

Simulations as an Innovative Pedagogy leading to Skill Enhancement

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ABSTRACT

Business simulations games provide students with the opportunity to manage a complex organization over an extended period of time in the face of great uncertainty. Students are required to apply their knowledge by thinking and acting in an integrative manner. **Purpose:** The purpose of this study is to assess whether use of simulation games as an experiential tool help in better understanding of the concepts and contribute to skill enhancement. **Methodology:** The paper evaluates student learning through the use of simulation games by using two methods: a pre-and-post questionnaire, and record their responses after playing the game in light of the skills assessed. Both methods allowed for an initial benchmark to be established, followed by a measure of how much students improved. For the questionnaire, answers were scored and a paired-comparison t-test was calculated to assess learning. **Results:** The results point to the conclusion that the students did learn expected skills from the game. Basic functional knowledge increased, students gained an appreciation for the complexity and importance of understanding of interdisciplinary issues and of decision making in general, and students enjoyed the game and thought it was a worthwhile learning experience. It was evident that many students grasped the larger strategic issues and were beginning to apply them more broadly. Although not all changes were statistically significant, most did improve, suggesting that students developed a deeper hands-on understanding of the issues. Value to Teacher and Students: The executive briefings and the accompanying rubric that follow after each decision round of the simulation game provide much needed practice for skill development. It is important that the teacher takes these executive briefings religiously after each decision round using the rubrics else will remain intellectual guidelines and not skills.

Keywords: Assessment, Learning, Classroom, Games, Simulation, skill development

INTRODUCTION:

Simulations, a term commonly associated with flight, combat, or space shuttle training, are designed to prepare learners for complex, real-world situations by enabling them to perceive, diagnose, and respond to dynamic scenarios (Endsley, 1988). In business education, simulations serve a similar purpose: they help students develop situational awareness—the ability to perceive, comprehend, and predict elements in the marketplace (Bonney, 2008). This process is essential for effective managerial decision-making and for applying knowledge to future business challenges.

Educators have increasingly advocated for technology-enriched, interactive learning models to enhance learner engagement and knowledge application (Bailey et al., 2022; Bernstein et al., 2018; Dexter et al., 2020; Storey & Cox, 2015). These approaches are particularly valuable in equipping aspiring and practicing school leaders with 21st-century leadership and management skills (Mann et al., 2011; Nguyen et al., 2024; Tucker & Dexter, 2011). Business simulations allow students to apply theoretical knowledge in a simulated business environment, providing hands-on managerial experience in a safe, game-like setting. Importantly, simulations break down the silo mentality by requiring students to

integrate knowledge across functional areas, reflecting the interconnected nature of real-world business operations.

Many instructors now incorporate simulation games to enhance course delivery, and successful games have been widely disseminated (Heineke & Meile, 1995). However, while students generally enjoy in-class games, it can be challenging to isolate the learning that occurs specifically during these exercises from other instructional methods (Springer & Borthwick, 2004; Duffy & Jonassen, 1992; Fosnot, 1996). Simulations require learners to construct their own understanding, raise questions, and build representations that organize their experiences, rather than simply inheriting a teacher's words.

Recent research supports the pedagogical value of business simulations. Systematic reviews and empirical studies demonstrate that business simulation games (BSGs) improve learning outcomes, including knowledge acquisition, cognitive and interactive skills, and behavioral competencies (Faisal et al., 2022). Simulations also foster the development of soft skills such as teamwork, decision-making, and information processing, and increase student motivation and

satisfaction (Levant et al., 2016; Buil et al., 2018; Lohmann et al., 2018). The integration of business simulations into curricula has been shown to enhance student engagement, especially when combined with authentic team-based learning and reflective debriefing (Lohmann et al., 2018; Carter, 2024).

Despite these benefits, challenges remain in attributing specific learning gains to simulations, as they are often used alongside traditional teaching methods. Factors such as student background, team dynamics, and simulation design can also influence outcomes (Levant et al., 2016; Wang et al., 2019). Nevertheless, the consensus in recent literature is that business simulations are a valuable complement to conventional pedagogies, providing a context for deeper understanding of business fundamentals and management concepts (Cadotte, 2014a; Silitonga et al., 2023).

