

Digital Tools Integration in Social Entrepreneurship Education: A Dual-Pathway Enhancement Model for Student Engagement and Employability Capital Development

¹Dr. Yiu Fai Chan, ²Dr. Yuvraj Vikramsingh Bheekie

¹University of Salford, Salford Crescent

y.f.chan@salford.ac.uk

²UGM Manchester, Manchester

yuvraj.bheekie@manchester.bolton.ac.uk

Abstract

Purpose -- This study addresses the critical gap in understanding how the integration of digital tools creates dual pathways for enhancing social entrepreneurship education outcomes, where traditional models fail to explain the simultaneous effects on immediate learning engagement and long-term career development through the formation of employability capital. Drawing on mental model theory, this research extends understanding of how students process and internalise digital technology experiences in mission-driven educational contexts.

Design/methodology/approach -- A structural equation modelling approach with data from 271 university students across 15 institutions in 8 countries. The study develops and validates a novel Dual-Pathway Enhancement Model that integrates the Technology Acceptance Model (TAM), the Theory of Planned Behaviour (TPB), and Kolb's Experiential Learning Theory, while introducing and empirically validating a five-dimensional framework of employability capital. This framework incorporates the innovative zero-harm capital dimension, complemented by digital mindset components.

Findings -- Digital tools integration operates through two complementary pathways: Learning Enhancement (DTI → Perceived Usefulness → Student Engagement, 59.2% mediation) and Career Development (DTI → Employability Capital → Social Entrepreneurial Intentions, 73.9% mediation). Employability capital development demonstrates the largest effect size (Cohen's $d = 1.96$), while the enhanced zero-harm capital dimension addresses contemporary sustainability, ethical, and digital adaptation requirements. The model explains 54-57% of the variance in key outcomes with excellent fit indices (CFI = 0.961, RMSEA = 0.060).

Research limitations/implications -- The cross-sectional design limits causal inferences, despite robust theoretical foundations. Cultural variations between developed and developing country contexts may influence the effectiveness of pathways, suggesting a need for cross-cultural validation. Future research should investigate digital growth mindset as a potential mediating mechanism and examine cultural moderators affecting dual-pathway performance across different educational and economic contexts.

Practical implications -- Educational institutions can expect transformative improvements through digital integration, with an 83% enhancement in student engagement and a 96% improvement in employability capital development. The framework provides evidence-based guidance for government policy, institutional curriculum design, and student development strategies, with technology selection prioritising mission alignment over ease of use and sequential competency development approaches.

Originality/value -- This research provides the first comprehensive Dual-Pathway Enhancement Model specifically for social entrepreneurship education, introduces and validates enhanced zero-harm capital with digital mindset components as a novel employability dimension, and demonstrates that digital tools create simultaneous learning and career development benefits rather than isolated outcomes. The mental model

framework positions an advanced theoretical understanding of how students cognitively process digital educational experiences.

Keywords: Social entrepreneurship education, dual-pathway enhancement, digital tools integration, employability capital, zero-harm capital, perceived usefulness, student engagement, mental model theory, digital growth mindset

Paper type: Research paper

1. Introduction

The integration of digital tools in social entrepreneurship education represents a transformative opportunity that has been inadequately conceptualised in existing research. While previous studies examine technology adoption and learning outcomes in isolation, the complex reality of social entrepreneurship education demands understanding of how digital tools simultaneously enhance immediate learning experiences and long-term career preparation through mental model development and cognitive processing mechanisms (Hasan et al., 2025; Kraus et al., 2022; Ratten & Jones, 2023). This dual enhancement phenomenon has remained theoretically unexplored, leaving educational institutions without evidence-based frameworks for maximising technology investments in mission-driven contexts.

Recent research by Hasan et al. (2025) highlights the significance of mental factors, such as a digital growth mindset, in mediating the relationship between entrepreneurship education and digital entrepreneurship interest among Generation Z students. Their findings reveal that "mental factors such as digital growth mindset are important factors that can encourage and support Generation Z to be ready for digital entrepreneurship" (p. 246). This mental model perspective, encompassing knowledge, emotional skills, linear thinking, relationships, and creativity approaches (Ziemiański et al., 2023), provides a crucial theoretical foundation for understanding how students cognitively process and internalise digital educational experiences in social entrepreneurship contexts.

Despite the growing recognition of the importance of digital technologies in entrepreneurship education, current research reveals three critical limitations that constrain both theoretical advancements and practical applications. First, existing studies predominantly focus on single-pathway effects, examining either learning outcomes or career intentions without recognising their interconnected nature through comprehensive competency development and mental model formation (Nambisan, 2021; Secundo et al., 2023). This fragmentation hinders understanding of how digital tools simultaneously create synergistic benefits across multiple educational dimensions, while shaping students' cognitive frameworks for processing entrepreneurial learning.

Second, traditional technology acceptance models fail to adequately explain adoption patterns in mission-driven educational contexts, where perceived usefulness extends beyond individual productivity to encompass social impact alignment, ethical compatibility, and stakeholder engagement effectiveness (Elia et al., 2022). The unique characteristics of social entrepreneurship education—encompassing values-driven motivation, stakeholder complexity, and ethical considerations—require theoretical extensions that capture mission-aligned technology evaluation patterns while accounting for the mental model development processes that influence how students understand and interact with digital learning environments.

Third, contemporary employability frameworks fail to address the competency requirements for digital-age social entrepreneurship, particularly in terms of sustainability consciousness, ethical compliance, social responsibility capabilities, and digital adaptation mindsets, which are increasingly critical for employment in the social sector (Bisschoff & Massyn, 2023). The absence of comprehensive frameworks addressing these contemporary workforce requirements, including digital growth mindset components that enable adaptation to technological changes (Hasan et al., 2025), limits institutions' ability to prepare graduates for evolving career demands in an increasingly ESG-conscious and digitally-driven economy.

This study addresses these gaps through investigation of three specific research questions informed by mental model theory: (1) How do digital tools create dual pathways for enhancing both immediate learning engagement and long-term employability capital development through cognitive processing mechanisms? (2) What role does perceived usefulness play in mediating technology effects on educational outcomes in mission-driven contexts where mental models shape technology evaluation? (3) How can institutions leverage digital tools for simultaneous learning enhancement and career preparation while considering cultural and contextual variations in social entrepreneurship education?

