# Designing a Digital Interactive Simulation for Teaching Business Analytics, Strategy, and Economics

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*Students can experience a challenging period of adaptability as they transition from high school to college class activities. As such, students can potentially lose interest in studying entrepreneurial economics, which often leads to difficulties in choosing the academic path that can fulfill their learning enthusiasm as they debut their college journey. The use of an educational game can potentially spark students' interest in the study of entrepreneurial economics. This research study explores the functional areas in the design of an educational game and the theoretical framework supporting the use of a digital interactive business simulation to facilitate the practical understanding of processes involved in strategic decisions and business analytics in the study of entrepreneurial economics.*

*Keywords: game design, learning theories, entrepreneurial economics, strategic decisions*

## INTRODUCTION

Students are often overwhelmed by the content of class material in their first year. For instance, game theory in the study of oligopoly markets in entrepreneurial economics involves mathematical formulas to model business interactions and strategic decision-making. Given the complexity of mathematical models and their abstract nature, some students struggle to discover the relationship between concepts of game theory and their real-life applications in terms of strategic decisions in entrepreneurship practices. Thus, students are faced with a limited understanding of concepts of game theory and their practical use in real-life business strategic management. Consequently, students can potentially lose interest in the study of entrepreneurial economics, which often leads to difficulties in choosing the academic path that can fulfill their learning enthusiasm as they debut their college journey. This research study explores the functional areas in the design of an education game and how those functional areas align with learning theories in gamification. In the end, this study presents the theoretical framework supporting the use of a digital interactive business simulation game to facilitate the practical understanding of processes involved in management strategic decisions in the study of entrepreneurial economics given the potential to enhance students' knowledge acquisition and learning engagement.

## GROWING A BUSINESS FROM SCALABILITY TO SUSTAINABILITY

Complex processes of data-driven strategic management are taught in academic institutions through pedagogical practices that foster students' critical thinking and enhance their understanding of those complex managerial processes in the real world (Jones et al., 2017; Kuratko, 2011). Specialized managerial processes such as entrepreneurial learning, data-driven strategy formulation, creativity, problem-solving, and decision-making can be fostered through an engaging exercise of critical thinking in a business simulation game (Kriz, 2003). Fostering critical thinking is achieved through conceptual inquiries of strategic management, which consists of strategic planning leading to scalability and sustainability in a competitive market.

### Strategic Planning

Entrepreneurial thinking is understood as discovering the interconnectedness of economic activities and being able to craft a strategic plan to exploit opportunities (Jones et al., 2017). Strategic planning starts with the assessment of an enterprise's internal resources. Moreover, assessing the external business dynamic is critical to achieving the scalability and sustainability of a firm (Raduan et al., 2009). Hence, the success of a strategic plan depends on presenting a vision, setting reasonable objectives based on the enterprise's internal resources and market challenges, and formulating and implementing a strategy capable of harnessing opportunities in a competitive market (Kriz, 2003; Nuntamanop et al., 2013). Ultimately, the success of strategic planning is tested through the firm's growth stages of scalability and sustainability.

### Scalability

The primary goal of a firm is to optimize its competitiveness while remaining profitable in the long run. Such a goal begins with the ability to scale up the business (Nielsen & Lund, 2015). Students learn concepts of scale and scope in economics, business management, and marketing classes. While economies of scale primarily refer to reduction in the average cost per unit associated with increasing the scale of production for a single product type, economies of scope refer to lowering the average cost through product diversification (Nielsen & Lund, 2015). Thus, the term scalability used in the context of running a company implies the potential for economic growth within the company (Dyer & Ericksen,2006). Achieving scalability involves a business's ability to increase returns to scale from additional resources such as technology (Pedrinaci et al, 2008). Furthermore, a business can achieve scalability if flexible enough to optimize material assets, such as labor, machinery, financial capital, and other forms of resources (Nielsen & Lund, 2015). Finally, the firm's strategic approach to achieve economies of scale and economies of scope should align with the firm's vision in terms of value propositions offered to customers (Powell & Hughes,2016). In addition to resource management to achieve success in scalability, profitability is a crucial component for a business entity to achieve sustainability.

### Sustainability

The theory of profit-maximizing describes a business organization's main objective to maximize long-term profit by developing a sustainable competitive advantage over competitive rivals in an industry (Raduan et al., 2009). While the resource-based theory describes the management of internal resources that a business possesses to achieve scalability, profit-maximizing strategies allow the business entity to sustain the competition and remain a viable company in the long run. The need for adaptability in strategic decisions is important to sustain profitability while adjusting to changes in the marketplace (Deverell & Olsson, 2010). Strategic management emphasizes the importance of the relationship between the shareholders or owners and the agents or managers to ensure the success of the business (Freeman & McVea, 2001). Studies of strategic management have led to numerous economic models attempting to incorporate strategic planning, business scalability, and sustainability, to guide business decision-making. Examples are game theory models in entrepreneurial economics.

## MODELS OF STRATEGIC DECISIONS IN ENTREPRENEURIAL ECONOMICS

Game theory consists of economic models involving mathematic formulas and graphs depicting situations in which business leaders make strategic decisions that favor their businesses and alter the condition of the market in which they operate (Madani, 2010; Ozkan-Canbolat et al., 2016). In game theory, a decision-maker is referred to as a player, which can include individuals, groups, companies, and government (Webster, 2014). A payoff refers to the gains or losses in the game, which may be measured in terms of utility, profits, revenues, or market share. A strategy is the underlying rationale for a player's moves. A player's set of strategies is described as a strategy profile (Webster, 2014). There are two basic types of game models in game theory: static and dynamic. While players do not know the moves of other players in a static game, the players in a dynamic game or a sequential-move game take turns.

