

Beyond AI: How Business Simulations Preserve Human-Centric Learning

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Abstract: As artificial intelligence becomes more integrated into higher education, it is increasingly capable of supporting decision-making, modelling complex systems, and accelerating technical learning. While these capabilities are welcomed and offer learning opportunities for students, AI does not account for dimensions of human learning, or the development of human-centric skills. This human-centric learning is essential for cultivating collaborative, responsible, and reflective graduates. Therefore, value must be placed on the intentional development of both technical and human-centric learning to complement each other in the age of AI. This study employs a qualitative methodology through the thematic analysis of 45 student reflections from a postgraduate business simulation module to investigate how business simulation promotes technical learning while preserving human-centric learning. Using a thematic coding framework, the study categorises learning into human-centric themes and assesses each for its replicability by AI. The findings highlight that while simulation integrated AI-enhanced tools (i.e. forecasting dashboards and scenario rewinds) aided student learning, the most meaningful learning described by students focuses on human-centric dimensions - resilience, collaboration, ethical reasoning, and reflective insight, and not on algorithmic optimisation through AI. The findings reveal that while AI enhances learning, it cannot replicate the emotional, ethical, and relational growth students undergo when confronting uncertainty, navigating team dynamics, and learning from failure. The paper argues for a pedagogical approach that defends and designs for human-centric learning - particularly in fields where leadership and judgment development are core. As education evolves alongside AI, it becomes essential to clarify not only what AI can do, but what it must not replace.

Keywords: e-learning, Simulation, Higher Education, Sustainability, Game-based Learning, Interactive Learning, Educational Gamification

1. Introduction

The rapid integration of artificial intelligence (AI) is fundamentally reshaping the landscape of teaching and learning across higher education. From adaptive tutoring systems to generative content creation tools, AI offers unprecedented speed, scalability, and precision - capabilities that are transforming not only how students access and consume information, but also how they create original work and engage with academic content (Atchley et al., 2024). In the domain of business and management education specifically, AI technologies are already assisting with a wide range of tasks, including market analysis, real-time performance feedback, and predictive scenario forecasting. These tools enhance the efficiency and depth of learning by simulating complex business environments, offering dynamic data-driven insights, and enabling learners to interact with sophisticated models of real-world decision-making.

Recent research has highlighted both the potential benefits and the inherent limitations of AI in supporting student skills development. On the one hand, AI can significantly expand access to diverse perspectives, aid in the construction of logical arguments, and tailor learning pathways to individual needs. On the other hand, over-reliance on AI tools risks diminishing students' intrinsic motivation for critical thinking, self-reflection, and ethical reasoning. AI can deliver outputs based on existing data and algorithms, but it lacks the capacity to engage in the nuanced, often uncomfortable, process of critical introspection that is vital to personal and professional growth.

A more profound limitation - central to this research - is AI's inability to cultivate human-centric dimensions of learning. Skills such as empathy, moral judgment, collaborative problem-solving, and the capacity for critical self-reflection are cultivated through human interaction, dialogue, and lived experience. These qualities cannot be replicated or replaced by algorithmic logic or machine learning, no matter how advanced the system. As AI becomes more embedded in pedagogical practice, this raises urgent questions about the evolving role of educators and the shifting nature of student engagement. What is at stake is not simply how we teach, but what kind of learning we value and preserve. It challenges us to consider the preservation of pedagogical approaches that emphasise human interaction, emotional intelligence, and experiential engagement - qualities essential for the development of responsible, ethical, and effective future leaders.

One such pedagogical approach that holds promise for sustaining human-centric learning is experiential learning. This mode of learning emphasises active participation, iterative reflection, and the application of theoretical knowledge in real-world contexts. Experiential learning is uniquely positioned to integrate both technical competencies and human skills by immersing students in scenarios that require ethical judgment, collaborative negotiation, and reflective practice. It enables students not only to understand business concepts, but to embody them in a way that fosters deeper comprehension and moral awareness.

This paper explores these themes through the lens of a business simulation module, examining the extent to which AI can replicate various learning outcomes, but more importantly, identifying which aspects of learning remain irreducibly human. It argues that as we move forward in integrating AI into higher education, we must also articulate and defend the pedagogical spaces where human-centric learning thrives - spaces that are essential for cultivating the reflective, ethical, and empathetic capacities of the next generation of business leaders.