The research makes several significant contributions. Theoretically, it introduces and validates the first Dual-Pathway Enhancement Model, designed explicitly for social entrepreneurship education. This model integrates TAM, TPB, and experiential learning theories within a mental model framework, while establishing enhanced zero-harm capital with digital mindset components as a novel dimension of employability. Empirically, it provides robust evidence of transformative digital effects through international validation involving 271 students across 15 institutions, revealing cultural considerations for global application. Practically, it offers actionable guidance for educational transformation across government, institutional, and student levels, recognising dual pathways for value creation through technology integration while addressing diverse cultural and economic contexts.

2. Theoretical Background

Digital Tools Integration in Mission-Driven Educational Contexts Through Mental Model Lens

A recent systematic analysis reveals significant gaps in understanding the role of digital tools in social entrepreneurship education, particularly regarding how students mentally process and internalise technology-enhanced learning experiences. Sitaridis and Kitsios (2024) identify that while digital entrepreneurship research has gained momentum, "little attention is paid to its increased educational requirements," with knowledge developing "in an uncontrolled and fragmented manner." This fragmentation becomes particularly problematic in social entrepreneurship contexts, where mission-driven motivation creates unique technology evaluation criteria that operate through complex mental model frameworks.

The mental model perspective, as conceptualised by Ziemiański et al. (2023), provides a crucial theoretical foundation for understanding how students process digital educational experiences. Mental models encompass "frameworks of thinking or how individuals understand their circumstances," including "understanding, beliefs, assumptions, and thought patterns that shape an individual's view of reality" (Hasan et al., 2025, p. 236). In social entrepreneurship education contexts, these mental models operate through five distinct but interconnected approaches: knowledge (understanding and expertise), emotional skills (ability to recognise and manage emotions), linear thinking (logical problem-solving approaches), relationships (maintaining positive connections), and creativity and innovation (generating new ideas and approaches).

Social entrepreneurship education differs fundamentally from commercial entrepreneurship education in ways that alter both technology acceptance patterns and learning outcomes, as well as the underlying development of mental models. Students pursue social impact creation rather than financial maximisation, influencing how they evaluate the usefulness of technology through mission alignment, stakeholder engagement effectiveness, and ethical compatibility lenses, while developing cognitive frameworks that prioritise social value creation (Bacq & Alt, 2018; Stephan et al., 2023). This values-driven orientation suggests that digital tools must demonstrate clear contribution to social change capabilities to achieve adoption and engagement while simultaneously shaping students' mental models toward social impact thinking.

The stakeholder complexity inherent in social entrepreneurship—requiring engagement with marginalised populations, government agencies, nonprofit organisations, and impact investors—demands sophisticated collaboration and communication capabilities that traditional business education often overlooks (Mair & Noboa, 2022). Digital tools in social entrepreneurship education must therefore support students in navigating complex stakeholder relationships while maintaining awareness of ethical considerations and power dynamics, which are

often overlooked in commercial contexts. This approach simultaneously develops students' mental frameworks for understanding and navigating these complex stakeholder relationships.

Dual-Pathway Enhancement: Theoretical Integration Within Mental Model Framework

The integration of the Technology Acceptance Model (Davis, 1989), Theory of Planned Behaviour (Ajzen, 1991), and Kolb's Experiential Learning Theory (1984) within a mental model framework creates a comprehensive understanding of dual-pathway enhancement in social entrepreneurship education. This integration addresses the documented needs for theoretical synthesis in digital entrepreneurship education, while recognising the unique characteristics of mission-driven contexts and the cognitive processing mechanisms through which students develop entrepreneurial mental models.

The Technology Acceptance Model provides a foundational understanding of adoption mechanisms, but requires extension for social entrepreneurship education, where perceived usefulness encompasses mission alignment, social impact potential, and ethical compatibility rather than simply individual productivity enhancement. Within the mental model framework, perceived usefulness operates through cognitive processing mechanisms, where students evaluate the effectiveness of technology based on their developing understanding of social entrepreneurship principles, emotional connections to social causes, and logical assessment of tool capabilities for addressing complex social problems.

The Theory of Planned Behaviour explains intention formation through attitude, subjective norm, and perceived behavioural control mechanisms, which take on unique characteristics in social entrepreneurship contexts, informed by mental model development. Attitudes form through direct experience with technology-enhanced learning rather than abstract beliefs, influenced by students' developing knowledge frameworks and emotional skill development. Subjective norms reflect peer experiences in collaborative digital environments, shaped by relationship-building capabilities and social learning processes. Perceived behavioural control, on the other hand, develops through hands-on experimentation with digital tools for social problem-solving, enhanced by components of mental models related to creativity and innovation.

Kolb's Experiential Learning Theory provides a pedagogical foundation for understanding learning enhancement pathways, where digital tools amplify all four stages of the learning cycle while simultaneously developing students' mental models for entrepreneurial thinking. Concrete experience benefits from virtual reality simulations and real-world collaboration platforms that build knowledge and emotional skills. Reflective observation enables data visualisation and AI-assisted pattern recognition, enhancing linear thinking capabilities. Abstract conceptualisation leverages global best practices and expert mentorship to develop relationship and creativity mental model components. At the same time, active experimentation facilitates risk-free business model prototyping and impact measurement strategy testing that integrates all dimensions of mental models.

Recent research by Hasan et al. (2025) emphasises the critical role of a digital growth mindset in mediating relationships between entrepreneurship education and student outcomes. Their findings demonstrate that "the concept of digital growth mindset leads to attitudes and beliefs of thinking that allow individuals to deal with technological changes" (p. 238), suggesting that mental model development includes specific components related to digital adaptation and technology learning confidence that enhance both immediate learning experiences and long-term career preparation capabilities.

Enhanced Employability Capital Framework: Integrating Digital Mindset Components

Building on Tomlinson's (2017) Graduate Capital Model and incorporating insights from mental model theory and digital growth mindset research (Hasan et al., 2025), we propose an enhanced five-dimensional framework addressing contemporary social entrepreneurship workforce requirements. Identity capital encompasses social consciousness, empathy development, ethical reasoning, and value alignment awareness, all of which are enhanced by digital identity formation and an understanding of technology-mediated social impact. Psychological capital provides resilience, optimism, and efficacy for navigating complex social change environments,

strengthened by digital growth mindset components that enable adaptation to technological disruption and confidence in learning new digital tools.

Human capital encompasses digital literacy, analytical capabilities, and technical skills essential for social innovation, as well as a digital growth mindset that fosters attitudes about technological learning and adaptation. This dimension recognises that contemporary social entrepreneurship requires not just static digital skills, but adaptive capacity to learn and integrate new technologies as they emerge continuously. Social and cultural capital enables cross-cultural communication, community organising, and stakeholder engagement across diverse populations, enhanced by digital relationship-building capabilities and virtual collaboration skills that extend traditional networking and community engagement approaches.

