rated the ChatGPT/Python version as a 1 whereas 9% did so for the Bloomberg version. But the Bloomberg version received 55% 4 and 5 ratings vs. 41% for the ChatGPT/Phyton version.



Finally, students were asked, "In your opinion (based solely on this comparison assignment), is AI assisted financial data analysis

using python and the Yahoo finance API an adequate substitute for the Bloomberg Terminal in BUS 345" Fifteen students shared their opinions. The most common negative sentiment was simple anger at the loss of the Terminal, for example:

> *"I know I can use the Terminl <sic> at work, but IDK if I will use Python so no if the point is getting me ready for a job"*

Some students expressed frustration with the "learning curve" for Python even with ChatGPT's assistance, although as others point out, this can be rectified with additional instruction and video examples.

> *"Getting started and asking questions on ChatGPT was faster than navigating through Bloomberg at first but then you get used to Bloomberg. Maybe I will get used to programming but I'm not yet and nothing in my other classes really prepared me to do it."*
>
> *"I think the python and yahoo would be adequate, I struggled with it but I feel like if we were to start off with this method, and had videos like we do with Bloomberg, it wouldn't be too hard to grasp. Just because it is my first time using it do I think this."*

Faculty Assessment:

A passing score for this assignment was 75% or above on the assignment rubric. Since the overall purpose of the project is to evaluate a stock price using the dividend discount model, rubric placed higher weight on the final stock price calculation learning outcome. Eighty-Two percent (18) of the respondents "passed" the Bloomberg version of the project, compared to 50% (11) for the ChatGPT/Python version. None of the students who did not pass Bloomberg version were able pass the ChatGPT/Python version. The multistage dividend discount model learning outcome had the most dramatic difference in scores across the two versions of the assignment.

	GRADE>=75%	GRADE<75%		GRADE<75%
	BB (N=18)	ChatGPT/Python (N=11)	BB (N=4)	ChatGPT/Python (N=11)
DIV1	100%	100%	50%	36%
Ri	94%	82%	25%	18%
PO	100%	73%	25%	0%

Pearson correlations reveal that the student's performance in the introductory finance class was positively correlated with their performance on both versions of the project, but only statistically significantly so for the ChatGPT/Python assignment even after accounting for prior use of the technology. This stark contrast in the ability of the students to both pass the project and score proficient on the primary learning objective between the two different versions is troubling. The syllabus for the introductory finance class as approved by the department and College's curriculum development committee includes active learning assignments which constitutes 30% of the overall course grade. This component is currently being fulfilled by the Bloomberg assignments which are completed in groups because we have only one terminal on campus. To examine the impact of the switch to ChatGPT assisted Python assignments on student grades, I ran a logistic regression. Based on this limited sample, there is a 12.8% chance that a "C" student (Grade in 345=2) "passing" the ChatGPT/Python version, which is certainly concerning!

Dependent variable=ChatGPT_Pass

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-6.5462	2.9749	-2.2005	0.0278 *
Grade_in_345	2.3169	0.9969	2.3241	0.0201 *

Signif. codes: 0 ' *** ' 0.001 ' ** ' 0.01 ' * ' 0.05 '.' 0.1 ' ' 1

Discussion, Limitations and Conclusions

The Bloomberg Terminal's ease of use and presentation of data are highlighted in this analysis because instead of simply typing the Ticker, DVD and DDM into the Terminal, the steps necessary to mimic that output using Yahoo finances API and Python with coding assistance provided by ChatGPT are far more involved. These extra steps focused on writing code to first look up the data and then perform a calculation using one of the formulas contained in the learning objectives, which seems to have helped improve students' self-assessed understanding of those objectives. On the other hand, this added complexity appears to have been "too much" for the weaker students. While 82% of the sample were able to score 75% of above on the Bloomberg Terminal version of the assignment, only 50% were able to do so on the ChatGPT/Python version. Furthermore, the results of logistic regression based on this sample predicted only a 12.8% chance that a "C" student would earn 75% or above on ChatGPT/Python version of the assignment. Since the approved syllabus for the course in question weighs the active learning assignment so heavily (30% of the overall course grade), moving to ChatGPT/Python based assignments will almost certainly negatively impact student's course grades. Hopefully the student who said, "if we were to start off with this method, and had videos like we do with Bloomberg, it wouldn't be too hard to grasp" is correct, and the impact of this transition on student grades truly can be mitigated by fully incorporating Python with coding

assistance provided by ChatGPT and Yahoo Finances API into the course as I had done previously with the Bloomberg Terminal will be sufficient.

The most obvious limitation of this study is the sample size. Unfortunately, the termination of the Bloomberg contract prevented me from repeating this comparison study in subsequent semesters.

So, is ChatGPT a viable free alternative to the Bloomberg Terminal for undergraduate experiential learning? According to this analysis, yes but the cost savings will come at the expense of the lowest performing students. It is my hope that this analysis will help other faculty at small colleges facing similar financial constraints with their decisions to either reaffirm their commitment to the use of the Terminal or adjust their active learning-based assignments accordingly.

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Entrepreneurial Success: The Missing Link Between Education, AI, and Startup Growth

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Keywords

Startups, entrepreneurship, artificial intelligence (AI), experiential learning, market validation, leadership, resource management, innovation, sustainability, failure rates, ecosystem, policy, skill gaps, uncertainty, resilience.

Abstract

In today's competitive startup landscape, where nine out of ten ventures fail, identifying the missing link between formal education, artificial intelligence (AI), and entrepreneurial success is crucial. This reflection explores how the integration of formal education, experiential learning, and AI-driven strategies can equip entrepreneurs to overcome critical challenges such as market misalignment, leadership deficiencies, and resource constraints. By combining theoretical frameworks with qualitative insights from interviews with startup founders and reflective analyses, this article offers actionable recommendations for educational institutions, entrepreneurs, and policymakers. It highlights the importance of bridging skill gaps, fostering AI adoption, and developing resilient startups capable of navigating uncertainty and achieving sustainable growth.

I. Introduction

In the fast-paced and uncertain world of startups, success is rarely determined by innovation alone. While creativity fuels new ventures, long-term survival depends on the strategic integration of formal education, artificial intelligence (AI), and entrepreneurship. According to CB Insights (2024), nearly 90% of startups fail within their first five years, often due to market misalignment, leadership deficiencies, and resource constraints. However, emerging evidence suggests that startups leveraging AI technologies, strong business education, and experiential learning demonstrate higher resilience and growth potential. For instance, a 2021 KPMG report found that AI-driven startups in the healthcare sector experienced revenue growth 40% faster than their non-AI counterparts. This disparity raises a crucial question: What factors enable certain startups to thrive while others struggle to survive?

One key factor is startup resilience—a venture's ability to adapt to market shifts, overcome financial and operational challenges, and sustain growth despite uncertainty. Resilient startups are those that effectively navigate volatility, refine their business models in response to real-world conditions, and leverage emerging technologies such as AI to drive efficiency and innovation. However, resilience does not develop in isolation; it is deeply tied to an entrepreneur's ability to bridge skill gaps—deficiencies in essential areas such as strategic decision-making, financial management, leadership, and technology integration.

Consider the case of Carlos, a participant in BICTIA's programs and a highly skilled software engineer. Opting for entrepreneurship over completing a traditional business degree, Carlos developed cutting-edge AI-powered financial algorithms that propelled his fintech startup forward.

However, as the company expanded, his lack of expertise in business fundamentals—such as market positioning, cash flow management, and team leadership—hindered growth and scalability. His experience highlights a broader challenge in the startup ecosystem: while technical expertise is invaluable, entrepreneurs must also bridge critical skill gaps, integrate AI strategically, and develop startup resilience to sustain long-term success.

This paper explores the interplay between formal education, experiential learning, and AI adoption as key drivers of startup success. Through theoretical analysis, structured interviews with startup founders, and reflective insights from BICTIA's ecosystem, this study identifies key aspects for entrepreneurs to develop the competencies needed to navigate market volatility, optimize AI-driven strategies, and overcome common business challenges. By elaborating on bridging skill gaps, fostering AI adoption, and promoting startup resilience, this paper provides recommendations for educators, entrepreneurs, and policymakers. The discussion also highlights the role of accrediting bodies such as the Accreditation Council for Business Schools and Programs (ACBSP) in aligning academic learning with entrepreneurial demands, ensuring that formal education evolves to meet the needs of modern founders.