2. Literature Review

2.1 AI in Education

Artificial intelligence (AI) is rapidly becoming embedded across the education landscape, with applications spanning adaptive learning platforms, automated feedback systems, chatbots, and intelligent tutoring systems. These technologies are redefining how educational content is delivered, managed, and experienced by both educators and learners (Luckin et al., 2016). In higher education, the emergence of generative text models such as ChatGPT, recommendation engines embedded in learning management systems, and real-time learning analytics platforms are increasingly influencing how students engage with content, complete assignments, and receive feedback (Holmes et al., 2022; Zawacki-Richter et al., 2019).

The promise of AI in education lies in its potential to enhance efficiency, offer scalable and personalised learning experiences, and generate actionable insights from large volumes of educational data. For example, AI can support differentiated instruction by tailoring content to individual learners' needs, track performance patterns to identify at-risk students, and automate administrative or assessment tasks to reduce educator workload (Ferguson et al., 2023; Chen et al., 2020). These developments are helping institutions respond to the increasing demand for flexible, student-centred, and data-informed approaches to teaching and learning.

However, alongside these innovations is growing concern about the potential narrowing and depersonalisation of the learning experience. As AI becomes increasingly competent at generating answers, producing feedback, and even recommending strategic decisions, there is a risk that educational priorities may shift toward outcomes that are easily quantifiable or automatable - while sidelining the less tangible, more iterative aspects of deep learning such as critical thinking, ethical reasoning, and emotional engagement (Selwyn, 2019; Knox, 2020). The affordances of AI are fundamentally statistical: it excels at pattern recognition, probabilistic forecasting, and performance optimisation within defined parameters. In business education, for instance, AI systems can simulate market dynamics, predict the success of strategic choices, and generate data visualisations far more quickly than a human team.

Yet, despite these strengths, AI remains limited in domains that require human-centric qualities - such as empathy, cultural sensitivity, creativity, ethical deliberation, and collaborative problem-solving. These dimensions of learning are not easily reduced to data points or algorithms and remain largely beyond the reach of current AI technologies (Williamson & Eynon, 2020). Furthermore, there is a concern that excessive reliance on AI may erode students' motivation to engage in self-directed learning and diminish their opportunities for reflection, dialogue, and interpersonal learning - elements that are foundational to holistic education.

As AI systems become more pervasive in higher education, the question is no longer whether they will shape learning, but how educators can ensure that the human dimensions of learning are preserved and prioritised. This includes reasserting the value of pedagogical approaches that promote dialogue, critical inquiry, ethical reasoning, and relational learning - areas where AI remains profoundly limited.

2.2 Human-Centric Learning

The limitation of AI is not merely technical; it is ontological in that AI cannot experience a decision or feel its consequences. It cannot draw conclusions or meaning in the same way that humans do, as it does not take account of interpersonal nuances (e.g. conflict resolution, trust-building); ethical judgment (e.g. weighing trade-

offs between profit and values); emotional processing (e.g. recovering from failure, managing team stress); or reflection insight (e.g. learning from mistakes through shared team dialogue and communication)

Edmondson (2023) argues that learning is not just feedback but reflection, context, and emotional processing. Similarly, leadership theorists point out that trust, moral courage, and vulnerability are core to professional growth - qualities that AI cannot authentically simulate (Denning, 2020; Brown, 2012). This, as AI grows more powerful, there is a need to protect and preserve human dimensions of learning, essential for developing future leaders. An effective pedagogical approach to promote human-centric learning is through experiential learning, which not only facilitates technical learning but also develops human-skills.

2.3 Experiential Learning Through Simulation

Experiential learning theories emphasise learning as a cyclical process of doing, reflecting, adapting, and applying (Kolb, 1984). These approaches value not only technical learning and skills development but also personal transformation - how learners grow in self-awareness, judgment, resilience, and ethical capacity through experience. One way this experience can be delivered to students is through simulation-based learning which creates opportunities for students to confront uncertainty, make decisions under pressure, and reflect on the interpersonal and emotional consequences of their decisions (Gosen & Washbush, 2004; Bellotti et al., 2012). Research (Washbush and Gosen, 2001; Faria et al., 2009; Wood et al., 2009; Costin et al., 2018) advocates the use of simulation games as an innovative learning tool. Learning in simulations is often emergent and relational and does not come from content delivery or data but from lived experiences of acting, failing, negotiating, communicating within a team (Lean et al., 2020). Further, simulations reflect and mirror the imperfect nature of business environments (Costin et al., 2018), offering a dynamic environment where students can navigate complex scenarios and make decisions, developing both technical and human-centric skills. They also feature a teams-based approach connecting students to the outside world and letting students act on their knowledge and skills, resulting in deeper learning (Costin et al., 2018). By engaging students in active participation, critical reflection, and the application of knowledge in real-world context, experiential learning through simulation, fosters deeper student understanding from both a technical and human perspective and so is explored in this research.