The most widely recognized model of game theory was established by John Forbes Nash, for which he received a Nobel Prize. In 1950, Nash formulated the notion of equilibrium which bears his name (Holt & Roth, 2004). One of the assumptions of Nash equilibrium describes strategies of multiple players in a competitive business interaction where nobody has an incentive to unilaterally deviate from their own strategy (Holt & Roth, 2004). Another assumption of Nash equilibrium suggests that all players adopt a strategy that is the best response to the strategies adopted by rivals. Based on these assumptions, each contender will stick to its strategy to obtain a better payoff at equilibrium (Holt & Roth, 2004; Webster, 2014).

Assumptions of Nash equilibrium have received some criticism from scholars. Schwartz (2015) argues that rational interplay does not necessarily lead to equilibrium even when assuming complete information and common knowledge. Schwartz (2015) explains that players sometimes have other strategies that might yield better outcomes than those leading to Nash equilibrium. Given that, Schwartz (2015) argues there can be no equilibrium if multiple opportunity pathways can lead to other outcomes, and therefore efface any possible Nash equilibrium. The possibility of Nash equilibrium being effaced is justified by the idea that players might not be fully rational to pick the strategy that might predict such equilibrium. Despite the criticism, most models of game theory have been developed based on assumptions in Nash equilibrium.

Utilizing the same assumptions in Nash equilibrium, equilibrium solutions based on output are highlighted in a Cournot situation, while the price equilibrium solutions are found in a Bertrand scenario (Rusescu, 2021). In their models, Cournot and Bertrand present scenarios of quantity equilibrium and price equilibrium models attained with strategic choices made simultaneously. Meanwhile, Stackelberg's model represents a perfect information, sequential game in which firms are engaged in quantity competition (Rusescu, 2021). Moreover, Stackelberg's model involving sequential strategic moves is considered dynamic, while strategic choices made simultaneously in Cournot and Bertrand describe static models. In the context of learning business decisions in game theory (the study of oligopoly market structures in economics), complex mathematical formulations are employed to model business interactions and strategic decisions (Madani, 2010; Ozkan-Canbolat et al., 2016). Given the complexity of mathematics, educational games are used to illustrate strategic decisions to facilitate students' understanding of the underlying concepts of game theory involving strategic decisions (Dixit, 2005).

## THE DESIGN OF AN INTERACTIVE GAME

The survival of an enterprise in a competitive market depends on sound managerial decisions leading to two important business growth stages: scalability and sustainability. The conceptual description of scalability and sustainability can be abstract, and therefore difficult to visualize in a traditional teaching approach. As such, an interactive game to simulate processes of management decision formulation leading to scalability and sustainability ought to incorporate three essential functional areas: Game mechanics, learning mechanics, and assessment mechanics (Turkay et al., 2014). Figure 1 illustrates these three functional areas.

### Game Mechanics

Game mechanics describe essential gameplay activities where students' behaviors are guided by well-established rules of moves and countermoves. The game's artifacts in the game design are the tools employed to execute moves and countermoves to implement a strategic decision after a consensus is reached among members of a team. Those moves and countermoves are motivated by learning objectives, which are executed through the game's learning mechanics (Turkay et al., 2014).

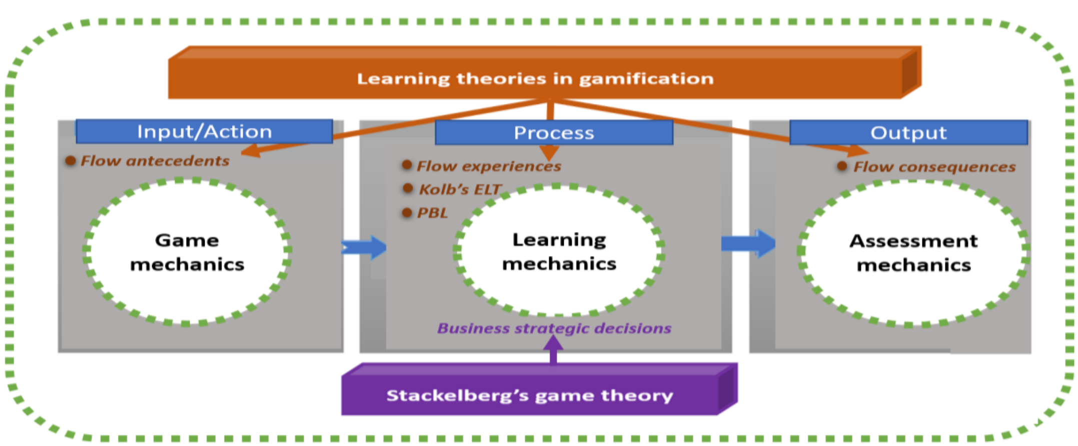
## Learning Mechanics

The learning mechanics of the game facilitate the execution of learning objectives, which represent the core knowledge that is to be acquired by students through the game (Turkay et al., 2014). In this study, for instance, the learning objectives in the design of the interactive game are to simulate management decision-making processes to grow a business from scalability to sustainability in a competitive business environment. Thus, the abstract nature of concepts of scalability and sustainability can be visualized through the game's narrative involving a business competition between two companies. Furthermore, learning mechanics in the design of an interactive game ought to be supported by learning theories (Turkay et al., 2014). In this study, learning theories involved in the design of the interactive game include the *flow theory* in interactive game-based learning, *Kolb's experiential learning* theory, and *problem-based learning*. In the end, students' learning experience is evaluated through assessment mechanics.

