

Strategy Simulation in Design

The Role of Simulation in Exploring Both Business & Design Decisions

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Abstract: In this paper, we discuss a simulation method that allows students to experience the many typical and often underlying forces of product management and design. Given the dynamic nature of strategy and product portfolio management, it is often difficult to convey the actions necessary to juggle multiple and sometimes conflicting constraints or opportunities within a business context. For the past five years, over 200 students in 15 offerings of a Product Portfolio Management class have been using this simulation technique to combine the different perspectives of business and design and how they inform strategic decisions over time. The simulation has been successful at helping design students understand the dynamics involved in product management and how design choices can influence, and be influenced, by business forces. In particular, it helps the students extend their thinking beyond a single product or service into the considerations necessary to manage an entire portfolio of products and services. It also gives them insights into competitive issues beyond cash flow efficiency and profitability, so they come to realize, for instance, that competitors do not necessarily share the same objectives – making it possible for more than one organization to “win” at the same time.

Key words: *Simulation, Design Strategy, Product Planning, NPD, Product Management*

1. Introduction

In this paper, we discuss an opportunity for business and design consilience that we have designed and used with graduate design students learning about modeling multiple business offerings at the IIT Institute of Design in Chicago. For the past five years, over 200 students in 15 offerings of the Product Portfolio Management class have been using a simulation exercise to expose typical and often underlying forces of product planning/design and competition. Although this level of business knowledge is not typically included in design curricula, we feel it is important and valuable to students who will work in leadership positions.

2. Leveraging business simulations for better business planning

2.1 Simulations and business planning

As businesses evolve under constant competitive pressures, their product mix is increasingly difficult to manage. Businesses continue to blend services and products, as well as brands and channels, to serve ever narrowing and multiplying customer segments. Incomplete, and often ambiguous, data on product/market performance, combined with these multifaceted offerings, blurs a manager’s vision to options and potential paths

forward. Tools to explore and clarify these choices remain few. Traditional business simulations offer some promise, but have yet to engage the full nature and challenges of today's product portfolio management.

For decades business simulations (and business games) have been used to provide managers and students opportunities to learn experientially. Usually this is done through managing a hypothetical company and market for a predetermined amount of time or specific challenge. The specific solutions vary greatly from market prediction, to management scenarios, to strategic explorations, and can exist in many forms from computer-based modeling to interactive role-playing [12, 13, 14, 16, 8]. Often, the main metric of these simulations is how well participants can forecast or achieve particular financial success. And while this is important, it can obscure other equally important elements of product planning including competitive strategy and risk management.

2.2 Complexity of simulations for business

For professionals that manage real world product portfolios, market urgency and incompleteness of information weigh heavily. Business leaders need to fill in gaps of information, cut through ambiguity, and effectively identify trends from which to direct choices for their businesses. Often the complexity of markets and a firm's product lines constrains strategic planning efforts to one or two viable courses of action, reducing the opportunity to explore assumptions and less obvious choices [7].

Those who try to expand their view are quickly overloaded with second order implications and options. This forces the firm to either oversimplify the market or else choose to ignore some portion, in order to somehow contain the investigation. Aggravating this further, oftentimes relevant information can only be seen in hindsight once events have unfolded. And more importantly, it is only during the actual interactions with market forces that goals and tactics are understood and crystallized, rather than their being understandable a priori [3, 7]. As the military strategist von Moltke famously wrote: "no campaign plan survives first contact with the enemy." What is needed is a simulation method that allows participants to truly explore their businesses, markets, and choices by experientially drawing out tacit and emergent insights.

3. Related Literature

Games, and in particular simulation games, have been widely used in business, in self-directed learning, and in the classroom. According to [9], the modern use of business games began in 1955 at Rand Corporation, and there have been dedicated journal and conferences for over 40 years (e.g. Simulation and Gaming; Absel). While some scholars (e.g. [1]) point out that the assessment of the learning effectiveness of simulation games is still not robust, others (e.g. [2, 8]) are less equivocal on the subject of their value, especially in business management processes and business strategies. [18] points out that another common use is for teaching concepts in marketing. For example [11] created a game that showed tactical positioning on a map that corresponded to statistics of sales in a particular market at a given time, and found a strong correlation between the conditions of the game and the actual changes in the market.

However, [12] rightly points out that even the best-designed game will not be of practical advantage to a corporation unless it is aligned with the right context, which consists of a moderate level of uncertainty, where there is a discrete set of possibilities to be tested. [12] also suggests that the roster of players should not be too homogeneous, since one advantage of a game is to include a diversity of perspectives. While it could be argued that a design school simulation violates this condition, our admissions practice has tended to include 50% of the

students from backgrounds other than design, which results in more interdisciplinarity if not an actual range of corporate job descriptions.

In addition to these factors, another issue that frequently arises in discussion of business game simulations is the balance between real-world complexity and the level of simplicity necessary to make the game accessible to first-time players. In this context, [4] examine the various ways in which businesses deal with the problem of complexity, and identify four key approaches: strategic chunking, sequential elaboration, organizational specialization and coordination, and intermediate measures of performance. Each of these approaches has implications for game design, as does the later discussion in [5] of the tradeoff between information-load and uncertainty. In our case, the paradox is present in our representation of profitability among competing products in a single cell, which we average for purposes of simplifying the necessary calculations (further discussion below).