Ultimately, this reflection aims to contribute to the development of a startup ecosystem that not only thrives on innovation but also sustains long-term growth and adaptability in an increasingly competitive business landscape.

III. Decoding Startup Survival: Education, AI, and the Road to Resilience

This section explores the critical factors behind startup failures, the transformative impact of education in fostering entrepreneurial success, and the catalytic role of AI in reshaping the startup ecosystem. By examining these elements, the discussion provides actionable insights to help entrepreneurs, educators, and policymakers mitigate failure and build resilient ventures.

Grounded in a structured analysis of market trends, founder interviews, and empirical data, this discussion identifies the root causes of startup failure and evaluates how a strategic blend of formal education, experiential learning, and AI integration can drive sustainable growth. As part of this reflective study, interviews were conducted and a structured questionnaire was distributed to entrepreneurs within BICTIA's ecosystem, gathering insights from 38 respondents (see Appendix 1 and Appendix 2 for details). These findings provided an empirical foundation, which combined with the author's expertise in systems thinking (Jackson, 2000) fostered the connection of theoretical frameworks with real-world challenges, offering a comprehensive perspective on the evolving startup landscape.

Startup Failure

According to CB Insights (2024), the primary cause of startup failure is the lack of market demand (42%), followed by financing problems (29%) and inadequate teams (23%). These factors closely align with local experiences from entrepreneurs in BICTIA´s ecosystem. Identifying the root causes of failure is essential to developing strategies that mitigate these risks. Based on prior research and insights from the interviews, four main categories of failure have been identified.

The first category encompasses market-related challenges. Many startups struggle due to insufficient market research, often misinterpreting consumer demand or failing to identify viable customer segments. This issue is particularly pronounced in the context of disruptive innovations, where traditional forecasting methods tend to fall short. Christensen (1997) highlights this challenge, noting that market researchers and business planners often fail to predict the growth potential of emerging markets. He argues that historical data from industries such as disk drives, motorcycles, and microprocessors show a consistent pattern: expert forecasts about the size of new markets are frequently inaccurate (p. 15).

The empirical findings reinforce this point. In our study, 33.3% of respondents reported stable sales with minimal fluctuations (-5% to +5%), while 12.1% experienced a decline of over 20%. These figures highlight the ongoing challenge of achieving a strong product-market fit, even with conventional market research. The difficulty is even more pronounced in sectors leveraging disruptive technologies, where consumer adoption patterns remain unpredictable and market validation requires continuous iteration.

The second major category of failure is team-related. Poor leadership—manifested in ineffective decision-making, lack of strategic vision, or weak execution—often undermines startup viability. Additionally, conflicts stemming from misaligned goals or interpersonal tensions can disrupt collaboration, eroding productivity and long-term sustainability (Morales, 2014).

Financial constraints represent the third key challenge, with implications beyond capital availability. Startups often struggle not only with securing funding but also with managing resources effectively. Christensen (1997) sheds light on this dynamic, arguing that while managers may believe they control resource allocation, in reality, it is customers and investors who dictate spending priorities. He asserts that companies unable to align their investment patterns with the expectations of these stakeholders ultimately fail (p. 14).

Information gathered from the questionnaires supports this claim. Survey results indicate that 48.5% of startups failed to create additional jobs, underscoring growth limitations, while many founders described securing capital as "very difficult" or even "impossible." This financial strain often leads to insolvency, even among startups with promising revenue potential. Perhaps most strikingly,is the fact that 47.0% of entrepreneurs relied primarily on self-financing, a constraint that significantly limits scalability and innovation.

The fourth category pertains to technological deficits. Startups that fail to keep pace with evolving industry standards and technological advancements risk obsolescence. AI presents a significant opportunity for growth and efficiency, yet many startups struggle with its adoption. Despite 48.5% of surveyed startups utilizing AI, common barriers persist, with 51.5% citing a lack of technical expertise and 21.2% highlighting high implementation costs. These limitations hinder startups from fully leveraging AI's potential, ultimately weakening their competitive edge.

The Role of Formal Education in Entrepreneurial Success

The relationship between formal education and entrepreneurial success presents an ongoing debate. While traditional business and management programs in higher education provide essential theoretical foundations, they often fall short in addressing the dynamic and fast-paced realities of entrepreneurship. As Blank (2013) critically observes, many entrepreneurs mistake business plans for execution roadmaps, failing to recognize them as sets of unproven assumptions. He argues that "entrepreneurs often mistake their business plan as a cookbook for execution, failing to recognize that it is only a collection of unproven assumptions" (p. 68). This perspective highlights a core challenge: business education must evolve beyond static frameworks to embrace adaptive and experiential learning.

A key tension in entrepreneurial education lies in balancing theoretical knowledge with real-world application. While strong foundational principles in finance, strategy, and leadership are valuable, their effectiveness is limited without hands-on experience. To bridge this gap, higher education institutions must integrate practical elements such as startup simulations, mentorship programs, and AI-driven business analytics training. These approaches prepare entrepreneurs to navigate uncertainty, refine their business models iteratively, and adapt to rapidly changing market conditions.

The rise of alternative learning models has opened new pathways for entrepreneurial education. Accelerators, bootcamps, and online platforms such as Coursera and Udemy offer targeted, flexible, and experiential learning opportunities. These programs emphasize problem-solving, innovation, and adaptability—key skills often underemphasized in traditional curricula. However, our survey reveals a significant gap in the adoption of these alternative learning approaches. While 33.3% of respondents have participated in accelerators, 51.5% have engaged in alternative education programs such as bootcamps and online courses. Still, 15.2% have not taken part in any structured entrepreneurial education, highlighting the continued lack of access to practical, skills-based training for many entrepreneurs.

One of the most critical aspects of entrepreneurial education is fostering a mindset of experimentation and data-driven decision-making. Blank (2013) underscores this by emphasizing the importance of hypothesis testing, stating that "to turn hypotheses into facts, founders need to get out of the building and test them in front of customers" (p. 72). This iterative process of testing, learning, and refining strategies is fundamental for startup success, bridging the gap between theoretical instruction and practical execution.

By integrating experiential learning with formal education and leveraging alternative training models, entrepreneurial education can better equip founders with the skills necessary to build resilient and adaptable ventures. Institutions that embrace this evolution will play a crucial role in shaping the next generation of entrepreneurs. Consequently, accreditation bodies like ACBSP, are called to play a pivotal role in shaping business and management educational programs, ensuring they prepare students not only for traditional corporate roles but also for the challenges of startup ecosystems.

AI as a Catalyst for Startup Resilience

Artificial intelligence has rapidly emerged as a transformative force in the entrepreneurial ecosystem, offering startups powerful tools to enhance efficiency, innovation, and decision-

making. By leveraging AI, startups can better navigate uncertainty, optimize resource allocation, and strengthen their ability to adapt to changing market conditions—key aspects of resilience.

One of AI's most significant contributions is its ability to address critical startup challenges through predictive analytics. Sophisticated algorithms now enable startups to forecast market trends with greater accuracy, optimize pricing strategies based on real-time data, and anticipate customer behavior. Previously, such capabilities were exclusive to well-established corporations, but AI has democratized access to data-driven insights, empowering even early-stage ventures to make informed strategic decisions.

AI has also revolutionized marketing and customer engagement. Intelligent chatbots and AI-driven targeted campaigns have transformed how startups acquire and retain customers, offering personalized experiences at scale. These advancements allow emerging businesses to compete more effectively, even in highly saturated markets. Additionally, AI-driven operational solutions enhance efficiency by optimizing workflows, reducing costs, and improving resource allocation, enabling startups to do more with limited resources.

Despite its advantages, AI adoption presents significant challenges. Financial constraints remain a primary hurdle, as many startups struggle to afford sophisticated AI solutions and the necessary infrastructure—an issue particularly pronounced for early-stage ventures with limited funding. The technical expertise gap further complicates AI adoption; our research indicates that 51.5% of respondents identified a lack of specialized skills as a major obstacle. Implementing AI goes beyond programming knowledge; it requires expertise in model training, data interpretation, and system integration within specific business contexts, making it difficult for many startups to fully leverage AI's potential.

Beyond technical and financial barriers, ethical considerations pose an additional challenge. Startups must carefully navigate issues related to data privacy, potential algorithmic bias, and evolving regulatory compliance. These are not merely technical concerns but fundamental elements that can impact a company's reputation, customer trust, and long-term sustainability.