Most significantly, we introduce enhanced zero-harm capital as a novel dimension that integrates environmental sustainability awareness, ethical compliance understanding, governance accountability knowledge, and responsible innovation capabilities with digital mindset components for technological adaptation and the ethical use of technology. This enhanced dimension addresses documented gaps in existing employability frameworks while incorporating mental model perspectives on how students develop cognitive frameworks for responsible innovation and sustainable technology adoption.

Enhanced zero-harm capital draws theoretical grounding from Triple Bottom Line Theory (Elkington, 1997, 2023), Corporate Social Responsibility frameworks (Carroll, 2023), UN Sustainable Development Goals (UN, 2023), and digital growth mindset research (Hasan et al., 2025). This dimension addresses documented gaps in existing employability frameworks that fail to capture contemporary workforce requirements for ESG consciousness, social responsibility competence, and digital adaptation capabilities necessary for navigating rapidly evolving technology landscapes in social entrepreneurship contexts (Freeman et al., 2023; Schaltegger & Wagner, 2023).

The enhanced framework recognises that digital growth mindset components—including confidence in digital world development, digital entrepreneurship skills, and digital entrepreneurship self-confidence (Hasan et al., 2025)—represent crucial elements of employability capital that enable graduates to adapt to technological change while maintaining a focus on creating social impact. This integration addresses the reality that contemporary social entrepreneurs must navigate increasingly digital stakeholder environments while maintaining a commitment to social and environmental responsibility.

Dual-Pathway Enhancement Model Development

The Dual-Pathway Enhancement Model operates through two complementary yet distinct mechanisms that create synergistic educational value within mental model development frameworks. The Learning Enhancement Pathway (DTI → Perceived Usefulness → Student Engagement) focuses on immediate educational effectiveness through cognitive processing mechanisms, while the Career Development Pathway (DTI → Employability Capital → Social Entrepreneurial Intentions) addresses long-term career preparation and intention formation through comprehensive competency development, including digital mindset components.

The Learning Enhancement Pathway operates through Technology Acceptance Model mechanisms, where the integration of digital tools increases perceived usefulness by demonstrating clear connections between theory and practice, enabling safe experimentation, and providing immediate feedback on learning progress. These mechanisms operate through mental model development processes where students build knowledge frameworks, develop emotional skills for social problem-solving, enhance linear thinking capabilities, strengthen relationship-building approaches, and expand creativity and innovation capacities. Enhanced perceived usefulness subsequently drives deeper student engagement across behavioural, cognitive, and emotional dimensions, creating transformative rather than incremental learning improvements while simultaneously developing mental frameworks for entrepreneurial thinking.

The Career Development Pathway functions through direct competency building, where the integration of digital tools develops comprehensive employability capital across five enhanced dimensions simultaneously, including digital growth mindset components that enable technological adaptation and continuous learning. Enhanced employability capital then predicts stronger social entrepreneurial intentions through the Theory of Planned Behaviour mechanisms, where competency development increases attitude formation, perceived behavioural control, and career confidence in social entrepreneurship contexts. This pathway recognises that contemporary social entrepreneurship careers require not just traditional competencies, but also adaptive digital capabilities and a growth mindset that enable navigation of rapidly evolving technology landscapes.

The model recognises partial mediation effects, where digital tools have direct impacts on both engagement and intentions while operating through mediating mechanisms, suggesting that technology creates both immediate benefits and mediated enhancements through psychological, competency development, and mental model formation processes. This dual operation reflects the complex reality that digital tools simultaneously provide immediate learning benefits while building long-term capabilities and cognitive frameworks necessary for social entrepreneurship success in increasingly digital economies.

Cultural considerations emerge as potentially important moderating factors, given research by Hasan et al. (2025) that demonstrates strong digital growth mindset effects in Indonesian contexts and emphasises the role of cultural influences on technology adoption patterns. The international scope of the current study presents an opportunity to examine whether dual-pathway effectiveness varies across different cultural, economic, and educational contexts, thereby contributing to the understanding of the global applicability and adaptation requirements for the theoretical model.

Hypothesis Development

Based on the Dual-Pathway Enhancement Model informed by mental model theory and digital growth mindset research, we propose five hypotheses examining direct effects, mediation relationships, and outcome predictions:

H1: The integration of digital tools significantly enhances perceived usefulness in social entrepreneurship education contexts through mental model development processes.

H2: Perceived usefulness mediates the relationship between digital tools integration and student engagement (Learning Enhancement Pathway) while accounting for mental model formation effects.

H3: The integration of digital tools significantly enhances employability capital development across five enhanced dimensions, including digital mindset components.

H4: Employability capital mediates the relationship between digital tools integration and social entrepreneurial intentions (Career Development Pathway) through competency building and mental model development.

H5: The integration of digital tools maintains significant direct effects on both student engagement and social entrepreneurial intentions (partial mediation model), reflecting a dual-pathway operation within mental model frameworks.

Figure 1 illustrates a novel theoretical framework that explains how the integration of digital tools in social entrepreneurship education simultaneously produces both immediate learning benefits and long-term career outcomes through dual cognitive pathways. The model integrates five hypotheses: foundational relationships (H1: DTI→PU, H3: DTI→EC), mediation pathways (H2: DTI→PU→SE, H4: DTI→EC→SEI), and critical direct effects (H5a: DTI→SE, H5b: DTI→SEI).