## Assessment Mechanics

Even though assessment mechanics can be theoretical in nature, they can be operationalized into a game in a way that knowledge acquisition can be measured. The learning objectives of business decisions leading to business growth of scalability and sustainability can be assessed in an interactive game based on the conceptual understanding of scalability and sustainability. While scalability is described as the phase where each entrepreneur is trying to develop economies of scale, meaning lowering average total cost as output increases, sustainability is understood as the phase where the entrepreneur is trying to increase profitability, cash level, and market share. Based on their conceptual definitions, assessing students' understanding of scalability and sustainability can be achieved through computation tests where students will demonstrate their skills in computing the cost of goods purchased, revenue, and profit related to business decisions in various market segments. Moreover, the learning mechanics of the game can help students better understand the roles that computed values of cost of goods purchase, revenue, and profit play in achieving scalability and sustainability in a business competition. In summary, functional areas in the design of an interactive game such as *game mechanics*, *learning mechanics*, and *assessment mechanics* presented by Turkay et al. (2014) are essential in describing the theoretical framework of this research study as indicated in Figure 2. The following describes the juxtaposition of the functional areas in the design of an interactive game and the theoretical framework of this research.

**FIGURE 1**
**FUNCTIONAL AREAS IN THE DESIGN OF AN INTERACTIVE GAME**




Note: Kolb's Experiential Learning Theory (Kolb's ELT), Problem-based Learning (PBL)

## LEARNING THEORIES IN GAMIFICATION

Among multiple definitions found in the literature, gamification is defined as a) the creation of a game to serve any non-entertainment goal or b) the transformation of an existing system into a game (Seaborn & Fels, 2015). In the context of education, the term "gamification" refers to digital game-based learning. Thus, gamification is understood as the use of the mechanics of a game and the thinking involved in a game to engage people, motivate action, promote learning, and solve problems (Seaborn & Fels, 2015). In this research study, the conceptual understanding of the term gamification, which refers to interactive game-based learning, involves three learning theories including the flow theory in game-based learning, Kolb's experiential learning in a group, and problem-based learning.

### The Flow Theory

The general assumption about game-based learning as an instructional strategy is that it offers a unique opportunity to immerse students in an experiential learning process where complex entrepreneurial concepts and practices are learned through a constructivist approach to knowledge formation (Kriz, 2003). The expectation is that the active participation of students in the construction of knowledge, in a context of live competition with instantaneous feedback of success or failure, will better equip students with the aptitude of strategic thinking needed to survive market uncertainties in today's global economy (Kriz, 2003).

The success of a game design is measured by the extent to which it generates a positive effect on players and facilitates the attainment of optimal experience (Kiili, 2005). When in a state of optimal experience, a person is in a psychological state where goal-driven activities are what matters the most. A proposed model of person-artifact-task (PAT) conceptualizes the major components of a state of optimal experience. According to the model, the extent to which a person working on a computer-related activity attains optimal experience is dependent on the interplay between the person, the task, and the artifact (Kiili, 2005). Hence, the main contribution of the PAT model to the flow theory is to describe how optimal experience takes place through various stages of flow involving the task itself, and the use of artifacts by individuals.

### Problem-Based Learning

Bethell & Morgan (2011) explain that problem-based learning (PBL) can be understood as experiential learning in a specific learning context. PBL is a teaching approach that uses realistic, problematic scenarios. The first step is for students to identify what they know already, they then research the areas where they have identified gaps in their knowledge and finally present an informed solution. Also, Hmelo-Silver (2004) asserts that, in problem-based learning, students are exposed to complex problems that do not have a single correct answer.

Hmelo-Silver (2004) explains that the goals of problem-based learning include helping students develop a) flexible knowledge, b) effective problem-solving skills, c) self-directed-learning skills, d) effective collaboration skills, and e) intrinsic motivation. Problem-based learning follows a learning cycle that starts with a problem scenario and then facts are identified, hypotheses are generated, knowledge deficiencies are identified, and new knowledge is applied (Hmelo-Silver, 2004). Furthermore, Jonassen (1997) identifies problem-based learning as an instructional approach to solving ill-structured problems. Understood as the kinds of problems that are encountered in everyday practice, ill-structured problems are typically emergent dilemmas. Because they are not constrained by the content domains being studied in classrooms, their solutions are not easily predictable, and they may also require the integration of several content domains (Jonassen, 1997).

### Kolb's Experiential Learning Theories

Experiential learning is defined as learning through experience with learning understood to be the basic process of human adaptation (Kolb & Kolb, 2009). Thus, Kolb's experiential learning theory is considered as a holistic theory that defines learning as the major process of human adaptation applicable in the formal education classroom and other areas of real life. The holistic view of learning in Kolb's experiential learning theory involves a process of constructing knowledge along an ongoing interaction of four learning styles, which are a) active experiment in a context of concrete experiment, b) active experiment in a context of abstract conceptualization, c) reflective observation in a context of concrete experiment, d) reflective observation in a context of abstract conceptualization (Kolb & Kolb, 2009; Kayes et al., 2005). Thus, these four learning styles are part of a holistic learning mechanism by which teams can transition from lower to higher developmental stages.