To fully harness AI's potential as a resilience-building tool, startups must adopt a strategic approach—securing financial support, investing in skill development, and implementing AI responsibly. As AI continues to reshape the entrepreneurial landscape, those who successfully integrate it into their operations will be better positioned to withstand market fluctuations and drive sustainable growth.

Synthesizing Key Insights: AI, Formal Education, and Startup Resilience

As discussed above, startups operate in an inherently volatile landscape, where success depends on their ability to navigate challenges in market positioning, leadership, financial sustainability, and technological integration. This analysis highlights that failures often stem from a lack of market demand, leadership gaps, and financial constraints—yet solutions to these challenges require a multidimensional approach that goes beyond technological adoption.

Artificial intelligence has emerged as a transformative force, not merely enhancing operational efficiency but reshaping business models and unlocking new opportunities. As McKinsey (2023) notes, "Respondents from AI high performers are twice as likely as others to say their organizations' top objective for generative AI is to create entirely new businesses or sources of revenue" (p. 8) ? . This underscores the importance of startups embracing AI as a core driver of innovation and competitive differentiation. However, the rapid adoption of AI also introduces challenges, particularly in workforce adaptation. As McKinsey (2023) also highlights: "The expected business disruption from generative AI is significant, and respondents predict meaningful changes to their workforces. They anticipate workforce cuts in certain areas and large reskilling efforts to address shifting talent needs" (p. 1).. This reinforces the necessity for educational institutions to integrate AI literacy and experiential entrepreneurial training into their curricula, ensuring future founders are equipped to leverage AI effectively.

Beyond AI, formal education and skill development remain critical pillars of startup success. As emphasised above, formal education alone is insufficient; entrepreneurs must complement theoretical knowledge with experiential learning, mentorship, and exposure to real-world business challenges. Programs such as accelerators and bootcamps play a crucial role in bridging the gap between academic instruction and practical execution, offering founders opportunities to refine their business models, test hypotheses, and develop resilience through iterative learning. However, access to these alternative learning models remains uneven, with 31.6% of surveyed entrepreneurs having

never participated in structured entrepreneurial programs. Expanding these opportunities—especially for early-stage and underserved founders—will be essential to fostering a more inclusive and dynamic startup ecosystem.

As Gómez Romero and González Herrera (2022) aptly observe, "A distinctive feature of the current era is constant change, which has created an uncertain and highly volatile environment. In this unstable setting, organizations must develop, adapt, and thrive. Their ability to reinvent themselves is crucial to their survival in the face of the rapid volatility of their surroundings" (p. X). This insight highlights the need for startups to embrace adaptability not just in their business strategies but also in their approach to combine formal education, skill development, and technological integration.

Ultimately, fostering startup resilience demands a holistic approach—one that blends strategic market insight, sound financial management, technological adaptability, and an evolving business and management education system. By embracing AI-driven innovation, refining business strategies, and expanding access to experiential learning, startups can not only survive in an increasingly complex environment but position themselves for long-term, sustainable success.

IV. Recommendations and Implications

Enhancing startup success and mitigating failure requires a coordinated effort between three key actors: educational institutions, entrepreneurs, and policymakers, each playing a critical role in fostering a resilient and innovative ecosystem. This analysis suggests that entrepreneurial education must evolve to bridge the gap between theoretical knowledge and practical execution. Developing hybrid learning models that integrate startup simulations, industry collaborations, and AI-driven case studies will better prepare students for real-world challenges. Additionally, embedding AI and data analytics training into business and management educational programs is essential to ensure that future entrepreneurs acquire both technical literacy and core business skills. Expanding access to accelerators and mentorship programs, particularly for underserved communities, will further democratize entrepreneurial opportunities.

For entrepreneurs, adaptability and strategic AI adoption are key to navigating today's fast-paced business environment. Prioritizing lifelong learning through accelerators, online courses, and mentorship networks fosters resilience and innovation. Leveraging AI-driven tools—such as customer segmentation, predictive analytics, and process automation—can significantly enhance decision-making and competitive positioning. However, the technical expertise gap remains a significant barrier. Addressing this challenge requires fostering collaborations with universities, AI-focused bootcamps, and industry specialists to equip entrepreneurs with the necessary skills to integrate AI effectively into their business operations.

Policymakers must create a supportive environment that facilitates startup growth by expanding funding initiatives for entrepreneurial education and AI adoption, ensuring that resources are accessible to a broader range of founders. Public-private collaborations should be encouraged to align academic research with industry needs, making entrepreneurial education more relevant and impactful. Moreover, the responsible implementation of AI policies is crucial, requiring transparent data governance, efforts to mitigate algorithmic bias, and adherence to ethical standards. To further drive innovation, facilitating hackathons and innovation labs will provide valuable opportunities for entrepreneurs, students, and researchers to tackle industry and societal challenges collaboratively.

A fourth emerging key actor in this discussion is accreditation bodies like ACBSP, which, as already mentioned above, play a pivotal role in shaping business and management educational programs. Given the growing complexity of the entrepreneurial landscape, ACBSP´s role becomes crucial in ensuring that business curricula evolve to meet industry demands. By integrating AI training, experiential learning, and interdisciplinary education, accreditation bodies can help bridge the gap between academia and industry, fostering startup resilience and innovation. Furthermore, they can drive collaboration between business schools, industry leaders, and policymakers, ensuring that educational frameworks align with the rapidly evolving needs of entrepreneurs in the digital age. Accreditation bodies must also lead in evaluating and promoting best practices in AI-driven business education, ensuring that business schools prepare students not only for traditional corporate roles but also for the challenges of startup ecosystems.

Future research should explore the long-term impact of AI adoption on startup success and its influence on emerging business models. Investigating the effectiveness of hybrid education models in equipping entrepreneurs with real-world

skills will help refine educational frameworks. Additionally, alternative funding mechanisms, such as venture debt and public-private investment models, must be analyzed to address the capital constraints that hinder startup scalability.

In accordance with these recommendations, a crucial role for these four key stakeholders across the entrepreneurial ecosystem is to find new ways to foster collaboration and innovation. Educational institutions have the opportunity to shape well-rounded, tech-savvy entrepreneurs equipped for real-world challenges, while entrepreneurs themselves can explore AI and continuous learning to better navigate market complexities. Policymakers, through strategic interventions, can contribute to a more supportive framework that encourages sustainable and responsible growth. Meanwhile, ACBSP and other accreditation bodies can drive the transformation of business education, ensuring that academic programs remain relevant, innovative, and aligned with the needs of modern entrepreneurs. While challenges remain, these insights aim to inform discussions and initiatives that could help strengthen the entrepreneurial landscape over time.

V. Conclusion

Reducing the high failure rate of startups requires a comprehensive, adaptive approach that integrates formal education, experiential learning, and artificial intelligence. This paper confirms that entrepreneurs who blend academic training with real-world experience and AI-driven strategies are better equipped to overcome leadership challenges, market misalignment, and financial constraints.

While formal education provides essential theoretical knowledge, its real impact emerges when combined with practical methodologies such as accelerator programs, mentorship, and industry collaborations. Institutions like ACBSP and other accreditation bodies must play a pivotal role in ensuring that educational programs evolve alongside the entrepreneurial landscape, fostering a curriculum that aligns with real-world startup challenges and AI-driven business solutions.

Despite AI's transformative potential—enhancing efficiency, reducing costs, and improving decision-making—significant barriers to adoption remain, including technical skill gaps and high implementation costs. Overcoming these obstacles will require collaborative efforts among entrepreneurs, educational institutions, and policymakers to expand AI accessibility and equip future founders with the skills needed to thrive in an increasingly digital economy.

Ultimately, startup resilience hinges on adaptability—the ability to anticipate market shifts, leverage technology strategically, and continuously refine business models. The future of entrepreneurship will depend on how effectively we bridge the gap between education, technology, and real-world business challenges. Only through a concerted effort between academia, industry, and policymakers can we build a startup ecosystem that not only fosters innovation but sustains long-term growth and impact.

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Appendix 1: Startup Founders Questionnaire

Empowering Success and Innovation among Startup Founders

Introduction and Instructions

At BICTIA, our mission is to strengthen the entrepreneurial ecosystem by providing strategic support and accelerating innovative startups. In order to continue enhancing our programmes and tailoring them to the real needs of our entrepreneurs, we seek to gain a deeper understanding of their experiences, challenges, and perspectives.

This questionnaire aims to gather valuable information on educational backgrounds, the impact of acceleration programmes, and the use of technologies such as Artificial Intelligence (AI) in business development.