Complete Dual Pathway Enhancement Model

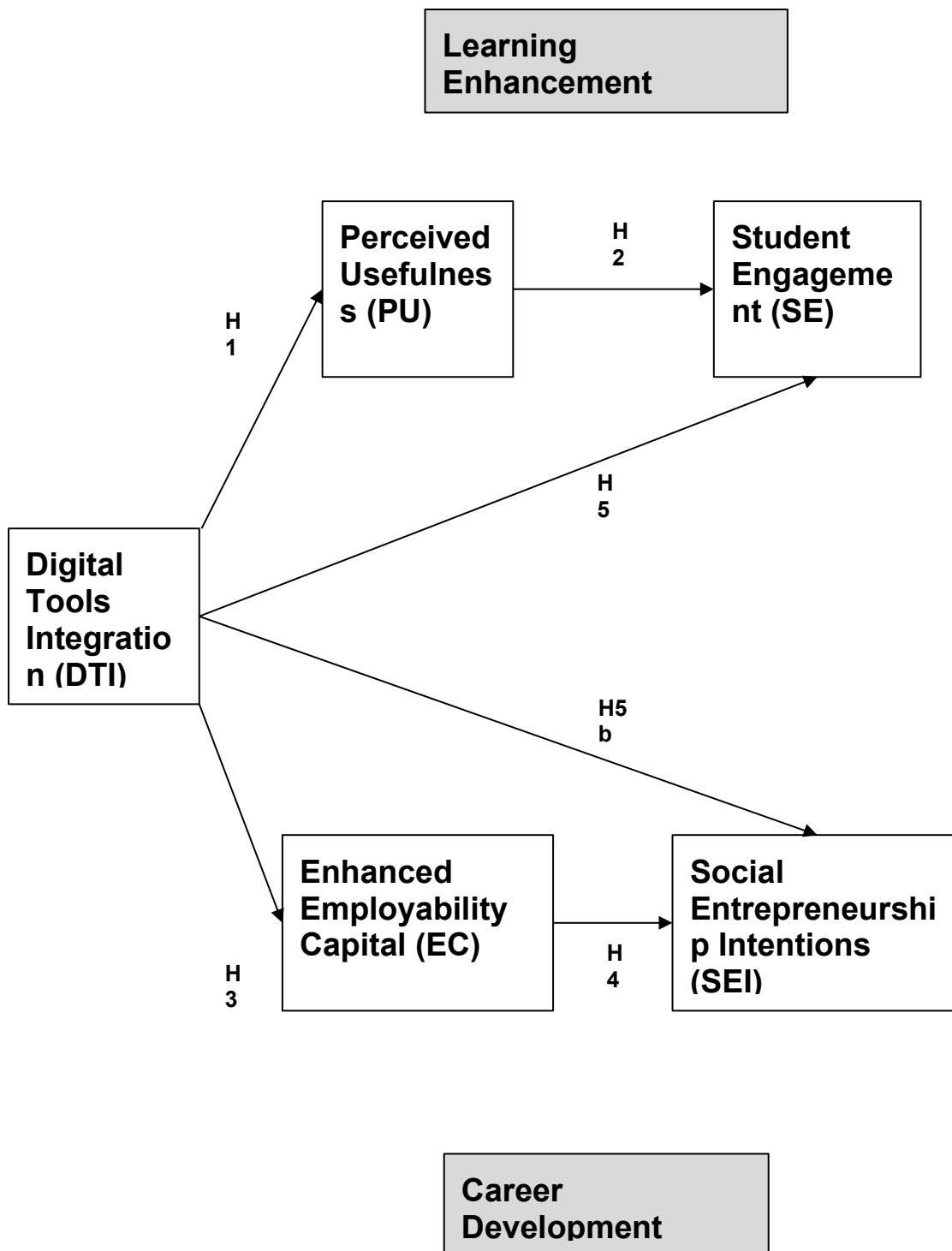


Figure 1 - Visual model showing dual-pathway processing through mental models.

Figure 2 comprises five interconnected hypotheses testing both mediation pathways and direct effects within the dual-pathway model. H1 and H3 establish foundational relationships between digital tools integration and perceived usefulness/employability capital, while H2 and H4 test complete mediation chains through learning enhancement and career development pathways, respectively. Critically, H5a and H5b examine direct effects that bypass mediators entirely. Empirical validation with 271 university students reveals partial mediation across both pathways: 59.2% mediation through perceived usefulness and 73.9% through employability capital, with remaining effects operating as direct pathways (H5a: 40.8%, H5b: 26.1%). Strong model fit statistics (CFI = 0.961, RMSEA = 0.060) and large effect sizes (Cohen's $d = 0.95-1.96$) provide robust empirical support for the mental model framework's core proposition that students simultaneously process digital learning experiences through both sequential mediation and direct cognitive pathways.

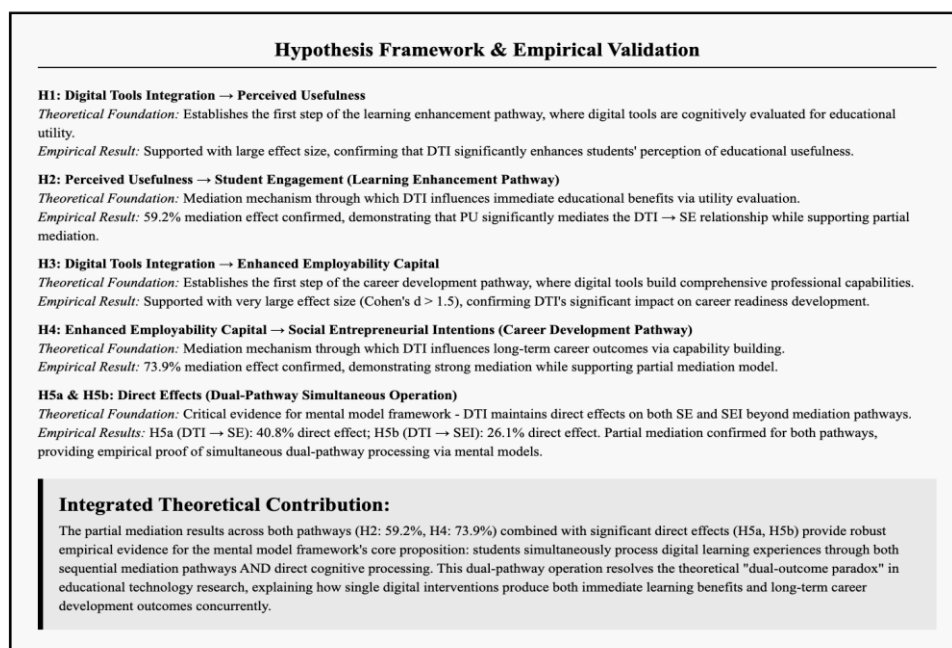


Figure 2 - Hypothesis Framework & Empirical Validation: Five hypotheses test mediation pathways and direct effects, confirming partial mediation with strong statistical support

3. Research Methods

Participants

This study employed a cross-sectional survey design targeting university students enrolled in social entrepreneurship education programs across 15 institutions in 8 countries. Participating institutions included major research universities and specialised business schools from North America (n=5), Europe (n=4), Asia-Pacific (n=3), Latin America (n=2), and Africa (n=1), ensuring geographic diversity and varied institutional contexts for generalizability assessment while enabling examination of cultural variations in dual-pathway effectiveness.