Team members experiment with the four experiential learning styles and develop a decision-making process by reflecting on their experience through conversations that examine and integrate differences in members' cognitive experience (Kolb & Kolb, 2009). These three learning theories in gamification aim at fulfilling the learning objective of an interactive game through learning mechanics. The learning objective consists of applying concepts of game theory in the process of making business decisions in a lived experience. In the end, assessment mechanics involved in the design of an interactive game help evaluate students' knowledge and learning engagement as they are actively learning concepts of strategic decisions in game theory.

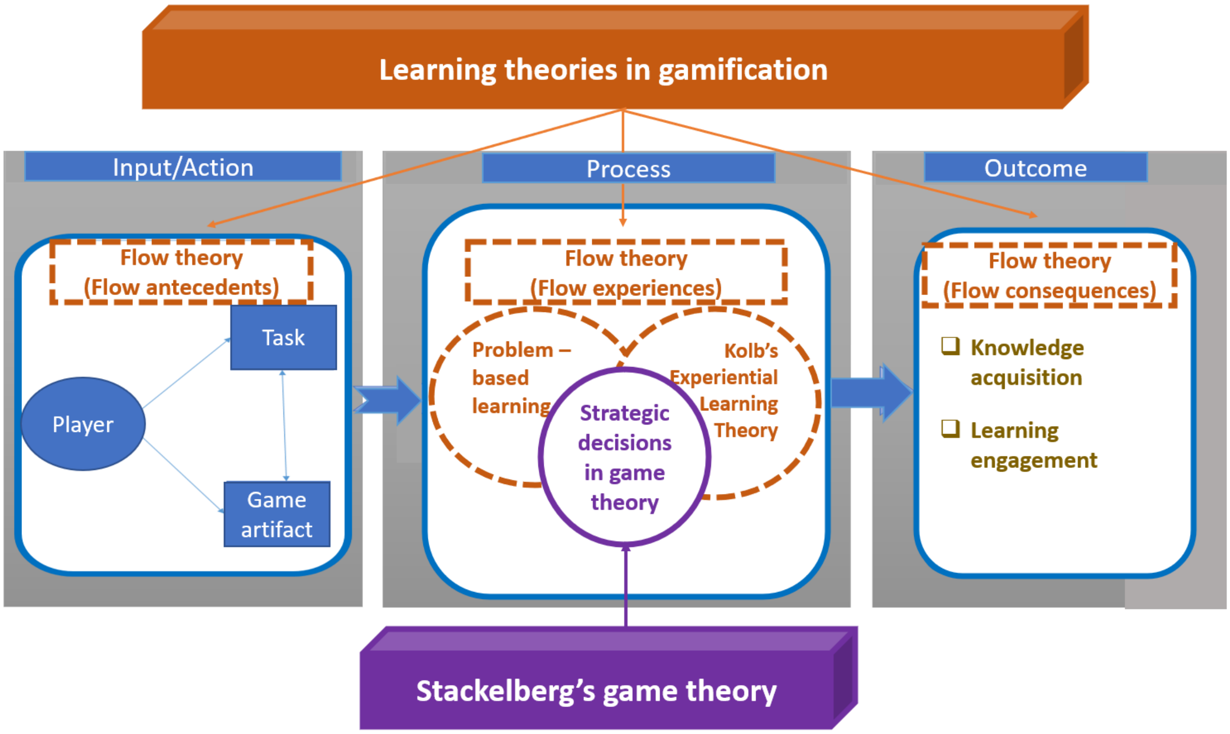
## THEORETICAL FRAMEWORK SUPPORTING THE USE OFAN INTERACTIVE GAME

The learning objective pursued in this interactive business simulation game is to engage students in making strategic decisions to grow a business from scalability to sustainability in an ongoing business competition. The proposed theoretical framework for the use of interactive business simulation games explains the process by which learning theories in gamification facilitate the practical application of concepts of strategic decisions in game theory. Such a process in the theoretical framework unfolds along three stages: ***Input, process,*** **and** ***outcome***. These three stages align with the functional areas in the design of an interactive game, which are *game mechanics*, *learning mechanics*, and *assessment mechanics.*

The ***input*** stage in the theoretical framework involves the *game mechanics* in the design of an interactive game where interactions between the players and the game's artifacts are initiated (see Figure 2). Such a stage of interactions between the players and the game's artifacts is also identified as the flow antecedent in the flow theory. The ***process*** stage in the pedagogical framework is where the *learning mechanics* in the design of the game facilitate the use of learning theories in gamification (see Figure 2). In that phase, students' intense interaction with the game's artifacts leads to flow experiences in the flow theory. During the Flow experiences, students are involved in problem-based learning as they are actively engaged in solving business challenges. Moreover, learning styles in Kolb's experiential learning theory enhance students' ability to examine and integrate each member's reflection in final strategic decisions in game theory. In the ***outcome*** stage of the theoretical framework, game participants reach flow consequences in the flow theory where the outcome of entrepreneurial knowledge acquisition and learning engagement are measured through *assessment mechanics* in the design of the interactive game (see Figure 2).