3. Pedagogical Design of the Business Simulation Module

The module at the centre of this research is a postgraduate business simulation module designed to develop strategic thinking, decision-making, and reflective learning through an immersive experience. Delivered via SimVenture Evolution (www.simventure.com/products/evolution/), the simulation tasks students with managing a virtual bicycle manufacturing company over a multi-year timeline (See Fig. 1). The module was intentionally structured to stretch both individual and team capabilities - not only in terms of technical skills, but also human-centric skills e.g. emotional resilience, ethical decision-making, and interpersonal and team collaboration dynamics.



Figure 1: The SimVenture Evolution Interface

The simulated learning experience adopted a structured approach which was divided into two key phases:

- *Phase 1: Individual Simulation* (Business Growth Activity – Years 4 Q1 to 7 Q4):

In this phase, students operated independently and were given a generous allowance of rewinds - a feature allowing them to revisit previous quarters to revise and reflect on decisions, encouraging experimentation, risk-taking, and learning from trial and error. Students tested pricing strategies, staffing models, and investment decisions in a controlled environment where failure was recoverable.

- *Phase 2: Team Simulation* (Seed-to-Scale Activity – Years 1 Q4 to 10 Q4):

In this phase, the team simulation imposed limited rewinds and increased the stakes of each decision. Teams were required to collaborate across finance, marketing, operations, and HR functions. Of note to this phase, two “blind spots” were built into the design: Years 1 Q4 to 3 Q3 and Years 8 Q1 to 10 Q3 were not accessible through the individual simulation, meaning students had no individualised preview of these periods. During this phase, teams had to rely entirely on shared judgment, dialogue, and consensus to guide the business forward.

This progression - from individual control to collective interdependence was not incidental. It was designed to mirror real-world business conditions where perfect information is rare, trade-offs are ethical as well as financial, and success depends on collective, and not solo decision-making.

At the outset of phase 2, students co-created Team Charters i.e. mutual agreements outlining how decisions would be made, how disagreements would be addressed, and what values would ultimately guide the team. Though not graded, these charters created a framework for teamwork and collaborations, allowing students to speak openly, challenge ideas, and process conflict without fear of reprisal (Edmondson, 1999). Reflections later revealed that these charters were not only respected - they were vital in helping teams navigate breakdowns, distribute leadership flexibly, and create the interpersonal trust needed to make decisions under pressure. The charters also laid the groundwork for students to take interpersonal risks - a necessary condition for human-centric learning.

Students were assessed through a structured individual reflection report, submitted on completion of the module. The reflections submitted served as the primary methodological tool for this study, providing qualitative data on student learning experiences, discussed in the next section.

4. Research Methodology

This study employed a qualitative methodology thematic analysis of 45 individual student reflections submitted as part of the summative assessment for a postgraduate business simulation module. These reflections were chosen as the primary data source as they offered unstructured, first-person accounts of the lived simulation experience. Students were not asked to comment on AI directly, making their insights into learning processes authentic and emergent. Each student submitted a reflective report of 1,500-2,000 words, guided by prompts related to: Individual and team decision-making; Role negotiation and leadership; Risk-taking and dealing with uncertainty; Ethical trade-offs and sustainability; Conflict, collaboration, and learning from failure.

4.1 Data Analysis

A two-layered thematic coding process was used to analyse the reflections. The first coding process centred on both human-centric and technical learning, focusing on the following themes: team collaboration & communication; resilience & recovery; ethical reasoning & values-based decisions; metacognition & self-awareness; leadership skills and technical skills. The second coding process focused on assessing AI replicability. Each theme (outlined above) was evaluated on whether the learning experience documented by the students in their reflections could plausibly be: (1) Fully replicable by AI (e.g. technical forecasting); (2) Partially replicable (e.g. decision support augmented by human judgment); (3) Not replicable (e.g. emotional recovery after failure, moral courage, or interpersonal negotiation). This framework was adapted from Edmondson (2023) which placed emphasis on learning from intelligent failure, echoing other studies (Selwyn, 2019; Holmes et al., 2022) on AI in education.

Each reflection was read line by line and coded using a spreadsheet-based matrix. Key quotes were extracted and assigned both a learning theme and a replicability classification. Patterns were then reviewed across the dataset to identify dominant themes and moments of divergence between human and AI-supported learning.