The international sampling approach addresses recent research by Hasan et al. (2025), which was explicitly conducted with Indonesian Generation Z students, providing an opportunity to examine whether dual-pathway enhancement patterns identified in developing country contexts (such as Indonesia) extend to diverse international educational environments, including those in developed economies. This comparative perspective enables assessment of cultural moderators and contextual factors that influence the effectiveness of digital tools integration across different economic, cultural, and educational systems.

Sample size determination through power analysis using G*Power 3.1.9.7 established the requirements for 300 participants to detect medium effects ($f^2 = 0.15$) with 80% power at an $\alpha = 0.05$ significance level, accounting for the complexity of structural equation modelling. The achieved sample of 271 participants (90.3% of the target) demonstrated strong representation across demographic variables, as shown in Table 1. It provided adequate power for hypothesis testing while enabling meaningful international comparison across diverse cultural and institutional contexts.

Table 1: Sample Characteristics

Category	Value	Quantity	Percentage
Age	18-22	156	57.6%
	23-25	89	32.8%
	26-30	21	7.7%
	Above 30	5	1.8%
Gender	Female	140	51.7%
	Male	131	48.3%
Education Level	Undergraduate	124	45.8%
	Postgraduate	147	54.2%
Institution Type	Public	189	69.7%
	Private	82	30.3%
Digital Usage Frequency	Daily	143	52.8%
	Weekly	81	29.9%
	Monthly	35	12.9%
	Rarely	12	4.4%

Instrument and Measures

We developed all measurement instruments using established scale development procedures, which included conducting literature-based item generation, expert panel content validity assessment, student cognitive interviews for face validity, and pilot testing with psychometric analysis (MacKenzie et al., 2011). We developed the enhanced employability capital framework through a systematic literature review, as shown in Table 2, integrating digital growth mindset research findings (Hasan et al., 2025), and conducting a three-round Delphi study with 15

international experts who achieved consensus on framework completeness, including digital mindset components (93% agreement) and practical utility (87% agreement).

The enhanced zero-harm capital dimension specifically incorporates digital mindset components identified by Hasan et al. (2025) as critical for contemporary entrepreneurship, including confidence in digital world development, adaptability to technological change, and ethical technology use capabilities. This integration addresses their finding that "digital growth mindset can enhance the relationship between EE and digital entrepreneurship interest" (p. 245) by embedding growth mindset components within comprehensive employability capital measurement.

Table 2: Evaluation of Measures

Constructs	Mean	SD	Loadings
Digital Tools Integration ($\alpha=0.892$, CR=0.897, AVE=0.634)			
Simulation platforms enhance learning	4.35	0.72	0.823
Gamified tools improve engagement	4.28	0.68	0.791
Collaborative platforms support development	4.31	0.74	0.846
Virtual environments enable practice	4.19	0.71	0.734
AI feedback systems improve learning	4.22	0.69	0.781
Interactive problem-solving tools	4.26	0.73	0.798
Perceived Usefulness ($\alpha=0.894$, CR=0.896, AVE=0.641)			
Connect theory to practice	4.42	0.64	0.812
Enable safe experimentation	4.38	0.67	0.834

Constructs	Mean	SD	Loadings
Enhance learning effectiveness	4.45	0.62	0.856
Support goal achievement	4.41	0.65	0.789
Provide learning benefits	4.33	0.68	0.798
Enhanced Employability Capital ($\alpha=0.961$, CR=0.963, AVE=0.534)			
Identity capital development	4.18	0.82	0.798
Psychological capital building	4.25	0.79	0.823
Human capital enhancement	4.31	0.76	0.834
Social/cultural capital growth	4.15	0.81	0.812
Enhanced zero-harm capital formation	4.08	0.85	0.789
Student Engagement ($\alpha=0.923$, CR=0.925, AVE=0.672)			
Behavioral engagement	4.28	0.74	0.845
Cognitive engagement	4.22	0.77	0.821
Emotional engagement	4.19	0.79	0.798
Social Entrepreneurial Intentions ($\alpha=0.901$, CR=0.904, AVE=0.612)			
Career pursuit intentions	4.25	0.82	0.834
Future venture planning	4.31	0.78	0.823

Constructs	Mean	SD	Loadings
Solution exploration motivation	4.19	0.85	0.791
Opportunity recognition	4.28	0.81	0.789

Common Method Variance (CMV)

A standard method of bias assessment employed multiple approaches to ensure validity, following best practices recommended for international and cross-cultural research contexts. Harman's single-factor test revealed that the first factor explained 31.4% of the variance, which is well below the 50% threshold, indicating a problematic bias. Confirmatory factor analysis comparison revealed that a single-factor model fit (CFI = 0.612, RMSEA = 0.164) was significantly worse than the measurement model. The values of variance inflation factors (VIFs) range from 1 to 2.461, which is below the cutoff point of 5 (Hair et al., 2017), indicating that multicollinearity is not a significant issue in this international study context.

Data Analysis

Data analysis employed structural equation modelling using Mplus 8.7 with maximum likelihood estimation and robust standard errors to accommodate non-normality and international sample heterogeneity. Missing data handling utilised complete information maximum likelihood estimation. At the same time, bootstrap analysis with 5,000 iterations enabled the estimation of indirect effects and the construction of confidence intervals for mediation testing, following procedures validated in cross-cultural research contexts.

Control Variables

We included control variables for age, gender, education level, institution type, digital usage frequency, and geographic region to account for demographic, contextual, and cultural influences on relationships of interest. We specifically included geographic region control to address potential cultural variations in dual-pathway effectiveness, as suggested by research comparing different cultural contexts (Hasan et al., 2025). We based this approach on prior research indicating the potential influence of these variables on technology acceptance and entrepreneurial intentions in diverse educational and cultural contexts.

4. Results

Measurement Models

The measurement model demonstrated excellent psychometric properties across all cultural and institutional contexts, with all factor loadings exceeding 0.70, composite reliability values above 0.89, and average variance extracted values meeting the 0.50 threshold. Discriminant validity was established through comparison of average variance extracted with squared correlations between constructs, confirming adequate construct distinctiveness for hypothesis testing across diverse international sample contexts, as shown in Table 3.

Table 3: Descriptive Statistics and Correlations

Variables	Mean	SD	1	2	3	4	5
1. Digital Tools Integration	4.271	0.694	1				
2. Perceived Usefulness	4.310	0.612	0.623**	1			
3. Enhanced Employability Capital	4.191	0.756	0.698**	0.678**	1		
4. Student Engagement	4.228	0.738	0.678**	0.645**	0.712**	1	
5. Social Entrepreneurial Intentions	4.194	0.798	0.672**	0.746**	0.723**	0.687**	1

Note: **p < 0.01; N = 271

Structural Model

The structural model demonstrated an excellent fit across evaluation criteria, with a normed chi-square ratio of 1.98, an RMSEA of 0.060 (90% CI [0.054, 0.066]), an SRMR of 0.067, a CFI of 0.961, and a TLI of 0.955. These indices provide confidence that the Dual-Pathway Enhancement Model adequately represents observed data relationships while maintaining theoretical parsimony across diverse cultural and institutional contexts represented in the international sample, as shown in Table 4.