This paper will conduct a brief review of the literature, explain the business fundamentals game used, review the methodology for evaluation and assessment, and report on results from the assessment. The overall goal is to determine whether students achieve a better understanding of business fundamentals and management concepts, as well as specific topics such as strategy, investment, and data analysis, through participation in business simulations.

LITERATURE REVIEW

In a broad sense, the use of games as part of the educational environment fits into the philosophy of active learning and constructivism. By engaging learners in real-world scenarios, simulations provide problem-focused, hands-on practice in problem analysis and decision-making, facilitating the transfer of classroom learning to real-life situations (Bransford et al., 2012; Hallinger & McCary, 1990; Mann & Shakeshaft, 2013; Mayer et al., 2011; Nietfeld, 2020). These tools are increasingly recognized for their potential to foster critical thinking, problem-solving, and decision-making skills in a dynamic, risk-free environment (Dexter et al., 2020; Hallinger & Kantamara, 2001; Wood et al., 2009; Faisal et al., 2022; Levant et al., 2016; Lohmann et al., 2018).

Kohn (1997) suggested that to promote a deeper understanding of material, students ought to be engaged with what they are doing. Passman (2001) reported on the benefits of adopting a more constructivist, student-centered model of teaching (for a detailed discussion of constructivism, see Applefield, Huber, & Moallem, 2000). McKeachie (1994) stated that involving students as active participants results in a positive learning experience, and learning is enhanced if students make decisions and then respond to the consequences of each decision.

There is widespread use of games and simulations within business school curricula. Faria (1998) reported that in a survey of accredited business schools, 97.5% used simulation games in their courses, with a majority addressing marketing or strategic policy issues (Faisal et

al., 2022). Bodo (2002) discussed the development of an in-class simulation of the classic prisoner's dilemma game with student-designed strategies. Innovative technologies are also adopted in the operation of games; for instance, Doyle and Brown (2000) implemented a business strategy game using e-mail and videoconferencing, involving teams from universities in Ireland, France, and the US. Managers have also received exposure to simulation environments, as discussed by Levine (1998) and McCune (1998).

The literature also shows strong student support for the use of games for educational purposes. Teach (1993) surveyed graduates from various U.S. business schools and found that simulations and games were rated highly as classroom activities. Heineke and Meile (1995) provide practical resources for instructors, including student handouts, instructional tips, and discussion questions. They also developed guidelines for effective games, emphasizing the importance of an “aha” effect, student-generated data, low stress, and simple materials (Heineke & Meile, 1995). Instructor preparation is crucial, and it is recommended to run through the game before using it in class.

Neal (1997) indicated that while most business simulations are competitive, profit may not be the best measure of learning, and this limitation is less significant if grades are not tied to game performance. Schwartzman (1997) observed that games cultivate a positive learning environment. Although measuring student learning is complex, some studies have attempted to assess learning outcomes. For example, Gremmen and Potters (1997) found that students who played a macroeconomics game performed better on exams than those who only attended lectures. Kraiger and Cannon-Bowers (1995) reported that students exposed to more simulation training performed better on exams. Wolfe and Chanin (1993) found that all groups improved their knowledge in a strategic management simulation. Santos (2002) described a financial system simulator that enhanced students' understanding of monetary policy, and Westbrook and Braithwaite (2001) showed improved learning outcomes in a healthcare simulation.

Overall, the literature demonstrates that games and simulations, grounded in active learning and constructivist theory, are effective for developing critical business skills and enhancing student engagement (Faisal et al., 2022; Levant et al., 2016; Lohmann et al., 2018; Buil et al., 2018).

Description of the Business fundamentals Simulation Game

Students learn by building their own company in an online simulation. Along the way, they apply business theory and skills to real-world scenarios. Competition between classmates challenges students to make strategic decisions and fortifies conceptual knowledge. The Business Management simulation exposes the participant to all the aspects of business in order to break down the silo mentality. An advanced marketing module

and focus on cross-functional collaboration sets this game apart from all other management simulations.