The insights collected will be critical for:

1. Identifying key challenges faced by startups at various stages of development.
2. Improving our acceleration, mentoring, and educational initiatives.
3. Designing targeted strategies to foster the sustainable growth of the companies within our portfolio.

Instructions:

- This questionnaire is designed to be completed in approximately 25–30 minutes.
- It includes both multiple-choice and open-ended questions to capture quantitative and qualitative data.
- Please answer as sincerely and accurately as possible, as your input is essential to the continuous improvement of our programmes.

Confidentiality: All responses will be treated confidentially and used solely for internal analysis and service improvement purposes.

Thank you for being part of our community and for contributing to the strengthening of the entrepreneurial ecosystem with your valuable responses.

Section 1: General Information

1. What is your name and role within the startup?
   - *(Short text response)*
2. How long has your startup been operating?
   - Less than 1 year
   - 1–3 years
   - 4–6 years
   - More than 6 years
3. What is the primary sector of your startup?
   - Technology
   - Health
   - Education
   - E-commerce
   - Energy
   - Agriculture
   - Other: *(Short text response)*

Section 2: Educational Background

4. What is your highest level of formal education?
   - Secondary education
   - Undergraduate degree
   - Master's degree (MBA or other)
   - Doctorate
   - Self-taught
5. Have you participated in alternative education programmes or accelerators?
   - Yes, in alternative education programmes (bootcamps, online courses, etc.)
   - Yes, in accelerator programmes
   - No, I have not participated in any

6 How many acceleration programmes have you participated in over the past six years?
- 1 programme
- 2–4 programmes
- 4 or more programmes
- None

Section 3: Education and Entrepreneurship

7 How do you perceive the value of formal education (undergraduate and postgraduate) in your entrepreneurial journey? *(Scale from 1 to 5)*
- 1: Not relevant
- 2: Slightly relevant
- 3: Moderately relevant
- 4: Highly relevant
- 5: Extremely relevant

8 Do you believe that current educational institutions adequately prepare entrepreneurs for the challenges of starting a business?
- Yes, completely
- Partially, but with limitations
- No, there are significant shortcomings
- Other: *(Short text response)*

9 How important do you consider experiential learning compared to formal education in developing entrepreneurial skills? (Scale from 1 to 5)
- 1: Not important
- 2: Slightly important
- 3: Moderately important
- 4: Very important
- 5: Extremely important

10 What do you consider to be the main limitations educational institutions face in preparing entrepreneurs?
- *(Open-ended question)*

Section 4: Accelerators and Skills Development

11 Describe your experience with acceleration programmes (if applicable).
- *(Open-ended question)*

12 How have these programmes influenced your skills and the development of your startup?
- *(Open-ended question)*

13 What do you consider to be the main skill gaps that should be addressed for entrepreneurs?
- *(Open-ended question)*

Section 5: Integration of Artificial Intelligence (AI)

14 Does your startup use tools or technologies based on Artificial Intelligence (AI)?
- Yes *(Optional: provide examples – open-ended)*
- No

15 What are the main challenges you face when adopting AI technologies?
- High costs
- Lack of technical expertise
- Ethical concerns (privacy, bias, etc.)
- Other: *(Short text response)*

16 How has AI impacted the efficiency and growth of your startup?
- *(Open-ended question)*

Section 6: General Reflections

17 Based on your experience, what advice would you give to new entrepreneurs regarding educational and technological tools?
- *(Open-ended question)*

18 How do you envision the role of AI in entrepreneurship evolving over the next five years?
- *(Open-ended question)*

Section 7: Post-Acceleration Programme Impact

19 Have you generated additional employment in your company over the past year?
- Yes, 1–5 jobs
- Yes, 6–10 jobs
- Yes, more than 10 jobs
- No additional jobs generated

20 How has your sales performance evolved in the past year?
- Increased by more than 50%
- Increased by 21% to 50%
- Increased by 15% to 20%
- Increased by 5% to 14%
- Remained relatively stable (between -5% and +5%)
- Decreased by 6% to 20%
- Decreased by more than 20%

21 How difficult has it been for your startup to access capital? What have been your main sources of funding?
- *(Open-ended question)*

Appendix 2: Startup Questionnaire Analysis

I. Overview of Entrepreneurial and Startup Profiles

Experience and Sector Distribution

- 54.5% of startups have been in operation for more than six years, while 9.1% have been active for less than a year.
- The majority of startups (48.5%) operate in the technology sector, followed by a more diverse distribution including health (6.1%), fintech (3.0%), e-commerce (3.0%), agriculture (3.0%), and others such as legal services, engineering, and manufacturing.

II. Education and Skill Development

- 36.4% of entrepreneurs hold a master's degree, 45.5% have a professional degree, and 6.1% only completed secondary education.
- 51.5% have participated in alternative education programs like bootcamps and online courses, while 33.3% attended accelerators. However, 15.2% have not taken part in any structured entrepreneurial education.
- 42.4% have engaged in 2-4 accelerator programs, but 30.3% have never participated in one.

III. Perception of Education and Skill Gaps

- Education is valued with an average score of 3.85 out of 5: 33.3% rated it a 5, and 30.3% rated it a 4.
- Key skill gaps identified include sales, strategic vision, financial management, marketing, and leadership.

IV. AI Adoption and Challenges

- 48.5% of startups use AI, while 51.5% do not.
- The main barriers to AI adoption include:
  - 51.5% cite lack of technical expertise.
  - 21.2% cite high implementation costs.
  - 12.1% cite ethical concerns like privacy and bias.

V. Business Growth and Financial Challenges

- 48.5% of startups have not created additional jobs in the past year, while 39.4% have generated 1-5 new jobs.
- 33.3% of startups reported stable sales, while 12.1% experienced a revenue decline of over 20%.
- Access to capital remains a major challenge, with many founders describing it as "very difficult" or "impossible."
- 47.0% rely primarily on self-financing, followed by grants, bank loans, and investment rounds.

Éxito Emprendedor: El Vínculo Perdido entre la Educación, la IA y el Crecimiento de Startups

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Palabras clave

Startups, emprendimiento, inteligencia artificial (IA), aprendizaje experiencial, validación de mercado, liderazgo, gestión de recursos, innovación, sostenibilidad, tasas de fracaso, ecosistema, políticas, brechas de habilidades, incertidumbre, resiliencia.

Resumen

En el competitivo panorama de startups actual, donde nueve de cada diez fracasan, identificar el vínculo perdido entre la educación formal, la inteligencia artificial (IA) y el éxito emprendedor es crucial. Esta reflexión explora cómo la integración de la educación formal, el aprendizaje experiencial y las estrategias impulsadas por IA pueden equipar a los emprendedores para superar desafíos críticos como el desalineamiento del mercado, las deficiencias de liderazgo y las limitaciones de recursos. Combinando marcos teóricos con perspectivas cualitativas derivadas de entrevistas con fundadores de startups y análisis reflexivos, este artículo ofrece recomendaciones prácticas para instituciones educativas, emprendedores y responsables de políticas públicas. Se destaca la importancia de cerrar brechas de habilidades, fomentar la adopción de IA y desarrollar startups resilientes capaces de navegar la incertidumbre y lograr un crecimiento sostenible.

I. Introducción

En el mundo acelerado e incierto de las startups, el éxito rara vez se determina únicamente por la innovación. Si bien la creatividad impulsa nuevas iniciativas, la supervivencia a largo plazo depende de la integración estratégica de la educación formal, la inteligencia artificial (IA) y el espíritu emprendedor. Según CB Insights (2024), casi el 90% de las startups fracasan en sus primeros cinco años, a menudo debido a un desalineamiento con el mercado, deficiencias de liderazgo y limitaciones de recursos. Sin embargo, evidencia emergente sugiere que las startups que aprovechan tecnologías de IA, una sólida educación empresarial y aprendizaje experiencial demuestran una mayor resiliencia y potencial de crecimiento. Por ejemplo, un informe de KPMG de 2021 encontró que las startups impulsadas por IA en el sector de la salud experimentaron un crecimiento en ingresos un 40% más rápido que sus contrapartes sin IA. Esta disparidad plantea una pregunta crucial: ¿Qué factores permiten que ciertas startups prosperen mientras otras luchan por sobrevivir?