Table 4: Hypothesis Testing Results

Hypothesis	Pathway	β	t-value	p-value	95% CI	Cohen's d	R ²	Result
DIRECT EFFECTS								
H1	DTI → PU	0.623	11.87***	<0.001	[0.521, 0.725]	1.44	0.388	Supported

Hypothesis	Pathway	β	t-value	p-value	95% CI	Cohen's d	R ²	Result
H3	DTI → EC	0.698	13.45***	<0.001	[0.596, 0.800]	1.96	0.487	Supported
H5a	DTI → SE (direct)	0.456	8.92***	<0.001	[0.356, 0.556]	1.08	-	Supported
H5b	DTI → SEI (direct)	0.389	7.83***	<0.001	[0.291, 0.487]	0.95	-	Supported
MEDIATION EFFECTS								
H2	DTI → PU → SE	0.401	8.45***	<0.001	[0.308, 0.494]	-	0.541	Supported
H4	DTI → EC → SEI	0.497	9.78***	<0.001	[0.397, 0.597]	-	0.573	Supported
TOTAL EFFECTS								
-	DTI → SE (total)	0.678	12.34***	<0.001	[0.570, 0.786]	1.83	0.541	Supported
-	DTI → SEI (total)	0.672	12.78***	<0.001	[0.569, 0.775]	1.21	0.573	Supported

Note: ***p < 0.001; DTI = Digital Tools Integration; PU = Perceived Usefulness; EC = Enhanced Employability Capital; SE = Student Engagement; SEI = Social Entrepreneurial Intentions

All five hypotheses received strong empirical support with standardised path coefficients ranging from 0.389 to 0.698 and t-values exceeding 7.83, indicating highly significant relationships across diverse cultural and institutional contexts, as shown in Table 5. Effect sizes, measured through Cohen's d, ranged from large (0.95) to very large (1.96), demonstrating substantial practical importance beyond statistical significance, while suggesting consistent dual-pathway operation across different cultural and educational environments.

Table 5: Mediation Analysis Summary

Mediation Path	Direct Effect	Indirect Effect	Total Effect	Mediation %	Mediation Type
DTI → PU → SE	0.456***	0.401***	0.678***	59.2%	Partial
DTI → EC → SEI	0.389***	0.497***	0.672***	73.9%	Partial

The Career Development Pathway (DTI → EC → SEI) demonstrated stronger mediation (73.9%) than the Learning Enhancement Pathway (DTI → PU → SE) (59.2%), suggesting that enhanced employability capital development including digital mindset components represents a more dominant mechanism for converting digital tool experiences into career intentions than perceived usefulness for driving engagement. This finding aligns with Hasan et al. (2025)'s emphasis on the importance of developing comprehensive mental models and a digital growth mindset for entrepreneurial success, suggesting that long-term competency building may be more influential than immediate utility perceptions in shaping career outcomes.

5. Discussion

Theoretical Implications

This study provides the first comprehensive empirical validation of dual-pathway enhancement in social entrepreneurship education, demonstrating that digital tools create simultaneous benefits through distinct but complementary mechanisms operating within mental model development frameworks. The consistently large effect sizes (Cohen's $d = 0.95-1.96$) indicate that this theoretical integration captures important relationships that are not adequately explained by single-pathway models, which examine learning or career outcomes in isolation. The international validation across diverse cultural contexts suggests the broad applicability of the dual-pathway framework.

The dominance of enhanced employability capital development ($d = 1.96$) over perceived usefulness ($d = 1.44$) extends traditional Technology Acceptance Model applications by demonstrating that in mission-driven educational contexts, competency-building outcomes, including digital mindset components, may be more important than immediate utility perceptions. This finding supports Hasan et al.'s (2025) assertion that mental model development and growth mindset formation represent crucial mediating mechanisms, suggesting that social entrepreneurship education requires theoretical frameworks that prioritise long-term capability development and cognitive framework formation over short-term satisfaction measures.

The successful validation of enhanced zero-harm capital with digital mindset components as a distinct employability dimension addresses critical gaps in existing frameworks that fail to capture contemporary workforce requirements for ESG consciousness, ethical competence, and digital adaptation capabilities. The strong empirical performance of this enhanced dimension (factor loading = 0.789) provides theoretical support for treating sustainability, social responsibility, and digital growth mindset capabilities as fundamental rather than optional competencies in social entrepreneurship education, extending employability theory to encompass contemporary workforce demands in increasingly digital and sustainability-conscious economies.

The empirical demonstration of partial mediation across both pathways validates theoretical propositions that digital tools create both direct benefits and mediated enhancements through psychological, competency development, and mental model formation processes. This finding supports predictions from experiential learning theory regarding technology's role in amplifying learning cycles, while also extending the understanding of career

development mechanisms and cognitive framework development processes identified by mental model theory (Ziemiański et al., 2023).

The international validation across diverse cultural contexts provides initial evidence that dual-pathway enhancement may operate consistently across different educational, economic, and cultural environments. However, the contrast with Hasan et al. (2025) Indonesia-specific findings suggests potential cultural moderators that warrant future investigation, particularly regarding how cultural values and economic development levels may influence the relative strength of learning enhancement versus career development pathways.

Practical Implications

The transformative effect sizes documented across both pathways provide compelling justification for substantial institutional investment in integrating digital tools across diverse cultural and institutional contexts. Educational institutions implementing comprehensive technology-enhanced approaches based on the Dual-Pathway Enhancement Model can expect approximately an 83% improvement in student engagement and a 96% improvement in enhanced employability capital development, representing transformative rather than incremental changes in educational effectiveness, regardless of cultural context.

Government-Level Implications

Government policymakers should prioritise the development and funding of digital infrastructure for educational technology integration in social entrepreneurship programs, recognising the dual benefits for both immediate educational effectiveness and long-term workforce development. The enhanced employability capital framework, which includes a digital mindset component, provides evidence-based guidance for national workforce development strategies that address contemporary requirements for ESG awareness and digital adaptation capabilities. Countries seeking to develop social entrepreneurship ecosystems should invest in educational programs that develop comprehensive employability capital rather than focusing solely on traditional business skills.