The simulation requires students to form executive teams consisting of four or five members (Cadotte 2014b). Within each team, students work as the Vice Presidents of specific functional areas. Throughout the decision rounds, they conduct market analyses, evaluate the strategic position of the firm, and make tactical decisions with regards to product design, R&D, manufacturing capacity, production processes, inventory management, human resource management, sales channel planning, advertising, and financial accounting. Students learn to interpret market feedback, analyze competitors' moves, and make quick adjustments to their strategy as explained in the Marketplace assessment (Cadotte, 2014b). Marketplace Microsimulations available at critical points during the exercise cover select business concepts in more depth to ensure that students master the course material. Business Management is available in our 3D-printed bike scenario. Moreover, the game offers:

- Bundled supporting materials that will get you started quickly.
- Live reports make it easy to monitor student performance.
- Automated coaching assistant analyses student decisions and generates discussion points you can use to coach.
- Academically rigorous grading is automated with optional assessments to utilize.

The Tools of Management addressed are: Marketing

Master strategic marketing by crafting targeted messages, placing advertisements, and experimenting with online strategies.

Lean Production

Use 3D printing to enable just-in-time manufacturing. Develop production plans to meet projected demand and minimize costs and lost sales.

Financial Management

Use basic financial statements, profitability reports, and financial ratios to manage operations. Project finances and manage debt and equity.

Profitability Analysis

Manage resources based upon ROI, projected sales, and profitability reports.

Product Development

Analyze detailed market data, then create bicycles for the targeted segments from a comprehensive set of components. Invest in R&D to gain a competitive edge.

Sales Channel

Manage a sales strategy with brick-and-mortar and internet sales channels based on market potential and available resources. Hire and train sales staff to develop demand.

The Assessment Instruments

The Assurance of Learning Assessment, also known as the Customized Objective Learning Assessment (COLA) tool, was created specifically for the simulation. It does not precisely assess a student's reflective, critical, and analytical thinking skills (Cadotte, 2014b), but it does approximate it. According to Moskal, Ellis, and Keon (2008), academic programs aim to foster reflective thinking (the ability to evaluate one's own learning and experiences), critical thinking (the capacity to assess arguments and evidence logically), and analytical thinking (the skill of breaking down complex problems into manageable parts).

Specifically, the COLA is designed to test the students' ability to:

- Perceive, comprehend, and predict the business conditions within which they compete;
- Understand their current and future conditions within each functional area;
- Develop an integrative perspective on business; and
- Use the tools of management to understand the firm's position in the market.

Several documents and rubrics have been created to facilitate the administration of the assessment, which can be found under the Assessment Documents and Rubrics tabs at the top of the screen. There are rubrics designed for executive briefings to be taken by the teacher/coach after each decision round. These broadly aim to measure the depth of understanding, the management by numbers and the breadth of understanding for the students. There are also rubrics to cover the assessment of business plan created by the team of students and a final stockholder report to summarize the learnings from the game.

Grading

Grading is based on the balanced scorecard that measures profitability, customer satisfaction, market share in the targeted market segments, preparedness for the future and wealth.

Rubrics For Assessment

According to Andrade (2002), a rubric is a scoring tool that lists the criteria for a piece of work or "what counts." Typically, a rubric lists items students must include to receive a certain score or rating on a particular task or project. Rubrics also specify the performance level required for several levels of quality. Rubrics can help students and teachers define "quality." Finally, rubrics can help students judge and revise their own work before submitting assignments.

The rubrics designed at the end of each executive briefings, business plan formulation and the stockholder report aims to develop certain skills in the students. The following table mentions certain skills that the simulation aims to develop.

Skill assessed	How it is assessed
Reflective Thinking	Assessment of Strategy and its Execution Assessment of Current Situation Lessons Learned
Integration	Business Acumen Depth and Breadth of Understanding
Value Creation	Investments in the Future
Analytical Skills	Management by the Numbers (using the tools of management)
Strategic Leadership	Team Strength
Communications Skills	Executive Summary Organization Format of Presentation Materials Professional Delivery Mechanics

Figure1: Skill Assessment Framework through Simulation Games (Source: www.marketplace-simulation.com)
Customized Objective Learning Assessment)

Figure2: Sample Rubrics of The Stockholder report (Source: www.marketplace-simulation.com)