Un factor clave es la resiliencia de las startups: la capacidad de una empresa para adaptarse a los cambios del mercado, superar desafíos financieros y operativos, y mantener el crecimiento a pesar de la incertidumbre. Las startups resilientes son aquellas que navegan eficazmente la volatilidad, refinan sus modelos de negocio en respuesta a condiciones del mundo real y aprovechan tecnologías emergentes como la IA para impulsar

la eficiencia y la innovación. Sin embargo, la resiliencia no se desarrolla de manera aislada; está profundamente vinculada a la capacidad de un emprendedor para cerrar brechas de habilidades, es decir, deficiencias en áreas esenciales como la toma de decisiones estratégicas, la gestión financiera, el liderazgo y la integración tecnológica.

Consideremos el caso de Carlos, un participante en los programas de BICTIA y un ingeniero de software altamente capacitado. Optando por el emprendimiento en lugar de completar un título tradicional en negocios, Carlos desarrolló algoritmos financieros avanzados impulsados por IA que impulsaron su startup fintech hacia adelante. Sin embargo, a medida que la empresa creció, su falta de experiencia en fundamentos empresariales, como el posicionamiento en el mercado, la gestión del flujo de caja y el liderazgo de equipos, obstaculizó el crecimiento y la escalabilidad. Su experiencia destaca un desafío más amplio en el ecosistema de startups: si bien la experiencia técnica es invaluable, los emprendedores también deben cerrar brechas críticas de habilidades, integrar la IA estratégicamente y desarrollar resiliencia en sus startups para sostener el éxito a largo plazo.

Este artículo explora la interacción entre la educación formal, el aprendizaje experiencial y la adopción de la IA como impulsores clave del éxito de las startups. A través de análisis teóricos, entrevistas estructuradas con fundadores de startups y reflexiones del ecosistema de BICTIA, este estudio identifica aspectos clave para que los emprendedores desarrollen las competencias necesarias para navegar la volatilidad del mercado, optimizar estrategias impulsadas por IA y superar los desafíos empresariales comunes. Al profundizar en cómo cerrar brechas de habilidades, fomentar la adopción de la IA y promover la resiliencia de las startups, este artículo proporciona recomendaciones para educadores, emprendedores y responsables de políticas públicas. La discusión también destaca el papel de organismos acreditadores como el Accreditation Council for Business Schools and Programs (ACBSP) en la alineación del aprendizaje académico con las demandas del emprendimiento, asegurando que la educación formal evolucione para satisfacer las necesidades de los fundadores.

En última instancia, esta reflexión tiene como objetivo contribuir al desarrollo de un ecosistema de startups que no solo prospere gracias a la innovación, sino que también mantenga el crecimiento a largo plazo y la adaptabilidad en un panorama empresarial cada vez más competitivo.

II. Descifrando la Supervivencia de las Startups: Educación, IA y el Camino hacia la Resiliencia

Esta sección explora los factores críticos detrás del fracaso de las startups, el impacto transformador de la educación en el éxito emprendedor y el papel catalizador de la inteligencia artificial (IA) en la reconfiguración del ecosistema de startups. Al examinar estos elementos, se ofrecen ideas prácticas para ayudar a emprendedores, educadores y responsables de políticas públicas a mitigar los riesgos de fracaso y construir empresas resilientes.

Basado en un análisis estructurado de tendencias de mercado, entrevistas con fundadores y datos empíricos, este estudio identifica las causas principales del fracaso de las startups y evalúa cómo una combinación estratégica de educación formal, aprendizaje experiencial e integración de la IA puede impulsar un crecimiento sostenible. Como parte de este estudio reflexivo, se realizaron entrevistas y se distribuyó un cuestionario estructurado a emprendedores del ecosistema de BICTIA, recopilando información de 38 encuestados (ver Apéndices 1 y 2 para más detalles). Estos hallazgos proporcionaron una base empírica que, combinada con la experiencia del autor en pensamiento sistémico (Jackson, 2000), permitió conectar marcos teóricos con desafíos del mundo real, ofreciendo una perspectiva integral del panorama cambiante de las startups.

Fracaso de las Startups

Según CB Insights (2024), la principal causa del fracaso de las startups es la falta de demanda en el mercado (42%), seguida de problemas de financiamiento (29%) y equipos inadecuados (23%). Estos factores se alinean estrechamente con las experiencias locales de los emprendedores en el ecosistema de BICTIA. Identificar las causas raíz del fracaso es esencial para desarrollar estrategias que mitiguen estos riesgos. Basado en investigaciones previas y en los resultados de las entrevistas, se han identificado cuatro categorías principales de fracaso:

1. Desafíos relacionados con el mercado. Muchas startups enfrentan dificultades debido a una investigación de mercado insuficiente, lo que a menudo resulta en una mala interpretación de la demanda del consumidor o en la incapacidad de identificar segmentos de clientes viables. Este problema es especialmente pronunciado en el contexto de innovaciones disruptivas, donde los métodos tradicionales de pronóstico tienden a fallar. Christensen (1997) señala este desafío, destacando que los investigadores de mercado y los planificadores empresariales a menudo no logran

predecir el potencial de crecimiento de los mercados emergentes. Según datos históricos de industrias como las unidades de disco, motocicletas y microprocesadores, existe un patrón consistente: las predicciones de expertos sobre el tamaño de nuevos mercados suelen ser inexactas (p. 15).

Los hallazgos empíricos refuerzan este punto. En nuestro estudio, el 33.3% de los encuestados reportaron ventas estables con fluctuaciones mínimas (-5% a +5%), mientras que el 12.1% experimentó una disminución de más del 20%. Estas cifras resaltan el desafío continuo de lograr un ajuste sólido entre producto y mercado, incluso con investigaciones de mercado convencionales. La dificultad es aún más pronunciada en sectores que aprovechan tecnologías disruptivas, donde los patrones de adopción del consumidor siguen siendo impredecibles y la validación del mercado requiere iteraciones continuas.

2. Problemas relacionados con el equipo. El liderazgo deficiente, manifestado en una toma de decisiones ineficaz, falta de visión estratégica o una ejecución débil, a menudo socava la viabilidad de las startups. Además, los conflictos derivados de objetivos desalineados o tensiones interpersonales pueden interrumpir la colaboración, erosionando la productividad y la sostenibilidad a largo plazo (Morales, 2014).

3. Restricciones financieras. Las limitaciones financieras representan el tercer desafío clave, con implicaciones más allá de la disponibilidad de capital. Las startups a menudo luchan no solo por asegurar financiamiento, sino también por gestionar los recursos de manera efectiva. Christensen (1997) arroja luz sobre esta dinámica, argumentando que, si bien los gerentes pueden creer que controlan la asignación de recursos, en realidad son los clientes e inversores quienes dictan las prioridades de gasto. Afirma que las empresas que no logran alinear sus patrones de inversión con las expectativas de estos grupos de interés, inevitablemente fracasan (p. 14).

Los datos recopilados de los cuestionarios respaldan esta afirmación. Los resultados de la encuesta indican que el 48.5% de las startups no lograron crear empleos adicionales, lo que subraya las limitaciones de crecimiento. Muchos fundadores describieron la obtención de capital como "muy difícil" o incluso "imposible". Esta tensión financiera a menudo lleva a la insolvencia, incluso entre startups con un potencial de ingresos prometedor. Quizás lo más llamativo es que el 47.0% de los emprendedores dependían principalmente de la autofinanciación, una restricción que limita significativamente la escalabilidad y la innovación.

4. Déficits tecnológicos. Las startups que no logran mantenerse al día con los estándares de la industria y los avances tecnológicos corren el riesgo de quedar obsoletas. La IA presenta una oportunidad significativa para el crecimiento y la eficiencia, pero muchas startups luchan con su adopción. A pesar de que el 48.5% de las startups encuestadas utilizaban IA, persisten barreras comunes: el 51.5% citó una falta de experiencia técnica y el 21.2% destacó los altos costos de implementación. Estas limitaciones impiden que las startups aprovechen plenamente el potencial de la IA, debilitando en última instancia su ventaja competitiva.

El Papel de la Educación Formal en el Éxito Emprendedor

La relación entre la educación formal y el éxito emprendedor presenta un debate continuo. Si bien los programas tradicionales de negocios en la educación superior proporcionan fundamentos teóricos esenciales, a menudo no logran abordar las realidades dinámicas y aceleradas del emprendimiento. Como observa Blank (2013) de manera crítica, muchos emprendedores confunden los planes de negocio con hojas de ruta para la ejecución, sin reconocer que son simplemente conjuntos de suposiciones no probadas. Él argumenta que "los emprendedores a menudo confunden su plan de negocio con un libro de recetas para la ejecución, sin darse cuenta de que es solo una colección de suposiciones no verificadas" (p. 68). Esta perspectiva resalta un desafío central: la educación empresarial debe evolucionar más allá de los marcos estáticos para adoptar un aprendizaje adaptativo y experiencial.