The outcome of learning engagement is reflected in team members' motivation to apply concepts of strategic decisions and win the simulated business competition in the interactive game. In conclusion, the three phases of *input*, *process*, and *output* in the theoretical framework proposed in this research study are supported by the functional areas in the design of an interactive game, which are *game mechanics*, *learning mechanics*, and *assessment mechanics* presented by Turkay et al. (2014). Furthermore, the authors assert that learning mechanics in the design of an interactive game ought to be supported by learning theories.

**FIGURE 2**
**THEORETICAL FRAMEWORK SUPPORTING AN INTERACTIVE GAME**




## KNOWLEDGE ACQUISITION AND LEARNING ENGAGEMENT ININTERACTIVE GAME

Game theory involves economic models such as Stackelberg's game theory model to illustrate interactions among competing business entities. Such interactions are understood through business decisions leading to strategic actions (Madani, 2010). Thus, economic models with mathematic formulations depict situations in which business leaders make strategic decisions that favor their businesses while altering the condition of the market in which they operate (Ozkan-Canbolat et al., 2016). Numerous static games such as the prisoner's dilemma are used to illustrate strategic decisions in business economics involving Nash equilibrium. In this research study, an interactive game-based instructional approach is proposed to illustrate the process of strategic decisions portrayed in game theory. The choice of an interactive game is to enhance knowledge acquisition and learning engagement.

### Knowledge Acquisition

Today's world of globalization presents problems and situations with a high level of complexity that people, groups, and organizations are confronted with (Kriz, 2003). Interactive games in education offer the advantage of integrating knowledge of various disciplines and making complex living contexts understandable. As such, interactive games involve dynamic models of real situations where processes, networks, and structures of specific existing systems are mimicked (Kriz, 2003). Moreover, interactive games incorporate players engaged in experiential learning involving reflective conversation and various learning styles in the experiential learning process (Kolb & Kolb, 2009). Thus, specialized managerial processes such as entrepreneurial learning, strategy formulation, creativity, problem-solving, and decision-making can be learned through an engaging learning process (Kriz, 2003). Moreover, the effectiveness of an interactive game-based instructional approach involves selecting the appropriate topic and defining the mode of assessment (Lengyel, 2020).

In effect, the learning mechanics of an interactive game ought to convey specific knowledge and emphasis should be placed on topic content, skills, and attitudes (Lengyel, 2020). As such, the extent to which the learning mechanics of an educational game help develop knowledge and skills to solve problems determines the pedagogical effectiveness of a gaming simulation (Kiili, 2005; Proulx et al., 2017; Plass et al. 2015). In the context of solving challenges to grow a business from scalability to sustainability in a competitive business environment, specific business management knowledge and skills are needed. First, the growth stage of scalability is achieved through the reduction of unit cost as output increases (Vlachos & Malindretos, 2015). Next, an enterprise's sustainability performance is realized through the stability and continuity of its supply chain network in making products or services and delivering them from suppliers to customers with higher profit (Vlachos & Malindretos, 2015). Thus, profitability is a crucial metric to assess the sustainability of an entrepreneurial venture. Hence, assessment mechanics to evaluate students' knowledge and skills to grow a company from scalability to sustainability involve computation tests. The learning objectives of business decisions leading to business growth of scalability and sustainability can be assessed in an interactive game based on the computation of cost of goods sold, revenue, and profit related to business decisions. Computational skills developed through the learning mechanics of the game will help students better understand the roles that computed values of cost of goods sold, revenue, and profit play in achieving scalability and sustainability in a business competition.

**Learning Engagement**

As an experiential learning approach, the use of an interactive game for educational purposes has the potential to motivate and engage students while facilitating the discovery of the relationship between theory-based knowledge and practical application (Lengyel, 2020; Urquidi-Martín et al., 2019; Vlachopoulos & Makri, 2017). Learning incentives such as student freedom, different learning paths, and immediate feedback explain students' commitment to learning through an interactive game (Lengyel, 2020). Moreover, a shared goal of team success in a competitive environment presents a unique opportunity for members to be engaged respectfully and be receptive to differing points of view given instantaneous feedback in a live simulation. In contrast to traditional paper test examination or a case study that takes weeks to get feedback, instantaneous feedback in a live simulation of a business competition presents the opportunity for prompt adjustment of learning styles to respond to ongoing challenges (Kolb & Kolb, 2009; Lengyel, 2020). Such initiatives of extemporaneous adaptation create a teamwork dynamic that nurtures individual and team engagement.

The interaction among the four learning modes proposed in Kolb's experiential learning theory in a group engages the learner in a process of learning cycle where action or reflection can be initiated in two possible contexts: concrete experience or abstract conceptualization (Kayes et al., 2005). Thus, the availability of four learning styles offers the learner some level of adaptability and freedom which prevents confinement in constructing knowledge and leads to intrinsic motivation (Kolb & Kolb, 2009). Learning motivation includes measures of students' participation level of interest and attitudes within specific learning domains (Ainley, 2004). Moreover, extrinsic motivation potentially derives from a shared image of the team, called executive consciousness that enables learning and problem-solving as a team attempts to respond effectively to the challenges presented (Kolb & Kolb, 2009). Hence, interviews, opinion surveys, and observation notes taken during team competitions can provide insights regarding a student's participation and engagement.

In summary, learning objectives in the design of an interactive game simulate the application of concepts of game theory involved in the process of making entrepreneurial decisions to grow a business in a competitive environment. Learning mechanics in the design of the game facilitates the execution of learning theories, which include the *flow theory, Kolb's experiential learning theory,* and *problem-based learning*. Executed through the game's learning mechanics, these learning theories unfold along stages of Input, Process, and Output. In the end, knowledge acquired by students and their learning motivation are evaluated through the game's assessment mechanics.