Coding was conducted by the lead researcher and verified against assessment criteria, simulation structure, and anonymised team outcomes.

The goal was not to measure AI capability, but to explore learning that AI cannot see, feel, or simulate - with a view to preserving human-centric learning in future learning design.

5. Findings

The research findings centre on human-centric student learning and transversal skills developed through completion of the business simulation module, each of which will be discussed below:

The analysis of reflections revealed several key themes central to human-centric learning, namely team collaboration and communication, resilience and recovery, ethical reasoning and values-based decisions, and metacognition and self-awareness. Table 1 outlines a sample of student reflections, which support the importance of interpersonal engagement, self-awareness, and value-driven leadership. These findings underscore the unique role of experiential learning environments, such as business simulations, in fostering human-centric skills and capabilities which are essential for responsible and adaptive leadership in complex, real-world contexts. Evidently, the student reflections show that their learning occurred not from mastering the simulation's technical systems, but from navigating interpersonal, emotional, and ethical challenges.

Table 1: Human & Technical Student Learning

Theme	Description	Student Reflection
Team Collaboration & Communication	This theme encompassed inclusive decision-making, conflict resolution, and shared accountability. These experiences required vulnerability, compromise, emotional maturity and trust.	<i>"Our meetings were chaotic at first, but once we agreed on clearer roles, the communication improved and so did our outcomes".</i> <i>"We argued a lot in the beginning - about strategy, pace, everything. But once we agreed to rotate leadership, things started to click. We learned to listen and trust."</i> <i>"We stopped making top-down decisions and moved to full-team voting. That's when our performance- and trust-started to improve".</i>
Resilience & Recovery	Students spoke openly about disappointment, frustration, and regaining motivation - emotional processes far outside the scope of AI.	<i>"After our poor performance in Q3, we had to regroup. It was frustrating, but owning the mistake together made us stronger".</i> <i>"There was a point when I felt like giving up..... but the feedback loop kept us going". Small wins rebuilt our energy"</i> <i>"I was convinced my strategy would work. It failed. I wanted to give up. But the team helped me reframe it, and we bounced back."</i>
Ethical Reasoning & Values-Based Decisions	These reflections revealed how students weighed financial performance against moral considerations - something AI can model but not experience.	<i>"We could have made more money by cutting staff or reducing quality, but that didn't feel right. We decided to prioritise sustainability even if it cost us."</i> <i>"We debated whether to lay off staff to boost profit. It sparked a serious ethics discussion. In the end, we cut bonuses instead".</i> <i>"It didn't sit right to prioritise sales over staff wellbeing, even in a simulation. We chose to keep morale high instead".</i>
Metacognition & Self-Awareness	Learning here was deeply personal, arising from reflection, feedback, and internal shifts - not from outcomes alone.	<i>"I realised I tend to dominate in group settings. This time, I stepped back. It changed the way we worked - and the way I see myself as a leader."</i>

Theme	Description	Student Reflection
		<i>"Usually I avoid conflict, but I learned that discomfort is where the growth is. That's new for me".</i> <i>"I used to focus only on outcomes, but I started reflecting more on why I made certain decisions. That changed how I learn".</i>
Leadership Skills	Student learned here centred on leadership in action but also on personal development, encompassing conflict mediation, initiative-taking.	<i>"There was a shouting match mid-project. Instead of avoiding it, we brought it up and reset our charter. That was the moment we became a real team."</i> <i>"At one point, no one was stepping up. I volunteered to lead a turnaround strategy. It wasn't perfect, but it gave the team direction".</i> <i>"I didn't see myself as a leader, but I stepped up when no one else would. That changed how I see my potential".</i>
Technical Skills	Students learning centred on technical forecasting, planning, and scenario testing, along with developing financial literacy skills.	<i>"I experimented with pricing and marketing changes to model different customer responses. It helped me understand the knock-on effects across departments."</i> <i>"Using the simulation dashboard to predict outcomes made me realise how data-driven thinking can improve confidence".</i> <i>"I built a model to test our pricing strategy across different quarters. That helped us avoid risky decisions"</i>

Coupled with the human-centric skills, student also developed a range of technical skills, including forecasting, planning, and scenario testing, along with developing financial literacy skills. These skills were not developed in isolation - they were activated through the business simulation experience, shaped by team interactions and reflective insight, combining both human and technical skills.