3.1 Simple taxonomy

More broadly, the field of serious simulation and gaming can be subdivided into three areas. First are simulation games, which are used most often in advanced business schools (e.g. [6]).

The second grouping is role-playing games, such as Business Tycoon Online, which has over 600,000 registered players. The focus of these games is to accumulate wealth against other real world players in a moderated environment.

The final grouping consists of those simulations used in consulting or business operations. They tend to lean toward modeling software, using a variety of techniques such as agent-based modeling, linear programming, and system dynamics [10]. However, as described in [4], it is also not uncommon for executives to use wargames as a way to better understand the interplay of factors in strategic planning.

4. A Simulation Game for Product Portfolio Management

4.1 Context of the simulation

At the IIT Institute of Design we hold a seven-week class on the methods and strategies for product and service portfolio management. The objective of this class is to help designers bridge the worlds of concept development and business optimization. The course is an introductory-level class, giving designers some exposure to the process of managing multiple products over time rather than the traditional approach for design of defining a single product in isolation. In doing so, students can develop a deeper understanding of real-world dynamic business challenges and how best to manage those constraints for successfully developing a set of concepts. The students in the class are given a seven-week paper to explore an assigned portfolio and provide recommendations applying the topics covered throughout the class.

Given the dynamic nature of strategy and portfolio management, it is often difficult to convey the actions necessary to juggle multiple and sometimes conflicting opportunities within a business context. Using a simulation game can help students experience this dynamic directly, making tangible the interactions between a given portfolio of offerings and their competing sets of products. The goal of the game is not to be a planning tool, but rather to be a planning experience, supporting the pedagogy of the class by providing hands-on immersions in strategic decision-making. Simulations of this type are often used in educational settings for their impact on engagement, internalization, and retention of critical concepts [1].

To use the simulation, the class is broken up into teams based on their assigned portfolios. The game is structured to emphasize competitive interplay and how that might affect the business and design choices as a portfolio evolves. The simulation attempts to assemble as many of the relevant elements as possible, providing students with the chance to look at different perspectives by focusing on the significance of the various factors such as timing (e.g. what is the trajectory or momentum over the last 6 moves), the velocity of change, and the types of changes that are happening or are possible at any given time.

4.2 Overview of the simulation

The simulation game works best for four players (or teams) each representing a company and responsible for a set of products in a predefined market. The game board is a large table of five price tiers on the vertical axis and four customer segments along the horizontal axis [Figure 1].

Each game session has a set-up step to help the teams get started, where all of the players discuss the common price tiers and customer segments they would like to use. This activity alone is a great source of discussion on how a company determines and describes their market positions. Once common prices and customers are determined, the players each place their products in the corresponding cell that closest represents their real world position. After all pieces are placed, the size of each customer segment is determined by the instructor. The determination of sizes is somewhat arbitrary, but can be used to ensure that useful competitive dynamics reveal themselves during game play. This completes the starting point for the game.

Water Purifiers		Segment A Name: <u>Home CEOs</u> Size: <u>50</u>	Segment B Name: <u>Outdoor</u> Size: <u>20</u>	Segment C Name: <u>Students</u> Size: <u>5</u>	Segment D Name: <u>Techies</u> Size: <u>10</u>
Tier options	Price Tiers				
A \$200 B \$500 C \$1000	\$200				
A \$150 B \$400 C \$800	\$150				
A \$100 B \$300 C \$600	\$100				
A \$50 B \$200 C \$400	\$50				
A \$10 B \$100 C \$200	\$10				

Figure 1. Typical Simulation Board

4.3 Playing the simulation

Once the game board is set with products placed at their price point and customer segment, the teams are asked to reflect on their positions, determine goal(s), and imagine viable strategies to achieve the goal(s). Two factors influence their ability to succeed – the actions of the other players and random market conditions they must react to on each turn.

In a round-robin fashion each team takes a turn, which can be one of three actions. 1) reposition a product, 2) add an new product, 3) remove a product. Each action costs a sum of money, which is adjusted based on the tier

of the market they are moving to. Before any action can be taken however, the team selects a card that describes a market or business condition they must react to. Some of these conditions limit, and some enhance, the actions the team can take. This method of selecting conditions provides a realistic degree of randomness, introducing constraints that range widely and often happen in real-world situations. Examples range from external factors like a market shift in aesthetic preferences to competitive elements like pricing strategies or even price wars. Also included are internal factors like political infighting, conflicting consumer insight, and new leadership. [Table 1]

Table 1. Market Conditions

	Positive	Negative
Internal conditions	<ul style="list-style-type: none"> • Budget increase • Actionable customer insight • Product platform reduces overall costs 	<ul style="list-style-type: none"> • Political infighting • CEO micro-management • Organizational restructuring • Product failure
External conditions	<ul style="list-style-type: none"> • Celebrity endorsement • Product wins tradeshow award • Unexpected growth of customer segment 	<ul style="list-style-type: none"> • Competitor sues • Loose channel to competitor • Supply vendor goes bankrupt • Competitor is first to market • Price war