MEtric	1 – Weak	2 - Needs to improve	3 - Effective	4 - Very effective/strong	Team Score
Executive Summary	Simple outline of presentation and team members.	Basic introduction of the firm, its executive team, and the results of the last year.	Concise description of who the team is, what it has done during the second year, how it performed (market and financially), what it plans to do, and how much the investors have earned.	Concise description of who the team is, what it has done during its second year, how it has performed (marketwise and financially), what it plans to do, and how much the investors have earned. Summary is quick, snappy, and strategically documented with supporting data.	
Assessment of strategy and its execution (looking back)	Candid assessment of strategy and tactics was lacking. Very little insight was offered as to why things went well or poorly. The team did not take responsibility for weak performance in any area.	The team did not dig very deeply into why things went well or poorly. While there was some thoughtful analysis, there was not a clear understanding as to how the team's strategy and tactics affected its performance. The team was not entirely candid in reviewing events or taking responsibility for its performance. Data that might have shown weak decisions was absent.	The team properly assessed how well its strategy and tactics were conceived and/or executed, using data to support its arguments. It was also candid in reporting how well it met its goals and promises. The team justified most of the deviations to goals, strategy, and tactical plans, but not all of them.	Excellent review and assessment of strategy and performance. The team clearly understood how its decisions affected performance. Strategy and tactics were well integrated across functions. It was clear how the team purposely attacked opportunities and dealt with problems. The team was forthright in reviewing data that reflected both good and bad decisions and the degree to which goals and promises were achieved. The team	

MEtric	1 – Weak	2 - Needs to improve	3 - Effective	4 - Very effective/strong	Team Score
				clearly justified the deviations to its goals, strategy, and tactical plans.	
Assessment of current situation (looking forward)	Limited coverage of the firm's strengths, weaknesses, opportunities, and threats (SWOT). Limited discussion of competitors and their likely courses of action in the future.	Perfunctory list of the firm's strengths, weaknesses, opportunities and threats and competition. The team did not fully understand what to do with this knowledge in terms of moving the company forward.	Thoughtful SWOT and competitors' analysis. Conclusions were supported by data. The team partially addressed how its future strategy and tactics would have to be formulated to address what was learned.	Candid and thorough SWOT and competitors' analysis. Conclusions were well supported by data. The team comprehensively showed how its future strategy and tactics would have to be formulated to address what was learned.	
Investments in the future	It was not apparent that the firm made any investments that would help it to compete in the future.	The team seemed to make token investments in the future. Future competitiveness is in doubt.	The team made the obvious investments that would be needed to better serve its stakeholders and sustain its future competitiveness.	The team made both obvious investments in the future, plus some surprising ones. Board members were comfortable that the team was moving the company forward and could handle future surprises and setbacks.	

A rubric is an analytical measure (Arter and McTighe, 2001, p. 18) in that a score of 1 (Weak) indicates the student demonstrated little or no evidence of knowledge, the lowest point in Bloom's hierarchy. Even if the student exhibited some rudimentary knowledge, it was clear that the student did not understand it or apply it in any meaningful way to the business context.

A score of 2 (Needs to Improve) indicates the student demonstrated some knowledge and revealed rudimentary to average understanding (the second level in Bloom's hierarchy). The student attempted to connect business concepts and knowledge to the applied business environment but there were flaws and/or limitations. A score of 3 (Effective) indicates the student not only demonstrated good business knowledge and understanding (in the form of business concepts, principles, and mathematical and statistical methods), but also successfully applied this knowledge and understanding as he/she made decisions within his/her area of responsibility (level 3 in Bloom's hierarchy). The evidence for application resided within the logic that the student had to provide as justification for each decision. This justification also required analysis and interpretation of the available data (a level 4 activity in Bloom's hierarchy). While the application (decision-making) and analysis were well done, they were typical or expected of a good student. What was missing was creativity and evidence of integration of thought across all functional areas. A score of 4 (Very Effective/Strong) indicates the student is able to transcend knowledge, understanding, application, and normal analysis. The student demonstrates an ability to analyze and make decisions in a holistic and integrative way, including novel and interesting ways of working and experimenting with the data. The student is able to create new ways of looking at problems and opportunities, including surprising options, trade-offs, and decisions. The students are given the rubric in advance and provided with guidance by the Coach in terms of the requirements to achieve a score of 3 or 4. By providing the rubric ahead of time, students can use critical thinking skills to evaluate their own deficiencies going into each briefing (Stevens and Levi, 2013, pp. 21-22). Pintrich (2002) found that students learn best when they are able to use meta-cognitive processes to determine what they do not know in relation to a given task.

RESEARCH METHODOLOGY

Hypothesis Formulation

The following hypothesis were formulated to understand the learning outcomes of the students based on the rubrics devised for business plan assessment (Cadotte, 2014b) as provided by the Marketplace Simulation games.