## CONCLUSION

In conclusion, the design of an interactive game aims at simulating the application of concepts of game theory involved in the process of making strategic management decisions to grow a business in a competitive environment. Learning mechanics in the design of the game facilitates the execution of learning theories, which include the *flow theory*, *Kolb's experiential learning theory*, and *problem-based learning*. Executed through the game's learning mechanics, these learning theories unfold along stages of Input, Process, and Output. In the end, knowledge acquired by students and their learning engagement are evaluated through the game's assessment mechanics.

The design of an effective digital interactive business simulation game, which incorporates managerial processes such as business analytics, creativity, problem-solving, and decision-making, has the potential to motivate and engage students collaboratively while facilitating the discovery of the relationship between theory-based knowledge and practical application (Lengyel, 2020; Vlachopoulos & Makri, 2017). Thus, instructors teaching business analytics, economics, and business strategic management in post-secondary educational institutions can benefit from this study as they try to incorporate game-based learning as part of their instructional strategies to improve students' learning experience in community colleges. Considering the importance of entrepreneurship in national and global economic growth, this study presents an opportunity for national and global educational institutions to further explore the value added of a digital interactive business simulation game when it comes to 21st-century collaborative skills development in Business Analytics, Strategic Management, and Economics education.

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## APPENDIX

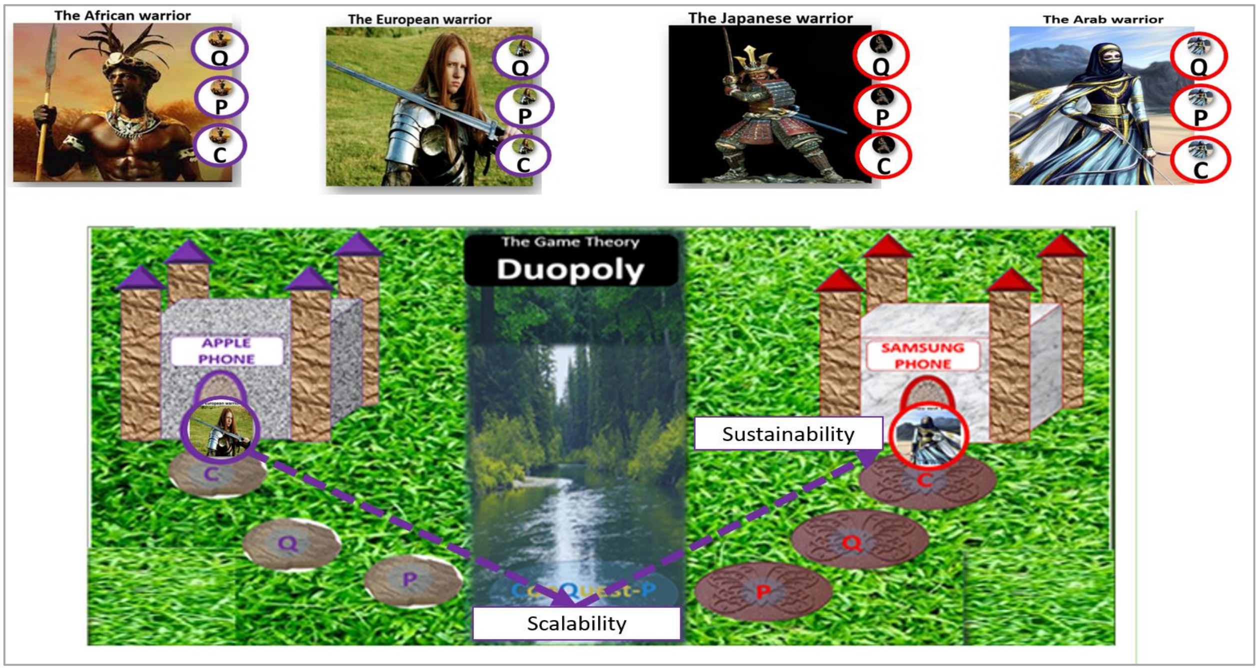
### Digital Interactive Game Designed for Teaching Business Analytics and Strategic Decisions

Interactive games engage students in an ongoing business competition where they learn to formulate strategic decisions in a learning context of continuing business adversity. Entrepreneurship practices involve business decision-making in a business environment that is constantly evolving. The survival of an enterprise depends on the extent to which it can generate enough sales revenue to cover its operational expenses and make a profit while navigating a competitive business environment. This interactive game offers the possibility to simulate business interactions involving survival skills so that students can learn to make business decisions in the context of ongoing business adversity. Thus, the design of this interactive game to teach entrepreneurship practices incorporates key business concepts, such as business growth stages of scalability and sustainability. Scalability is described as the starting business growth stage where each entrepreneur is trying to develop economies of scale (lowering average total cost as output increases). Following the growth stage of scalability, sustainability is understood as the phase where the entrepreneur is trying to increase profitability, cash level, and market share. The learning objectives of the interactive game consist of growing a business from scalability to sustainability, and the following provides a brief description of such learning objectives, moves, and countermoves leading to business growth stages of scalability and sustainability.