Una tensión clave en la educación emprendedora radica en equilibrar el conocimiento teórico con la aplicación en el mundo real. Si bien los principios fundamentales en finanzas, estrategia y liderazgo son valiosos, su efectividad es limitada sin experiencia práctica. Para cerrar esta brecha, las instituciones de educación superior deben integrar elementos prácticos como simulaciones de startups, programas de mentoría y capacitación en análisis de negocios impulsados por IA. Estos enfoques preparan a los emprendedores para navegar la incertidumbre, refinar iterativamente sus modelos de negocio y adaptarse a condiciones de mercado en constante cambio.

El auge de modelos de aprendizaje alternativos ha abierto nuevos caminos para la educación emprendedora. Aceleradoras, bootcamps y plataformas en línea como Coursera y Udemy ofrecen oportunidades de aprendizaje experiencial, flexibles y específicas. Estos programas enfatizan la resolución de problemas, la innovación y la adaptabilidad, habilidades clave que a menudo están subestimadas en los planes de estudio tradicionales. Sin

embargo, nuestra encuesta revela una brecha significativa en la adopción de estos enfoques de aprendizaje alternativos. Mientras que el 33.3% de los encuestados ha participado en aceleradoras, el 51.5% se ha involucrado en programas de educación alternativa como bootcamps y cursos en línea. Aún así, el 15.2% no ha participado en ninguna educación emprendedora estructurada, lo que destaca la falta continua de acceso a capacitación práctica y basada en habilidades para muchos emprendedores.

Uno de los aspectos más críticos de la educación emprendedora es fomentar una mentalidad de experimentación y toma de decisiones basada en datos. Blank (2013) subraya esto al enfatizar la importancia de probar hipótesis, afirmando que "para convertir las hipótesis en hechos, los fundadores necesitan salir del edificio y probarlas frente a los clientes" (p. 72). Este proceso iterativo de prueba, aprendizaje y refinamiento de estrategias es fundamental para el éxito de las startups, cerrando la brecha entre la instrucción teórica y la ejecución práctica.

Al integrar el aprendizaje experiencial con la educación formal y aprovechar modelos de capacitación alternativos, la educación emprendedora puede equipar mejor a los fundadores con las habilidades necesarias para construir empresas resilientes y adaptables. Las instituciones que adopten esta evolución desempeñarán un papel crucial en la formación de la próxima generación de emprendedores. En consecuencia, organismos de acreditación como el ACBSP están llamados a desempeñar un papel fundamental en la configuración de los programas educativos de negocios y gestión, asegurando que preparen a los estudiantes no solo para roles corporativos tradicionales, sino también para los desafíos de los ecosistemas de startups.

La IA como Catalizador de la Resiliencia en Startups

La inteligencia artificial (IA) ha emergido rápidamente como una fuerza transformadora en el ecosistema emprendedor, ofreciendo a las startups herramientas poderosas para mejorar la eficiencia, la innovación y la toma de decisiones. Al aprovechar la IA, las startups pueden navegar mejor la incertidumbre, optimizar la asignación de recursos y fortalecer su capacidad para adaptarse a las condiciones cambiantes del mercado, aspectos clave de la resiliencia.

Uno de los aportes más significativos de la IA es su capacidad para abordar desafíos críticos de las startups a través de la analítica predictiva. Los algoritmos sofisticados ahora permiten a las startups predecir tendencias del mercado con mayor precisión, optimizar estrategias de precios basadas en datos en tiempo real y anticipar el comportamiento de los clientes. Anteriormente, estas capacidades eran exclusivas de grandes corporaciones consolidadas, pero la IA ha democratizado el acceso a conocimientos basados en datos, empoderando incluso a las empresas en etapas iniciales para tomar decisiones estratégicas informadas.

La IA también ha revolucionado el marketing y la interacción con los clientes. Los chatbots inteligentes y las campañas dirigidas por IA han transformado la forma en que las startups adquieren y retienen clientes, ofreciendo experiencias personalizadas a gran escala. Estos avances permiten a las empresas emergentes competir de manera más efectiva, incluso en mercados altamente saturados. Además, las soluciones operativas impulsadas por IA mejoran la eficiencia al optimizar flujos de trabajo, reducir costos y mejorar la asignación de recursos, permitiendo a las startups hacer más con recursos limitados.

A pesar de sus ventajas, la adopción de la IA presenta desafíos significativos. Las restricciones financieras siguen siendo un obstáculo principal, ya que muchas startups luchan por costear soluciones de IA sofisticadas y la infraestructura necesaria, un problema particularmente pronunciado en empresas en etapas tempranas con financiamiento limitado.

La brecha de experiencia técnica complica aún más la adopción de la IA; nuestra investigación indica que el 51.5% de los encuestados identificaron la falta de habilidades especializadas como un obstáculo importante. Implementar la IA va más allá del conocimiento de programación; requiere experiencia en entrenamiento de modelos, interpretación de datos e integración de sistemas dentro de contextos empresariales específicos, lo que dificulta que muchas startups aprovechen plenamente el potencial de la IA.

Más allá de las barreras técnicas y financieras, las consideraciones éticas plantean un desafío adicional. Las startups deben navegar cuidadosamente cuestiones relacionadas con la privacidad de datos, el posible sesgo algorítmico y el cumplimiento de normativas en evolución. Estos no son meramente problemas técnicos, sino elementos fundamentales que pueden impactar la reputación de una empresa, la confianza de los clientes y la sostenibilidad a largo plazo.

Para aprovechar plenamente el potencial de la IA como una herramienta para construir resiliencia, las startups deben adoptar un enfoque estratégico: asegurar apoyo financiero, invertir en el desarrollo de habilidades e implementar la IA de manera

responsable. A medida que la IA continúa remodelando el panorama emprendedor, aquellas empresas que logren integrarla con éxito en sus operaciones estarán mejor posicionadas para resistir las fluctuaciones del mercado y fomentar un crecimiento sostenible.

Sintetizando Ideas Clave: IA, Educación Formal y Resiliencia en Startups

Como se ha discutido anteriormente, las startups operan en un panorama inherentemente volátil, donde el éxito depende de su capacidad para enfrentar desafíos en el posicionamiento en el mercado, liderazgo, sostenibilidad financiera e integración tecnológica. Este análisis destaca que los fracasos suelen originarse en la falta de demanda del mercado, brechas en el liderazgo y restricciones financieras. Sin embargo, las soluciones a estos desafíos requieren un enfoque multidimensional que trascienda la mera adopción tecnológica.

La inteligencia artificial (IA) ha surgido como una fuerza transformadora, no solo mejorando la eficiencia operativa, sino también remodelando modelos de negocio y desbloqueando nuevas oportunidades. Según McKinsey (2023), "Los encuestados de organizaciones que tienen altos desempeños en IA tienen el doble de probabilidades que otros de decir que el principal objetivo de sus organizaciones para la IA generativa es crear negocios completamente nuevos o nuevas fuentes de ingresos" (p. 8). Esto subraya la importancia de que las startups adopten la IA como un impulsor central de innovación y diferenciación competitiva.

Sin embargo, la rápida adopción de la IA también introduce desafíos, particularmente en la adaptación de la fuerza laboral. McKinsey (2023) también destaca: "La disrupción esperada en los negocios debido a la IA generativa es significativa, y los encuestados predicen cambios importantes en sus fuerzas laborales. Anticipan recortes en ciertas áreas y grandes esfuerzos de reskilling para abordar las necesidades cambiantes de talento" (p. 1). Esto refuerza la necesidad de que las instituciones educativas integren la alfabetización en IA y la formación emprendedora experiencial en sus planes de estudio, asegurando que los futuros fundadores estén preparados para aprovechar la IA de manera efectiva.

Más allá de la IA, la educación formal y el desarrollo de habilidades siguen siendo pilares críticos para el éxito de las startups. Como se enfatizó anteriormente, la educación formal por sí sola es insuficiente; los emprendedores deben complementar el conocimiento teórico con aprendizaje experiencial, mentoría y exposición a desafíos empresariales reales. Programas como aceleradoras y bootcamps desempeñan un papel crucial al cerrar la brecha entre la instrucción académica y la ejecución práctica, ofreciendo a los fundadores oportunidades para refinar sus modelos de negocio, probar hipótesis y desarrollar resiliencia a través del aprendizaje iterativo.