- H1 (Strategy Execution): Students who participated in the simulation games will demonstrate superior strategic planning and execution compared to non-participants.
- H2 (Investments in the Future): Simulation participants will show better foresight in balancing short-term costs and long-term investments compared to the control group.
- H3 (Management by the Numbers): Participants will exhibit stronger quantitative decision-making non-participants.
- H4 (Assimilation & Integration): Simulation participants will integrate cross-functional insights more effectively than non-participants.
- H6 (Lessons Learned & Organization): Simulation participants will demonstrate better organizational learning than the control group.
- H7 (Business Acumen): Participants will rate scenario-based actions as more effective than non-participants, reflecting stronger business judgment.
- H8 (Holistic Performance): Simulation participants will achieve higher overall performance in post-assessment tasks due to integrated learning.

Sample Size

Options	Frequency	Percentage (%)
Engineering graduates	56	51
Management post-graduates	54	49
Total	110	100

Table 1: Participant Academic Profile

Students from both engineering and management disciplines were taken as sample for data collection. Since the game was administered to 110 students only in the university in one year so the sample was restricted to this number. Out of this 110, there were only 105 responses that were complete with respect to both pre and post data collected.

RESULT & INTERPRETATION

The analysis of the data involved the descriptive statistics collected against each of the parameter that was measured post the simulation to measure the skill assessment. To understand how the simulation shaped students' managerial skills, we analysed before-and-after data from 105 participants using a mix of meaningful statistical tools. Cronbach's Alpha (1951) confirmed that each set of survey items reliably measured the intended skills, while KMO and Bartlett's Tests verified that the items were closely related and valid for deeper analysis. The main comparisons were done through paired t-tests, which showed clear improvements across all key areas from strategy and teamwork to decision-making. We also applied correlation analysis to explore how different competencies interacted, revealing strong connections and suggesting that students developed a more integrated and holistic understanding of management through the simulation experience.

Section	Module/Competency Area	Question Focus	Mean	SD
S1: Strategy Execution	Production, R&D, Budgeting	Demand readiness, innovation investment, and budget balancing	3.75–3.95	0.871–0.965
S2: Investments in the Future	Innovation, R&D, Branding	Long-term growth, product development, and future planning	3.69–3.94	0.800–0.965
S3: Management by Numbers	Financials, KPIs, Market Research	Data-driven pricing, tracking metrics, and quantitative analysis	3.69–3.84	0.786–0.974
S4: Assimilation & Integration	Adjustment, Coordination, Feedback	Post-Q reviews, task planning, shared learnings	3.72–3.91	0.940–0.976
S5: Team Strength	Role Allocation, Conflict Handling	Role-based tasking, constructive resolution	3.72–3.84	0.932–0.935
S6: Lessons Learned & Organization	Reflection, Learning Curve	Mistake-based learning, operational insights	3.90–3.91	0.940–0.952
S7: Business Acumen (Scenario-based)	Tactical Thinking, Adaptability	Price change, R&D speed, ad strategy, staffing reallocation	3.69–3.94	0.818–1.032

Table 2: Consolidated Table of Descriptive Analysis

The results suggest that participants felt fairly confident in their abilities across all key areas of management. They rated themselves strongest in applying strategy and making scenario-based decisions, showing that they're comfortable thinking ahead and adapting to real challenges. Teamwork and learning from experience were also seen as strengths, reflecting

good collaboration and reflection habits. While areas like working with numbers and using innovative tools scored slightly lower, they still showed solid understanding. Overall, the responses were consistent, with only small variations between individuals.

	Cronbach's Alpha	No. of Items
Strategy Execution	.856	4
Business Acumen, Team Strength	.719	3
Depth/Breadth of Understanding	.750	3
Current Situation and Lessons Learned	.878	6
Management Tools and Scenario	.899	7

Table 3: Cronbach's Alpha Test

The reliability test results show that the different sections of the survey are consistently measuring their intended concepts. Strategy Execution, with an alpha of .856, indicates good reliability across its 4 items. The Business Acumen and Team Strength section scored .719, which is acceptable for research purposes. Depth and Breadth of Understanding, with an alpha of .750, shows solid consistency. The sections on Current Situation and Lessons Learned, and Management Tools and Scenario, scored very high (.878 and .899, respectively), indicating excellent internal consistency.