### Learning Objectives

The learning objective in this interactive game-based lecture is to simulate decision-making processes to grow a business from scalability to sustainability in a competitive business environment. Given that business growth stages of scalability and sustainability take place over years in real life, an interactive business simulation game offers the opportunity to simulate those fiscal years and business decisions in a way that prompt and adaptive business decision-making can be fostered in a simulated setting. Thus, the abstract nature of concepts of scalability and sustainability can be visualized through the game's narrative involving a business competition between two companies: Apple and Samsung. First, scalability is achieved when a contender reaches the river as indicated in Figure 3. That means the business has attained economies of scale through unit cost reduction. Next, sustainability is achieved when a contender crosses the river and conquers the opponent's castle. In our illustration, Apple reaches the river, crosses, and conquers Samsung's castle. That means Apple dominates the market.

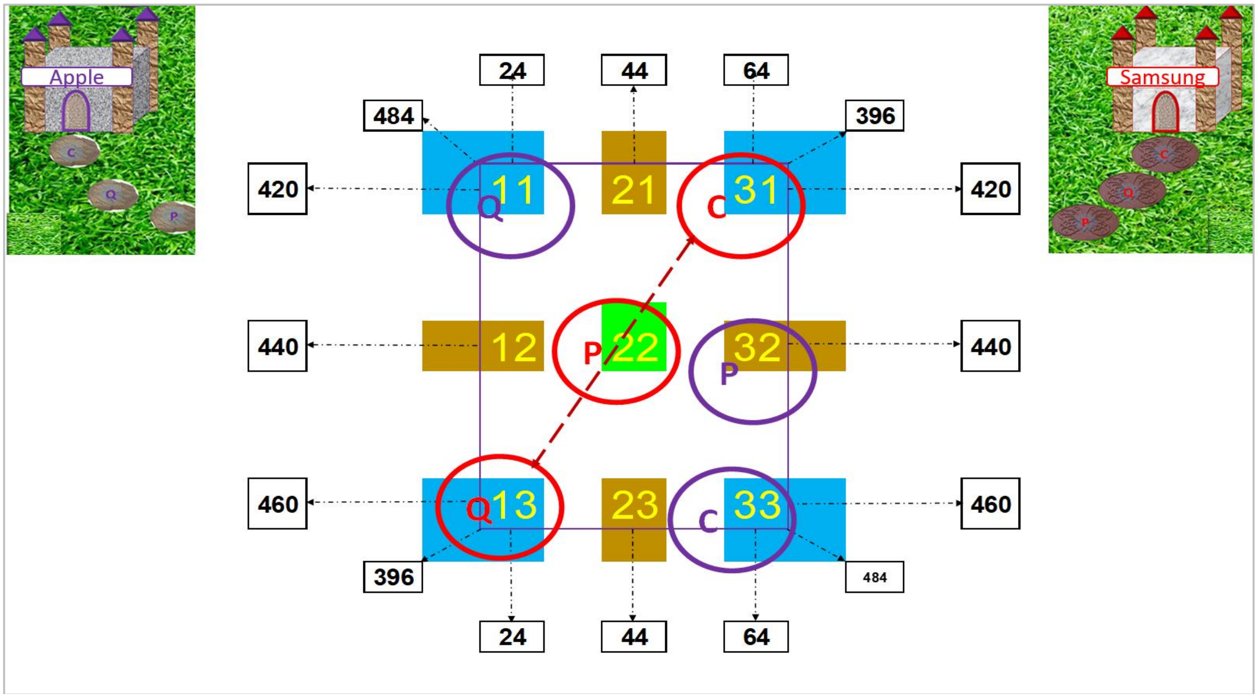
**FIGURE 3**
**GROWING A BUSINESS FROM SCALABILITY TO SUSTAINABILITY**




**Moves and Countermoves to Achieve Scalability and Sustainability**

Scalability and sustainability are achieved through moves and countermoves performed on the gameboard as depicted in Figure 4. Contenders have three pieces to place on the gameboard by taking turns. Given that moves are made sequentially, a coin toss helps determine which contender goes first. After all the pieces are placed on the gameboard, they are moved on the gameboard vertically, horizontally, or diagonally through market segments. Skipping a spot or jumping over a piece to reach an empty spot is not allowed. The depiction in Figure 4 shows that Samsung won the round because a straight line can connect its three pieces. Thus, Samsung realizes a profit of $396,000 (profit indicated on the peripheral of the gameboard are in thousands) while Apple incurs a loss of $161,000 (the computation of a loss is shown in figure 8).

**FIGURE 4**
**GAMEBOARD DEPICTING NUMERIC DATA IN THE MARKETPLACE**




Note: Data are collected at the end of a simulated fiscal year (a fiscal year is one round in the game). Numbers on the periphery of the gameboard are profit computed in thousands. Students will learn how to compute those numbers.

*Achieving Scalability*

In this business simulation, scalability is achieved through winning multiple rounds (each round represents a fiscal year) with a $ 50, 000 cash reward for each. At the end of year one, the graph in Figure 5 shows that both companies have a cash level of negative $100,000. With the assumption that Apple wins two rounds, Apple is rewarded $50,000 for each win and the company's cash level reaches zero or breakeven at the end of year 3 (See Figure 5).

**FIGURE 5**
**CASH REWARD ANALYTICS IN ACHIEVING SCALABILITY**


*Achieving Sustainability*

Before achieving sustainability, Apple will first achieve scalability by winning two rounds with a reward of $50,000 for each win and reach a cash level of zero or breakeven at the end of year 3 as depicted in Figure 5. After achieving scalability, Apple will achieve sustainability with three additional wins. Each win is rewarded with $50,000 and Apple ends up dominating the market with a cash level of $150,000 as indicated in Figure 6.