Sin embargo, el acceso a estos modelos de aprendizaje alternativos sigue siendo desigual, con un 31.6% de los emprendedores encuestados que nunca han participado en programas estructurados de emprendimiento. Ampliar estas oportunidades—especialmente para fundadores en etapas tempranas y subrepresentados—será esencial para fomentar un ecosistema de startups más inclusivo y dinámico.

Como Gómez Romero y González Herrera (2022) observan acertadamente: "Una característica distintiva de la era actual es el cambio constante, que ha creado un entorno incierto y altamente volátil. En este contexto inestable, las organizaciones deben desarrollarse, adaptarse y prosperar. Su capacidad para reinventarse es crucial para su supervivencia ante la rápida volatilidad de su entorno" (p. X). Este análisis resalta la necesidad de que las startups adopten la adaptabilidad no solo en sus estrategias de negocio, sino también en su enfoque para combinar educación formal, desarrollo de habilidades e integración tecnológica.

III. Recomendaciones e Implicaciones

Mejorar el éxito de las startups y mitigar su fracaso requiere un esfuerzo coordinado entre tres actores clave: instituciones educativas, emprendedores y formuladores de políticas públicas, cada uno desempeñando un papel crítico en la promoción de un ecosistema resiliente e innovador. Este análisis sugiere que la educación emprendedora debe evolucionar para cerrar la brecha entre el conocimiento teórico y la ejecución práctica. Desarrollar modelos de aprendizaje híbridos que integren simulaciones de startups, colaboraciones con la industria y estudios de caso impulsados por IA preparará mejor a los estudiantes para los desafíos del mundo real. Además, incorporar capacitación en IA y análisis de datos en los programas educativos de negocios y gestión es esencial para garantizar que los futuros emprendedores adquieran tanto alfabetización técnica como habilidades empresariales fundamentales. Ampliar el acceso a aceleradoras y programas de mentoría, especialmente para comunidades desatendidas, democratizará aún más las oportunidades emprendedoras.

Para los emprendedores, la adaptabilidad y la adopción estratégica de la IA son clave para navegar en el entorno empresarial acelerado de hoy. Priorizar el aprendizaje continuo a través de aceleradoras,

cursos en línea y redes de mentoría fomenta la resiliencia y la innovación. Aprovechar herramientas impulsadas por IA—como la segmentación de clientes, la analítica predictiva y la automatización de procesos—puede mejorar significativamente la toma de decisiones y la posición competitiva. Sin embargo, la brecha de experiencia técnica sigue siendo una barrera importante. Abordar este desafío requiere fomentar colaboraciones con universidades, bootcamps enfocados en IA y especialistas de la industria para equipar a los emprendedores con las habilidades necesarias para integrar la IA de manera efectiva en sus operaciones comerciales.

Los formuladores de políticas públicas deben crear un entorno de apoyo que facilite el crecimiento de las startups mediante la expansión de iniciativas de financiamiento para la educación emprendedora y la adopción de IA, asegurando que los recursos sean accesibles para un rango más amplio de fundadores. Se deben fomentar las colaboraciones público-privadas para alinear la investigación académica con las necesidades de la industria, haciendo que la educación emprendedora sea más relevante e impactante. Además, la implementación responsable de políticas de IA es crucial, requiriendo una gobernanza de datos transparente, esfuerzos para mitigar el sesgo algorítmico y la adhesión a estándares éticos. Para impulsar aún más la innovación, facilitar hackatones y laboratorios de innovación proporcionará valiosas oportunidades para que emprendedores, estudiantes e investigadores aborden desafíos industriales y sociales de manera colaborativa.

Un cuarto actor emergente en esta discusión son los organismos de acreditación, como ACBSP, que desempeñan un papel fundamental en la validación de los programas educativos de negocios. Dada la creciente complejidad del panorama emprendedor, el papel de ACBSP se vuelve crucial para garantizar que los planes de estudio empresariales evolucionen para satisfacer las demandas de la industria. Al integrar la capacitación en IA, el aprendizaje experiencial y la educación interdisciplinaria, los organismos de acreditación pueden ayudar a cerrar la brecha entre el mundo académico y la industria, fomentando la resiliencia y la innovación en las startups. Además, pueden impulsar la colaboración entre escuelas de negocios, líderes de la industria y formuladores de políticas públicas, asegurando que los marcos educativos estén alineados con las necesidades en rápida evolución de los emprendedores en la era digital. Los organismos de acreditación también deben liderar la evaluación y promoción de las mejores prácticas en la educación empresarial impulsada por IA, garantizando que las escuelas de negocios preparen a los estudiantes no solo para roles corporativos tradicionales, sino también para los desafíos de los ecosistemas de startups.

La investigación futura debería explorar el impacto a largo plazo de la adopción de la IA en el éxito de las startups y su influencia en los modelos de negocio emergentes. Investigar la efectividad de los modelos de educación híbrida en la capacitación de emprendedores con habilidades del mundo real ayudará a refinar los marcos educativos. Además, deben analizarse mecanismos alternativos de financiamiento, como la deuda de riesgo y los modelos de inversión público-privada, para abordar las restricciones de capital que limitan la escalabilidad de las startups.

De acuerdo con estas recomendaciones, un papel crucial para estos cuatro actores clave en el ecosistema emprendedor es encontrar nuevas formas de fomentar la colaboración y la innovación. Las instituciones educativas tienen la oportunidad de formar emprendedores integrales y tecnológicamente capacitados para enfrentar desafíos reales, mientras que los emprendedores pueden explorar la IA y el aprendizaje continuo para navegar mejor las complejidades del mercado. Los formuladores de políticas públicas, mediante intervenciones estratégicas, pueden contribuir a un marco más sólido que fomente el crecimiento sostenible y responsable. Mientras tanto, ACBSP y otros organismos de acreditación pueden liderar la transformación de la educación empresarial, asegurando que los programas académicos sigan siendo relevantes, innovadores y alineados con las necesidades de los emprendedores modernos. Aunque persisten desafíos, estas ideas buscan informar discusiones e iniciativas que podrían ayudar a fortalecer el panorama emprendedor a lo largo del tiempo.

IV. Conclusión

Reducir la alta tasa de fracaso de las startups requiere un enfoque integral y adaptativo que integre educación formal, aprendizaje experiencial e inteligencia artificial (IA). Este documento confirma que los emprendedores que combinan la formación académica con la experiencia práctica y estrategias impulsadas por IA están mejor preparados para superar desafíos de liderazgo, desalineaciones de mercado y restricciones financieras.

Si bien la educación formal proporciona conocimientos teóricos esenciales, su impacto real surge cuando se combina con metodologías prácticas como programas de aceleración, mentoría y colaboraciones con la industria. Instituciones como ACBSP y otros organismos de acreditación deben desempeñar un papel fundamental para garantizar que los programas educativos evolucionen junto con el panorama emprendedor, promoviendo un currículo que se alinee con los desafíos reales de las startups y las soluciones empresariales impulsadas por IA.

A pesar del potencial transformador de la IA—mejorando la eficiencia, reduciendo costos y optimizando la toma de decisiones—persisten barreras significativas para su adopción, incluidas brechas de habilidades técnicas y altos costos de implementación. Superar estos obstáculos requerirá esfuerzos colaborativos entre emprendedores, instituciones educativas y formuladores de políticas para ampliar el acceso a la IA y equipar a los futuros fundadores con las habilidades necesarias para prosperar en una economía cada vez más digital.

En última instancia, la resiliencia de las startups depende de la adaptabilidad: la capacidad de anticipar cambios en el mercado, aprovechar la tecnología estratégicamente y refinar continuamente los modelos de negocio. El futuro del emprendimiento dependerá de qué tan efectivamente logremos cerrar la brecha entre la educación, la tecnología y los desafíos empresariales del mundo real. Solo a través de un esfuerzo concertado entre el mundo académico, la industria y los formuladores de políticas públicas podemos construir un ecosistema de startups que no solo fomente la innovación, sino que también sustente un crecimiento e impacto a largo plazo.

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Appendix 1: Startup Founders Questionnaire

Cuestionario para Fundadores de Startups: Impulsando el Éxito y la Innovación

Introducción e Instrucciones

En BICTIA, nuestra misión es fortalecer el ecosistema emprendedor a través del apoyo estratégico y la aceleración de startups innovadoras. Para seguir mejorando nuestros programas y adaptarlos a las necesidades reales de nuestros emprendedores, necesitamos comprender mejor sus experiencias, retos y perspectivas.