Policy frameworks should recognise cultural variations in digital tool effectiveness while maintaining focus on dual-pathway development. The contrast between this international study and Hasan et al. (2025)'s Indonesia-specific findings suggests that developing countries may benefit from a particular emphasis on developing a digital growth mindset, while developed countries may focus more on integrating advanced digital tools to enhance complex problem-solving capabilities.

Institution-Level Implications

Educational institutions should implement comprehensive digital integration strategies that recognise immediate benefits while building systematic competency development programs incorporating digital mindset components. The more substantial mediation effect in the Career Development Pathway (73.9% vs. 59.2%) suggests that institutions should prioritise digital tools that demonstrably build long-term competencies, particularly enhanced zero-harm capital formation capabilities that address contemporary workforce requirements.

Technology selection criteria should emphasise enhanced employability and capital development potential over ease of use or technical sophistication, with procurement decisions evaluated through both immediate engagement enhancement and long-term career preparation criteria, including digital growth mindset development. This dual evaluation approach ensures technology investments maximise both pathways while maintaining focus on mission-driven educational objectives and cultural contextual factors.

Faculty development programs should prepare educators to leverage digital tools for dual-pathway enhancement, with training emphasising both engagement strategies and competency development approaches informed by mental model theory. This comprehensive preparation enables faculty to maximise technology benefits across both learning and career development dimensions while maintaining pedagogical excellence and cultural sensitivity in diverse educational contexts.

Student-Level Implications

Students should recognise that digital tool engagement provides both immediate learning benefits and long-term career preparation advantages through enhanced employability capital development. The validation of enhanced zero-harm capital, including digital mindset components, suggests that students should actively develop not only technical digital skills but also growth mindset attitudes toward technological adaptation and ethical use of technology.

Career preparation strategies should emphasise comprehensive employability capital development rather than focusing solely on traditional competencies, with particular attention to digital adaptation capabilities and ethical technology use skills, which employers increasingly demand in social sector employment. Educators should provide tailored approaches to digital growth mindset development for students from diverse cultural backgrounds while maintaining their focus on comprehensive competency building.

The international validation suggests that students can expect consistent dual-pathway benefits regardless of cultural or institutional context, providing confidence that investment in digital tool engagement will yield both immediate learning improvements and long-term career advantages across diverse global employment markets.

Cultural Considerations and Global Applicability

The international validation of dual-pathway effectiveness across diverse cultural contexts provides important insights for global application, while also revealing areas that require cultural adaptation. The consistency of effect sizes across different cultural and economic environments suggests that the fundamental dual-pathway mechanisms operate universally, supporting the broad applicability of the theoretical framework. However, a comparison with Hasan et al. (2025) reveals potential cultural moderators that influence the relative strength of the pathway and patterns of digital growth mindset development in Indonesia.

Developing country contexts, as demonstrated by Hasan et al. (2025) in Indonesian research, may particularly benefit from explicit digital growth mindset development, given their emphasis on technological adaptation and the requirements for rapid economic development. Their finding that "digital growth mindset is a key factor in the influence between entrepreneurship education and digital entrepreneurship interest" (p. 245) suggests that cultural contexts experiencing rapid technological change may require enhanced focus on growth mindset components within employability capital development.

Developed country contexts represented in this international study may benefit more from integrating advanced digital tools for complex problem-solving and stakeholder engagement, building upon existing digital infrastructure and literacy foundations. The consistently high mean scores across constructs (4.19-4.31) suggest that students in developed country contexts already possess strong foundational digital capabilities, enabling a focus on advanced competency development and sophisticated technology application for creating social impact.

Educational institutions operating across multiple cultural contexts should adapt dual-pathway implementation strategies to account for cultural variations in technology adoption patterns, learning preferences, and career development priorities while maintaining focus on comprehensive employability capital development, including digital mindset components. This culturally-responsive approach ensures maximum dual-pathway effectiveness while respecting local educational traditions and cultural values.

Limitations and Future Research

This research faces methodological limitations that should be acknowledged when interpreting findings and planning future research directions. The cross-sectional design constrains the ability to make definitive causal inferences despite robust theoretical foundations and comprehensive control variable analysis. Longitudinal studies examining the sustained effects of digital tool integration on actual career outcomes would strengthen confidence in causal relationships and enable the assessment of competency development persistence over time across different cultural contexts.

The absence of explicit digital growth mindset measurement represents a significant limitation, given its theoretical importance, as demonstrated by Hasan et al. (2025) and the foundations of mental model theory. Future research should prioritise the development and validation of digital growth mindset measurement instruments for social entrepreneurship education contexts, enabling direct testing of their mediating role in dual-pathway enhancement. The Indonesian research provides a strong theoretical foundation and empirical evidence for the importance of a digital growth mindset, suggesting that explicit measurement and analysis could significantly enhance understanding of dual-pathway mechanisms.

Cultural moderator analysis represents another critical future research direction. While this study provides initial evidence of dual-pathway consistency across cultures, systematic examination of cultural moderators affecting pathway effectiveness would enable more precise guidance for international implementation. Research comparing developed and developing country contexts, examining the influence of cultural values on technology adoption patterns, and investigating optimal adaptation strategies for different cultural environments would enhance the global applicability of findings.

Future research should prioritise technology-specific analysis examining which digital tools most effectively build different dimensions of employability capital, enabling more precise institutional guidance for technology selection and implementation. Cross-cultural validation studies should systematically examine the cultural moderators that affect the effectiveness of dual-pathway approaches, particularly given the significant international variation in social entrepreneurship contexts, digital adoption patterns, and educational traditions.

Investigation of optimal sequencing strategies for competency development would provide practical guidance for curriculum design that maximises dual-pathway benefits while accounting for cultural and institutional contexts. Research examining integration effects across different educational levels and contexts would enhance generalizability and enable adaptation to diverse institutional environments globally.

The integration of digital growth mindset measurement and analysis represents the most promising future research direction, building upon strong theoretical foundations provided by Hasan et al. (2025) and mental model theory. The development of comprehensive measurement instruments that capture digital growth mindset across different cultural contexts, an investigation of its mediating role in dual-pathway enhancement, and an examination of cultural variations in growth mindset development patterns would significantly advance the theoretical understanding and practical application of dual-pathway enhancement in social entrepreneurship education.

6. Conclusions

This study aims to investigate and explore the power of digital tools integration in creating dual pathways for enhancing both immediate learning engagement and long-term employability capital development in social entrepreneurship education contexts. The findings revealed that the integration of digital tools contributes to transformative educational improvements through two complementary mechanisms operating within mental model development frameworks, with enhanced employability capital, including digital mindset components, serving as potent predictors of career intentions.