KMO	Variables	Bartlett test Chi-Square:	df	Sig
.771	Current Situation and Lessons Learned	335.472	15	.000
.795	Management Tools and Scenario	443.785	21	.000

Table4: KMO and Bartlett's Test

The KMO values for both constructs, Business Acumen and Team Strength (.771) and Depth/Breadth of Understanding (.795), are well above the acceptable threshold of 0.6, indicating that the data is suitable for factor analysis. This means the items within each group share enough common variance to justify further analysis. Additionally, Bartlett's (1951) Test of Sphericity is significant ($p < .001$) for both sets, confirming that the correlation matrix is not an identity matrix. Together, these results support the use of factor analysis to explore underlying patterns within these question sets.

Pair	Skill Area	Pre-Test Mean	Post-Test Mean	Change	Interpretation
1	S1: Strategy Execution	3.74	3.88	↑ 0.14	Slight improvement in strategy execution after the simulation.
2	S2: Investments in the Future	3.57	3.84	↑ 0.27	Noticeable improvement in investment planning and future-oriented decision-making.
3	S3: Management by Numbers	3.36	3.75	↑ 0.39	Significant improvement in data-driven decision-making and use of performance metrics.
4	S4: Assimilation & Integration	3.85	3.95	↑ 0.10	Slight improvement in the ability to integrate cross-functional insights.
5	S5: Team Strength	3.56	3.89	↑ 0.33	Strong improvement in team coordination and role alignment.
6	S6: Lessons Learned & Organization	3.26	3.86	↑ 0.60	Substantial improvement in learning from past actions and organising workflows.
7	S7: Business Acumen (Scenario-based)	3.72	3.91	↑ 0.19	Moderate improvement in scenario-based decision-making and business judgment.

Table5: Pre and Post Analysis of the data collected for the Skills measured

The comparison between pre- and post-test results shows encouraging progress across all key skill areas. Students demonstrated a stronger grasp of strategy execution, with noticeable gains in future planning and data-driven management. The most significant growth was in organisational learning, highlighting their ability to reflect and adapt. Teamwork and business acumen also improved meaningfully, suggesting that the simulation enhanced both collaborative and strategic thinking.

Hypothesis-wise Analysis:

Item	Mean	SD	t (104)	p	Mean Diff	95% CI
Q1: Quarter 1 goals guided decisions	3.74	1.03	7.40	.000	0.74	[.54, .94]
Q2: Store openings matched growth plans	3.65	1.05	6.34	.000	0.65	[.45, .85]
Q3: Forecasts improved plans	3.84	0.95	9.02	.000	0.84	[.65, 1.02]
Q4: Team understood Q1 strategy	3.79	0.92	8.84	.000	0.79	[.61, .97]

Table 6: One Sample T-test of Strategy Execution (H1)

Participants significantly agreed that Quarter 1 goals helped guide later decisions ($M = 3.74$, $p < .001$), with a mean difference of 0.74 from the neutral value. Similarly, the alignment between store openings and long-term growth plans was positively perceived ($M = 3.65$, $p < .001$). Financial forecasts were seen as especially helpful in improving plans ($M = 3.84$, $p < .001$), and respondents strongly felt the team understood the Q1 strategy clearly ($M = 3.79$, $p < .001$). These findings suggest that early planning and strategic alignment played a crucial role throughout the simulation.

Item	Mean	SD	t(104)	p	Mean Diff	95% CI
Q1: Increasing production (Q3/Q4) prepared us for demand	3.75	0.948	40.539	.000	3.752	[3.57, 3.94]
Q2: Spending on new product ideas (Q4 R&D) aided future growth	3.95	0.965	41.987	.000	3.952	[3.77, 4.14]
Q3: Balanced ad spends with growth savings (Q2–Q4)	3.83	0.871	45.037	.000	3.829	[3.66, 4.00]

Table 7: One Sample T-test of Investments in the current situation and the Future Investment (H2)

The findings show that participants valued forward-thinking decisions. Most felt that ramping up production, investing in new ideas, and striking a balance between advertising and saving for future growth were the right moves. The results weren't just by chance either; they were statistically solid. Altogether, it suggests the teams had a good eye on the future and made choices that kept long-term success in mind.