4.4 Conclusion of the simulation

Upon the conclusion of a round, the teams calculate their revenue based on price tiers and customer segment sizes. We purposefully simplify this area of business to deemphasize the role of cash flow and profitability. Cells where there are competing products split evenly the revenue that the cell generates. Once the summing is complete, the next round begins. Play continues for as long as possible. Usually around 5-6 rounds is enough to reveal useful patterns and issues involved. At the beginning of the game, students are allowed to change only a few factors in a single move, but by the end of the game they are planning three moves ahead for all the factors under their control. This approach simulates the difficulty of having businesses attempt to plan ahead using multiple tactics while simultaneously reacting quickly to changing conditions.

4.5 Debriefing

Upon completion of the simulation game, all students are asked to participate in a debriefing, where the instructor recounts the game play and begins to point out the differences between the game and the reality of portfolio management [15]. This elicits many fruitful discussions about how choices are formed and made within the dynamics of a moving market. Among the typical topics covered, the most common ones relate to how the game over-simplifies certain market attributes like unevenly distributed and fuzzy customer boundaries, or different cost structures to deliver offerings to market within the same portfolio. Some of the less obvious, but equally compelling, insights are the effort to simultaneously manage long-term and short-term goals, anticipating competitive moves, and resolving conflicting goals due to market shifts.

5. What we learned

5.1 Scope and use of simulation

Overall the objective of the simulation is to expose students to the complexity that exists when managing a set of offerings facing multiple competitive offerings. The intent is that, through this exposure, students can more readily understand the dynamics involved and how different elements of their designs influence the overall solution sets. In general, students react well to the game, often claiming it is the highlight of the course.

In experimenting with variations of the game, we have used narrow categories of product offerings (e.g. a line of digital picture frames) and alternatively broad categories (e.g. home appliances). The problems that arise are similar in essence, but vary significantly in detail. Regardless of scope of the category, one immediate and consistent outcome is that the students tend to let other measurements fall to the wayside as revenue becomes a central focus. This tendency creates a useful reflective discussion about the difficulty of balancing multiple, different, and simultaneous goals across business and design.

In addition, we have experimented with using the game within the process of the class. Originally, it was left to the end of the course, but is now typically used in the middle, where it allows the students to dive into the experience to help inform their discussions and learning through the rest of the course. The students are able to comprehend how multifaceted a significant business can be with respect to current and future offerings. This has resulted in stronger papers and deeper discussions during the remaining sessions.

5.2 Unresolved challenges

Our current challenge with the game is balancing the number of factors that are involved and the number of calculations (profit, costs, share per product, etc.) in assessing the effects of each move. This challenge is not new [5, 3] and solving this balance of complexity is essential to more powerful experiences that illustrate the skills necessary to manage a portfolio.

Students still struggle to understand the relative strengths and weaknesses of their portfolio upon completion of the game. Part of this seems to be the simplification of averaging competing product revenue within a given cell, and some of it may be that there is not enough time to inspect the narrative of the game and distill what influenced the choices made. Being able to “rewind” a portion of the experience to see what might have happened had an alternative direction been chosen would provide useful forms of comparison and contrast.

6. Future Directions

A version of our simulation is currently being developed for use on a computer-based multi-touch surface. Shifting to a digital form is a fairly obvious refinement in term of managing calculations and playback. That said, part of the success of the game is the person-to-person interaction. Being able to literally see the competition in the form of another team in the game is important to revealing the true nature of competitive markets. However, using the digital version to hide the mechanics of calculations and further highlight the factors that need to be considered will be a substantial improvement. The underlying model representing the market can then be embellished without complicating the set of choices a team must make.

Additionally, over time once the simulation is stable in terms of game mechanics we will consider looking toward integrating more real-world data on both the offerings as well as the customers. This will enhance the immersion and help students to engage beyond an abstract game to a real-life scenario of product management. Another vector of development is to distill the actions taken into a set of typical and non-typical moves. Matching moves with real-world historical moves could transform the simulation from a generic game to a case-study approach, opening up many more scenarios for students to experience and analyze.

Finally, we plan on producing metrics of improvement through pre-game and post-game evaluations of the students' knowledge and understanding of core concepts related to the objectives of the game.

7. Conclusion

We have described how a simulation approach to combining business and design challenges in a real-world market scenario can help students understand the nature of effective portfolio planning. We believe the over-reliance on financial measures in typical business simulations obscures other equally important factors that affect planning decisions with respect to competitive and customer insights. Through hundreds of students, we have learned that an experiential hands-on approach combined with multiple perspectives of design and business is effective at surfacing how design and business challenges can align or compete for attention from business leaders. Moving forward, we anticipate that remediating the game to a digital form can enhance the learning experience and further help students to explore more options, understand better, and ultimately make better decisions.

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