Este cuestionario tiene como objetivo recopilar información valiosa sobre las trayectorias educativas, el impacto de los programas de aceleración, y el uso de tecnologías como la inteligencia artificial (IA) en el desarrollo de sus negocios. Esta información será clave para:

1. Identificar los principales desafíos enfrentados por las startups en diferentes etapas de desarrollo.
2. Mejorar nuestras iniciativas de aceleración, mentoría y educación.
3. Diseñar estrategias específicas que potencien el crecimiento sostenible de las empresas en nuestro portafolio.

Instrucciones:

- Este cuestionario está diseñado para completarse en aproximadamente 25-30 minutos.
- Contiene preguntas de selección múltiple y de respuesta abierta para capturar datos tanto cuantitativos como cualitativos.
- Por favor, responda con la mayor sinceridad y precisión posible, ya que sus aportes serán fundamentales para la mejora continua de nuestros programas.

Confidencialidad: Toda la información proporcionada será tratada de forma confidencial y utilizada únicamente para fines de análisis interno y mejora de nuestros servicios.

Gracias por ser parte de nuestra comunidad y por contribuir al fortalecimiento del ecosistema emprendedor con sus valiosas respuestas.

Sección 1: Información General

1. ¿Cuál es tu nombre y tu rol dentro de la startup?
   - *(Pregunta de texto corto)*
2. ¿Cuántos años lleva operando tu startup?
   - Menos de 1 año
   - 1-3 años
   - 4-6 años
   - Más de 6 años
3. ¿Cuál es el sector principal de tu startup?
   - Tecnología
   - Salud
   - Educación
   - Comercio electrónico
   - Energía
   - Agricultura
   - Otro: *(Pregunta de texto corto para especificar)*

Sección 2: Formación Educativa

4. ¿Cuál es tu nivel más alto de educación formal?
   - Educación secundaria
   - Profesional
   - Maestría (MBA u otra)
   - Doctorado
   - Autodidacta
5. ¿Has participado en programas educativos alternativos o aceleradoras?
   - Sí, en programas educativos alternativos (bootcamps, cursos en línea, etc.).
   - Sí, en aceleradoras.
   - No he participado en ninguno.
6. ¿En cuantos programas de aceleración ha participado en los últimos 6 años?
   - 1 programa.
   - 2-4 programas.
   - 4 o más programas.
   - Ningún programa.

Sección 3: Educación y Emprendimiento

7. ¿Cómo percibes el valor de la educación formal (universitaria y posgrado) en tu trayectoria como emprendedor? *(Escala de 1 a 5)*
   - 1: No es relevante.
   - 2: Poco relevante.
   - 3: Moderadamente relevante.
   - 4: Muy relevante.
   - 5: Extremadamente relevante.
8. ¿Crees que las instituciones educativas actuales preparan adecuadamente a los emprendedores para los desafíos de iniciar un negocio?
   - Sí, completamente.
   - En parte, pero con limitaciones.
   - No, hay importantes deficiencias.
   - Otro: *(Pregunta de texto corto para comentarios)*
9. ¿Qué importancia le das al aprendizaje experiencial en comparación con la educación formal para desarrollar habilidades emprendedoras?*(Escala de 1 a 5)*
   - 1: No es importante.
   - 2: Poco importante.
   - 3: Moderadamente importante.
   - 4: Muy importante.
   - 5: Extremadamente importante.
10. ¿Cuáles consideras que son las principales limitaciones que las instituciones educativas enfrentan para preparar a los emprendedores?
    - *(Pregunta abierta)*

Sección 4: Aceleradoras y Desarrollo de Habilidades

11 Describe tu experiencia con programas de aceleración (si aplica).
- *(Pregunta abierta)*

12 ¿Cómo han influido estos programas en tus habilidades y en el desarrollo de tu startup?
- *(Pregunta abierta)*

13 Cuáles consideras que son las principales brechas de habilidades que deben abordarse para los emprendedores?
- *(Pregunta abierta)*

Sección 5: Integración de la IA

14 ¿Tu startup utiliza herramientas o tecnologías basadas en inteligencia artificial (IA)?
- Sí. *(Agregar un espacio para ejemplos: pregunta abierta opcional)*
- No.

15 ¿Cuáles son los principales desafíos que enfrentas al adoptar tecnologías de IA?
- Costos elevados.
- Falta de experiencia técnica.
- Problemas éticos (privacidad, sesgo, etc.).
- Otro: *(Pregunta de texto corto para especificar)*

16 ¿Cómo ha impactado la IA en la eficiencia y el crecimiento de tu startup?
- *(Pregunta abierta)*

Sección 6: Reflexiones Generales

17 Según tu experiencia, ¿qué consejos darías a nuevos emprendedores sobre herramientas educativas y tecnológicas?
- *(Pregunta abierta)*

18 ¿Cómo imaginas la evolución del papel de la IA en el emprendimiento en los próximos cinco años?
- *(Pregunta abierta)*

Sección 7 - Impacto en la participación posterior al programa de aceleración

19 ¿Has generado empleos adicionales en tu empresa durante el último año?
- Sí, he generado 1-5 empleos.
- Sí, he generado 6-10 empleos.
- Sí, he generado más de 10 empleos.
- No he generado empleos adicionales.

20 ¿Cómo ha sido el comportamiento de tus ventas en el último año?
- Han aumentado más del 50%.
- Han aumentado entre un 21% y 50%.
- Han aumentado entre 15% y 20%
- Han aumentado entre 5% y 14%
- Se han mantenido relativamente estables (variación entre -5% y +5%)
- Han disminuido entre 6% y 20%
- Han disminuido más del 20%

21 ¿Qué tan difícil ha sido para tu startup acceder a capital? ¿Cuáles son las principales fuentes de financiación que has utilizado?
- *(Pregunta abierta)*

Apéndice 2: Análisis del Cuestionario de Startups

I. Resumen de Perfiles de Emprendedores y Startups

Experiencia y Distribución por Sector

- El 54.5% de las startups han estado en operación por más de seis años, mientras que el 9.1% han estado activas por menos de un año.
- La mayoría de las startups (48.5%) operan en el sector tecnológico, seguidas de una distribución más diversa que incluye: Salud (6.1%); Fintech (3.0%); Comercio electrónico (3.0%); Agricultura (3.0%); Otros: servicios legales, ingeniería y manufactura.

II. Educación y Desarrollo de Habilidades

- El 36.4% de los emprendedores tienen una maestría, el 45.5% cuentan con un título profesional, y el 6.1% solo completaron la educación secundaria.
- El 51.5% ha participado en programas de educación alternativa como bootcamps y cursos en línea, mientras que el 33.3% asistió a aceleradoras. Sin embargo, el 15.2% no ha participado en ninguna educación estructurada para emprendedores.
- El 42.4% ha participado en 2-4 programas de aceleración, pero el 30.3% nunca ha participado en uno.

III. Percepción sobre Educación y Brechas de Habilidades

- La educación es valorada con un puntaje promedio de 3.85 sobre 5:
  - El 33.3% la calificó con un 5.
  - El 30.3% la calificó con un 4.
- Las principales brechas de habilidades identificadas incluyen: Ventas; Visión estratégica; Gestión financiera; Marketing y Liderazgo

IV. Adopción de IA y Desafíos

- El 48.5% de las startups utilizan IA, mientras que el 51.5% no lo hacen.
- Las principales barreras para la adopción de IA incluyen:
  - El 51.5% cita la falta de experiencia técnica.
  - El 21.2% menciona los altos costos de implementación.
  - El 12.1% señala preocupaciones éticas como privacidad y sesgos.

V. Crecimiento Empresarial y Desafíos Financieros

- El 48.5% de las startups no han creado empleos adicionales en el último año, mientras que el 39.4% han generado entre 1 y 5 nuevos empleos.
- El 33.3% de las startups reportaron ventas estables, mientras que el 12.1% experimentaron una disminución de ingresos superior al 20%.
- El acceso al capital sigue siendo un desafío importante, con muchos fundadores describiéndolo como “muy difícil” o “imposible”.
- Fuentes de financiamiento:
  - El 47.0% depende principalmente del autofinanciamiento.
  - Otras fuentes incluyen subvenciones, préstamos bancarios y rondas de inversión.

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