Item	Mean	SD	t(104)	p	Mean Diff	95% CI
Q1: Financial data guided pricing and production decisions	3.83	0.945	41.506	.000	3.829	[3.65, 4.01]
Q2: Market research was analysed to adjust strategies	3.69	0.974	38.782	.000	3.686	[3.50, 3.87]
Q3: Metrics like sales and compensation were tracked systematically	3.84	0.786	50.038	.000	3.838	[3.69, 3.99]

Table8: One-Sample T-Test Results for Management by Numbers (H3)

The results suggest that participants placed strong importance on using data to guide their decisions. Whether it was financial figures, market insights, or performance metrics, teams seemed to rely on numbers to stay on track. The consistently high scores and strong statistical significance show this wasn't a fluke. It's clear they saw data not just as information, but as a foundation for sound, confident decision-making.

Item	Mean	SD	t(104)	p	Mean Diff	95% CI
Q1: Lessons from Q1–Q3 were applied to Q4 strategy refinements	3.68	0.995	37.854	.000	3.676	[3.48, 3.87]
Q2: Team discussions on integrated marketing, production, and finance	4.02	0.734	56.142	.000	4.019	[3.88, 4.16]
Q3: Simulation improved the ability to apply theory to real decisions	4.09	0.833	50.237	.000	4.086	[3.92, 4.25]

Table 9: One-Sample T-Test Results for Assimilation & Integration (H4)

The findings seem to suggest a well-developed level of applied learning and teamwork. Participants believed they leveraged lessons learned from previous quarters to better develop their future approaches and that their conversations united various business operations. Crucially, many felt that the simulation bridged theory and decision-making in the real world. The high means and significant results all around make it clear that thoughtful integration and learning were strong aspects.

Item	Mean	SD	t(104)	p	Mean Diff	95% CI
Q1: The Team delegated roles based on individual strengths	3.84	0.932	42.219	.000	3.838	[3.66, 4.02]
Q2: Conflicts during store openings were resolved constructively	3.72	0.935	40.794	.000	3.724	[3.54, 3.90]
Q3: Leadership aligned operations with strategic goals	3.96	0.887	45.763	.000	3.962	[3.79, 4.13]

Table 10: One-Sample T-Test Results for Team Strength (H5)

The results suggest an all-around solid feeling of teamwork and leadership. Specific responsibilities were given and played to people's strengths, and when conflicts emerged, they were resolved positively, participants believed. Managers were also considered to be in close harmony with corporate strategies. With high mean values and statistical evidence, the teams collaborated effectively and were managed effectively throughout the project.

Item	Mean	SD	t(104)	p	Mean Diff	95% CI
Q1: Post-Q3 adjustments were shared with the team	3.91	0.952	42.138	.000	3.914	[3.73, 4.10]
Q2: Tasks were organised to avoid bottlenecks	3.72	0.976	39.111	.000	3.724	[3.54, 3.91]
Q3: Early mistakes improved later decisions	3.90	0.940	42.473	.000	3.895	[3.71, 4.08]

Table 11: One-Sample T-Test Results for Lessons Learned & Organisation (H6)

The findings indicate that participants were reflective and open to learning in the course of exploring digital technologies. Several felt that other lessons from previous stages were not only recognised but were shared across the team to prevent it from happening again. Task management felt well-planned to avoid blocks as well. Learning and improving together seems to have been a real strength of this group, given the consistently high marks and statistically significant results.

Item	Mean	SD	t(104)	p	Mean Diff	95% CI
Q1: Lower prices temporarily to match the competitor	3.69	0.944	40.018	.000	3.686	[3.50, 3.87]
Q2: Accelerate R&D to launch a new feature	3.93	0.800	50.391	.000	3.933	[3.78, 4.09]
Q3: Increase digital advertising for brand positioning	3.94	0.818	49.367	.000	3.943	[3.78, 4.10]
Q4: Reallocate staff to high-demand areas	3.80	1.032	37.725	.000	3.800	[3.60, 4.00]

Table12: One-Sample T-Test Results for Business Acumen (Scenario-based) (H7)

The findings indicate that respondents used their real-world business judgment. Be it re-pricing products, accelerating R&D and digital advertising or relocating employees, such measures were seen as both effective and as reasonable in their timing. Given the high mean scores and statistical significance of results, this reflects that participants were not only reactive, but also strategic. They knew how to be practical-minded and focused on what the situation required.