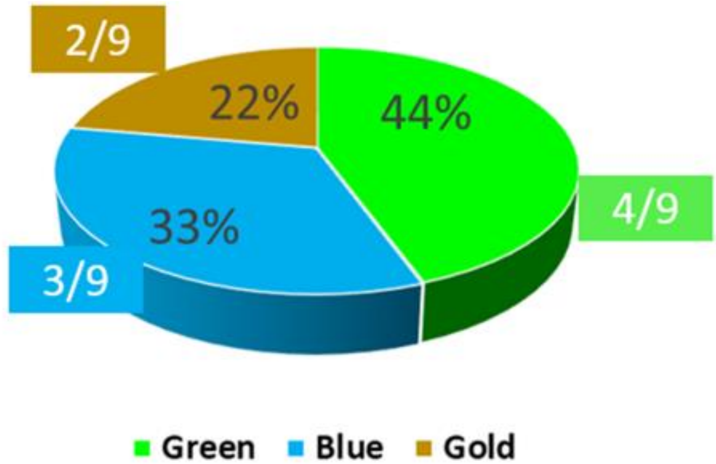
**FIGURE 6**
**CASH REWARD ANALYTICS IN ACHIEVING SUSTAINABILITY**


## Market Segments and Computation of Losses

*Market Segments*

Market segments are identified as the green spot with 4 possibilities of winning, the blue spots with 3 possibilities of winning, and the gold spots with 2 possibilities of winning as shown in Figures 4 and 7. Strategic decisions involving cost(C), quantity(Q), and price(P) are formulated along those market segments. Successful strategic decisions should lead to a straight line drawn through a contender's three pieces with letters "C", "Q", and "P" as shown in Figure 4.

**FIGURE 7**
**MARKET SEGMENTS' PERCENTAGE WEIGHTS**

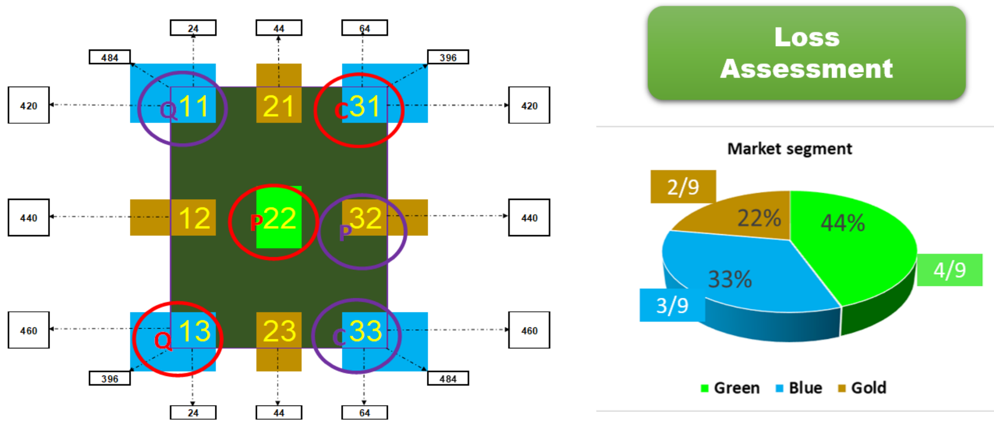



*Losses Computation*

Computations of cost of goods purchased, cost of goods sold, revenue, and profit incorporated in the interactive business simulation game provide an understanding of business metrics related to business growth stages of scalability and sustainability. In Figure 4, contenders' pieces on the gameboard provide numeric values of costs, quantities, and prices to compute costs of goods purchased, costs of goods sold, revenue, and profit. Numbers on the periphery of the gameboard are profits made when a contender wins. As indicated in Figure 4, Samsung wins with a profit of $396,000 (profit on the gameboard is in thousands).

The cost of goods purchased is computed to assess the loss of a contender in a round. As indicated in Figure 8, values of unit cost and quantity are obtained on the gameboard. When a contender loses a round, the loss is assessed by determining the portion of the cost of goods purchased that was not sold. The total market opportunity is 9 out of 9. Apple's market opportunity realized is obtained by adding the market opportunity of letters "P" and "Q". These letters indicate the market segments in which the company's sales were made. The letter "P" is in the gold market with a market opportunity of 2/9 and the letter "Q" is in the blue market with a market opportunity of 3/9. Therefore, Apple's market opportunity realized is (2/9) + (3/9) = 5/9, and market opportunity missed is (9/9) – (5/9) = 4/9. As a result, Apple's loss is (4/9) *(cost of goods purchased) = (4/9) *363. The final estimated loss is equal to $161,000 as indicated in Figure 8.

**FIGURE 8**
**DATA COLLECTION AND THE COMPUTATION OF LOSSES**




| | Total cost of goods purchased (CGP) | | |
|---|---|---|---|
| | Cu | Q | CGP |
| Apple | 33 | 11 | 33x 11= 363 |

| Market segment assessment | | |
|---|---|---|
| Total market opportunity | Market opportunity realized | Market opportunity missed |
| 9/9 | 5/9 | 4/9 |

| Loss Assessment Equal or less than 484 | |
|---|---|
| CGP | Final loss |
| ( 4/9 ) x ( 363 ) = 161 | 161 |