In developing the research further, student learning from the simulation was assessed through the lens of AI replicability, evaluating the extent to which the skills demonstrated, both technical and human-centric- could be replicated by AI, with a view to investigating what skills need to be preserved. Table 2 below outlines the learning in terms of AI replicability:

Table 2: AI replicability?

Learning	AI Replicable?	Why/why not?
Team Collaboration & Communication	No	Requires emotional nuance, empathy, and live negotiation.
Resilience & Recovery	Partially	AI can simulate options but doesn't experience consequence or fear.
Ethical Reasoning & Values-Based Decisions	No	Involves subjective values, trade-offs, and moral judgment.
Metacognition & Self-Awareness	No	Metacognition and self-awareness are grounded in lived experience.
Adaptable leadership	No	AI lacks emotional intelligence, contextual judgment, & human intuition required to navigate complex, evolving interpersonal dynamics.
Technical Forecasting planning, and scenario testing	Yes	AI excels at modelling outcomes and optimising inputs.

The analysis of 45 student reflections revealed a consistent pattern that while AI can support or replicate the technical aspects of the business simulation i.e. technical forecasting and scenario planning, the most transformative learning experiences described by students were human in nature.

6. Discussion

This study set out to explore to what extent can AI replicate learning through business simulations, but more importantly what aspects of learning remain human-centric and need to be preserved? The business simulation design for this research intentionally created conditions for technical and human learning. This simulated design ensured that the module was not just a decision-making platform, but also a human-centric learning space for real-world business leadership, where information is imperfect, outcomes are unpredictable, and the quality of the team relationship often determines success or failure. Through the creation of combined scenarios requiring both technical and human-centric capabilities, the student learning was captured through structured reflections that not only documented what they did, but what they felt, and the impact of this. The business simulation student experience revealed that AI excels at simulating environments, modelling outcomes, and providing instant feedback. In this research, AI-supported tools such as dashboards, rewind functions, and forecasting models played a valuable role in helping students manage complexity, enhancing decision quality, and facilitating accelerated technical learning.

While the technical learning enhanced by AI offered an invaluable learning experience, the human-centred insights shared through student reflections were equally enriching. The human-centric learning provided students with the opportunity to build resilience by making wrong decisions and experience negative learning; facilitated teamwork and collaboration to effectively develop their communication skills; it allowed them to make value-based decisions with moral reasoning and overall changed how they understood themselves as leaders. These experiences required emotion, reflection, trust, and accountability - qualities that AI cannot simulate because they are not data-driven, but human-driven.

As AI tools continue to improve, there is a risk that educational systems will gravitate toward what is easiest to measure or automate - prompting a shift away from human-centric skills development. If educators design learning environments around what AI can do, it may undervalue what only humans can do: feel regret, extend trust, choose courage, listen deeply, and change direction not because a model told us to, but because someone helped us see different perspectives.

7. Conclusion and Recommendations

As artificial intelligence becomes increasingly embedded in education, it is tempting to imagine a future where machines optimise learning as efficiently as they analyse data. But this study shows that in some of the most meaningful domains of development - resilience, reflection, ethical decision-making, interpersonal trust - learning is not something AI can replicate.

Through the analysis of student reflections, this paper has illuminated the boundary between what AI can support and what remains human. While students benefited from AI-enhanced tools like forecasting dashboards and rewind functions, their most powerful learning moments arose not from efficiency, but from tension: the discomfort of failure, the challenge of team conflict, the vulnerability of ethical compromise, and the courage of self-reflection.

This paper acknowledges the valuable role AI can play in education, particularly in modelling systems, real-time feedback, and supporting technical learning. More importantly, this research promotes that the real work of business education must remain grounded in human-centric learning. If educators want to prepare graduates for a business environment that is both automated and ambiguous, learning must be designed to accommodate not solely technical learning that AI can replace, but human-centric learning that develops not just competence, but character. Thus, educators in designing simulation-based or AI-augmented learning experiences should preserve human-centric learning by intentionally embedding design principles that accommodate both technical and human-centric student learning. Such an approach will ensure that as technology and AI advances, the core of learning remains anchored in the complexity, emotion, and ethics of human experience.

Ethics Declaration

This study involved human participants in the form of student engagement, and formal ethical approval was obtained from the university's ethics committee prior to data collection. All participants were informed about

the purpose of the study and provided informed consent in accordance with ethical guidelines. Participation was voluntary, and confidentiality and anonymity were maintained throughout.

AI Declaration

Artificial intelligence tools were used during the development of this paper to support tasks such as proofreading, language refinement, and idea clarification. All intellectual contributions, critical analysis, and final content decisions were made by the authors.

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