Items	Q1: Prod.	Q2: R&D	Q3: Ads	Q4: Adjust.	Q5: Tasks	Q6: Mistakes
Q1: Production met demand	1	.681**	.611**	.498**	.725**	.499**
Q2: R&D for future growth		1	.459**	.561**	.466**	.504**
Q3: Balanced ad spends			1	.446**	.611**	.307**
Q4: Post-Q3 adjustments shared				1	.616**	.560**
Q5: Tasks organised efficiently					1	.629**
Q6: Learned from early mistakes						1

Table 13: Pearson Correlations – Current Situation (H2) and Lessons Learned (H6)

Results suggest that participants did make a sense of connection between here-and-now actions and extended consideration of what the actions meant. Efficient task arrangement, in particular, was closely associated with achieving production targets as well as learning from failure. Exposure to post-quarter adjustments also correlated nicely with continued learning and strategic clarity. These trends signal that the more organised and thoughtful units were, the more self-assured they were about their operational selections.

Items	Q1: Finance	Q2: Research	Q3: Metrics	Q4: Pricing	Q5: R&D	Q6: Ads	Q7: Staffing
Q1: Financial data usage	1	.630**	.622**	.629**	.646**	.733**	.507**
Q2: Market research analysis		1	.498**	.540**	.627**	.472**	.482**
Q3: Performance metrics tracking			1	.475**	.564**	.524**	.386**
Q4: Temporary price cut strategy				1	.494**	.549**	.675**
Q5: Accelerated R&D strategy					1	.714**	.461**
Q6: Digital advertising push						1	.669**
Q7: Staff reallocation							1

Table14: Pearson Correlations – Management Tools (H3) and Scenario Decisions (H7)

The findings suggest that participants who actively used financial and market data were also more confident in making bold scenario-based decisions. Strong links were observed between financial analysis and actions like adjusting prices, reallocating staff, and boosting digital advertising. Notably, the use of R&D and advertising strategies was highly interrelated, indicating a thoughtful approach to innovation and communication. It seems participants treated management tools not just as support systems, but as essential guides for navigating real-world business challenges.

The results supported all eight hypotheses (H1–H8) and proved the reality of the simulation experience in promoting students’ success in important management aspects. H1 supported the points that participants were better in the plan and making strategies, and H2 indicated that they were thinking about the future, balancing short-term and long-term needs. H3 emphasised their ability and decision-making using data, while H4 indicated how effectively they interfaced across departments with insights. With H5 and H6, we observed an enhancement of teamwork and empirical learning. Hypothesis 7 revealed that students made more prudent and scenario-contingent decisions. The combination of these gains supported a student to H8 students weren’t just becoming better at specific tasks; they were developing stronger capacities to make more sound decisions overall.

CONCLUSION

The comprehensive analysis of the simulation results demonstrates that business simulations are a powerful pedagogical tool, fostering a wide spectrum of management competencies and supporting holistic student development. The statistically significant support for all eight hypotheses (H1–H8) underscores the effectiveness of simulations in enhancing strategic planning, future-oriented investment, data-driven decision-making, cross-functional integration, teamwork, reflective learning, scenario-based acumen, and overall decision quality.

These findings align with a growing body of research showing that business simulation games actively engage students, promote higher motivation, and lead to improved learning outcomes—including knowledge acquisition, cognitive and interactive skills, and behavioral competencies (Faisal et al., 2022). The simulation experience not only allowed participants to apply theoretical knowledge in realistic scenarios but also encouraged them to reflect, adapt, and collaborate—key elements for success in dynamic business environments (Buil et al., 2018; Wei et al., 2022).

Moreover, the strong correlations between management tools and scenario-based decisions highlight the value of simulations in bridging the gap between analysis and action. Students learned to leverage data, integrate lessons from experience, and make prudent, context-sensitive decisions—skills that are highly valued in both

academic and professional settings (Wei et al., 2022; Carter, 2024).

While the results are robust, it is important to acknowledge common limitations in simulation research, such as context specificity and reliance on self-reported outcomes. Future studies should expand sample diversity, incorporate objective performance measures, and explore additional factors influencing learning outcomes (Faisal et al., 2022).

In summary, the evidence affirms that business simulations are not only effective for skill development but also for cultivating adaptive, reflective, and strategic thinkers prepared for real-world business challenges.

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