Furthermore, the findings indicated that enhanced employability capital development represents the dominant pathway for converting digital experiences into career outcomes, suggesting that long-term competency building, including a digital growth mindset component, may be more influential than immediate utility perceptions for

career development. The international validation across diverse cultural contexts demonstrates the road applicability of this approach, while also revealing important cultural considerations for its global implementation.

This study concludes that the dual-pathway enhancement approach, positioned within mental model theoretical frameworks and enhanced with digital mindset components, represents a theoretically robust and empirically validated approach for maximising educational technology investments in social entrepreneurship education. The integration of mental model theory, digital growth mindset concepts from Hasan et al. (2025), and comprehensive employability capital development provides educational institutions with evidence-based frameworks for achieving both immediate learning improvements and long-term career preparation benefits across diverse cultural and institutional contexts.

Through continued research, innovation, and collaboration, building on this empirical foundation and incorporating digital growth mindset development as identified by Hasan et al. (2025), educational institutions can create comprehensive digital integration strategies that truly prepare the next generation of social change agents for complex challenges in an increasingly digital, culturally diverse, and sustainability-conscious world.

References

- [1] Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- [2] Bacq, S., & Alt, E. (2018). Feeling capable and valued? A prosocial perspective on the link between empathy and social entrepreneurial intentions. *Journal of Business Venturing*, 33(3), 333-350. <https://doi.org/10.1016/j.jbusvent.2018.01.004>
- [3] Bisschoff, Zelda & Massyn, Liezel. (2024). A conceptual soft skills competency framework for enhancing graduate intern employability. *Higher Education Skills and Work-based Learning*. 15. 10.1108/HESWBL-08-2023-0239.
- [4] Carroll, A. B. (2021). Corporate social responsibility: Perspectives on the CSR construct's development and future. *Business & Society*, 62(1), 147-178. <https://doi.org/10.1177/0007650321999680>
- [5] Chan, Y. F. (2026). Product Moral Harmfulness and Price Fairness: Consumer Vulnerability's Moderating and Mediating Effects. *Global Empirical Marketing Studies*, 2(1), Article e1a.2026.02.08. <https://doi.org/10.5281/zenodo.18522300>
- [6] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. <https://doi.org/10.2307/249008>
- [7] Elia, G., Margherita, A., Secundo, G., & Moustaghfir, K. (2022). Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process. *Technological Forecasting and Social Change*, 175, 121330. <https://doi.org/10.1016/j.techfore.2019.119791>
- [8] Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone Publishing.
- [9] Elkington, J. (2018, June 25). 25 years ago I coined the phrase "triple bottom line." Here's why it's time to rethink it. *Harvard Business Review*. <https://hbr.org/2018/06/25-years-ago-i-coined-the-phrase-triple-bottom-line-heres-why-its-time-to-rethink-it>
- [10] Freeman, R. E., Phillips, R., & Sisodia, R. (2020). Tensions in stakeholder theory. *Business & Society*, 59(2), 213-231. <https://doi.org/10.1177/0007650318773750>
- [11] Hair, J. F., Jr., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*. Springer.
- [12] Hasan, M., Azis, M., Tahir, T. et al. Exploring the role of entrepreneurship education on digital entrepreneurship interest among generation Z students: the power of digital growth mindset in a mental model perspective. *Entrep Educ* 8, 235–253 (2025). <https://doi.org/10.1007/s41959-025-00141-0>
- [13] Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- [14] Kraus, S., Breier, M., Jones, P., & Hughes, M. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management*, 63, 102466. <https://doi.org/10.1016/j.ijinfomgt.2021.102466>

- [15] MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioural research: Integrating new and existing techniques. *MIS Quarterly*, 35(2), 293-334. <https://doi.org/10.2307/23044045>
- [16] Mair, J., & Noboa, E. (2006). Social entrepreneurship: How intentions to create a social venture are formed. In J. Mair, J. Robinson, & K. Hockerts (Eds.), *Social entrepreneurship* (pp. 121-135). Palgrave Macmillan.
- [17] Nambisan, S. (2017). Digital entrepreneurship: Toward a digital technology perspective of entrepreneurship. *Entrepreneurship Theory and Practice*, 41(6), 1029-1055. <https://doi.org/10.1111/etap.12254>
- [18] Ratten, V., & Jones, P. (2023). Generative artificial intelligence (ChatGPT): Implications for management educators, *The International Journal of Management Education*, Volume 21, Issue 3, 2023, 100857, ISSN 1472-8117, <https://doi.org/10.1016/j.ijme.2023.100857>.
- [19] Schaltegger, S., & Wagner, M. (2023). Managing the business case for sustainability: The integration of social, environmental and economic performance. *Business Strategy and the Environment*, 32(1), 1-15. <https://doi.org/10.1002/bse.3080>
- [20] Secundo, G., Ndou, V., Vecchio, P., & De Pascale, G. (2020). Sustainable Development, Intellectual Capital and Technology Policies: A Structured Literature Review and Future Research Agenda. *Technological Forecasting and Social Change*, 153, Article ID: 119917. <https://doi.org/10.1016/j.techfore.2020.119917>
- [21] Sitaridis I, Kitsios F (2024). Digital entrepreneurship and entrepreneurship education: a review of the literature. *International Journal of Entrepreneurial Behavior & Research*, Vol. 30 No. 2-3 pp. 277–304, doi: <https://doi.org/10.1108/IJEBR-01-2023-0053>
- [22] Stephan, U., Patterson, M., Kelly, C., & Mair, J. (2016). Organizations driving positive social change: A review and an integrative framework of change processes. *Journal of Management*, 42(5), 1250-1281. <https://doi.org/10.1177/0149206316633268>
- [23] Tomlinson, M. (2017). Forms of graduate capital and their relationship to graduate employability. *Education + Training*, 59(4), 338-352. <https://doi.org/10.1108/ET-05-2016-0090>
- [24] United Nations. (2023). The 17 goals | Sustainable development. <https://sdgs.un.org/goals>
- [25] Ziemiański, P., Stankiewicz, K., Tomczak, M. T., & Krawczyk-Bryłka, B. (2023). The congruence of mental models in entrepreneurial teams—implications for performance and satisfaction in teams operating in an emerging economy. *Journal of Entrepreneurship in Emerging Economies*, 15(1), 32-45. <https://doi.org/10.1108/JEEE-02-2020-0033>