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MANAGEMENT SIMULATION GAMES: A CASE STUDY OF FIZZY DRINKS

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Master's Thesis

Supervisor

Dr. Engin SANSARCI

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Signature

DEDICATION

This dissertation is devoted to God who is my source of wisdom and strength. To my parents Carminda Mabota and Casimiro Mabota who have been constantly supportive and encouraging through all the journeys of my life and my entire family. I also dedicated to this work to my advisor for his guidance and assistance.

PREFACE

The basis of this project steamed from my desire to broaden my knowledge regarding management simulation games. As the world moves further into the digital era the operation of systems and real-life problems with help of models has become more popular and this simulation illustrates how the models progress under different circumstances over time. My goal is to apply this method analyse its results and efficacy.

ABSTRACT

MANAGEMENT SIMULATION GAMES: A CASE STUDY OF FIZZY DRINKS

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Management simulations have been gaining notoriety from both academics and practitioners over the last decades. The purpose of this study is to do research on management simulation games which have been identified as an adequate fictional source to manage real life issues. The game that motivated this dissertation is Fizzy Drinks which is a beverage company simulation game that has the goal of the becoming the most successful beverage company. The problem on this paper was to simulate the game using high-quality and low-cost Porter's generic strategies to obtain satisfactory results on the company's sales and overall success. This paper can be used as evidence that management simulation games are practical in academic learning and as an incentive for people who are interested in using and studying them. Based on the simulation results a conclusion about the effectiveness of the model was made. Some points for future research and improvement of the model were also included.

Keywords: Management Simulations, Causal Loops, Alternative Strategies.

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ABBREVIATIONS

CMSs	:	Construction Management Simulations
CSO	:	Chief Strategy Officer
CLDs	:	Causal Loop Diagrams
HR	:	Human Resources
TQM	:	Total Quality Management
R&D	:	Research and Development
COGS	:	Cost of Goods Sold

1. INTRODUCTION

1.1 WHAT ARE MANAGEMENT SIMULATION GAMES?

Management simulations are computer supported simulations that originated in the military war and surfaced in the late 1950s**.** They have been used in teaching management as a learning tool. CMSs were created to develop and model business strategies in order to find the best scenarios to improve the success of an industry or company. These games give the players the ability to learn about complex systems and find solutions for real life business problems and to observe how the models improve over time [1]. In this framework management simulation games are considered as a powerful instrument in engaging and inspiring players vigorously in a learning environment thus making the player become actively involved in the decision-making process [17].

1.2 IMPORTANCE OF MANAGEMENT SIMULATION GAMES

CMSs are applicable in various educational sectors although their main ambition is to yield adequate tutoring. These games can possibly be used to supervise skills mediation [2]. There are two kinds of expertise that could be promoted or mediated by the use of games for business management and industry: soft skills (communication, team-working, time management, creativity, mediation skills, cooperation skills, learning ability) and hard skills (discipline-based training, customer service, product/service knowledge, sales, project management, health and safety, innovation, risk management and decision making) [3]. It often takes in the supplementation of conventional learning and teaching techniques with applied science such as browser-based systems as an archive for instructional materials for students to access known as the blended knowledge perspective. Using this method grants the delivery of a more flexible curriculum that makes education and learning attainable to students who have different lifestyles, learning experiences and goals [16].

1.3 TYPES OF MANAGEMENT SIMULATION GAMES

1.3.1 City Building Games

City building games are a subgroup of CMSs in which the player performs as the leader or town manager where the player works to manage and grow a simulated town. Players only have the

permission to supervise city management and building placement features such as work priorities and salaries while the building itself is executed by nonplayable characters on the game. The Ceaser series, Cities skylines and the SimCity are types of city building games.

1.3.2 Colony Management

Colony management games are alike city building games, though ground on creating a colony in a secluded area with a smaller number of resources, hence are demanded to combine and collect assets from the neighborhood to construct their own colony. Theses games use building and management broadly with further details on more characteristics of the game than any type of simulation game. These may as well include fighting against entities of the remote territory. This may be denominated as base construction games. Notable colony management games are Surviving Mars, Oxygen Not Included and Frostpunk.

1.3.3 Business Simulation and Tycoon Games

Business Simulation games, the game discussed in this paper are a subgroup of CMSs that simulate a company, business or an economy aiming at making a business financially prosperous. Some of the business simulation games incorporate more aspects of management than construction, giving players the ability of trading systems or stock markets. In a more concreate scale, a management simulation places the player in control of a commercial facility or business, hiring staff, designing layouts, and performing measures directed towards controlling the flow of clients and demand as the business expands. These management simulations involve games like Farm Manager, Airport CEO, Two-point hospital and Sim Tower.

1.3.4 Life Simulation Games

This subgroup of simulation games includes components of business simulation games, however players have a progressive part in the game and often have tasks equal to real-life situations in a company to keep it running. These type of simulation games focus less on business and management components although players may need to determine how to

administer time on the game to achieve success. Some examples are the Sims series, Animal Crossing, Story of Seasons and Stardew Valley.

1.3.5 Government Simulation Games

A political or government simulation is a type of game that focuses on simulating politics and government of a country or state. The game involves creation and carrying out of foreign policy, simulation of political campaigns and creation of domestic political policies. Early examples from cold war age are Balance of Power, Conflict Middle East Political Simulator and Crisis in the Kremlin.

1.3.6 Sports Management Games

Sport Management simulations positions players as the team managers or owner of a sports club and monitors decisions regarding player selection, training and other decisions of the team as they progress through a session much rather leading the team towards a championship title. In some cases, the managing decisions are put on top of the sport simulation. An example is the Football Manger series [4].

1.4 FIZZY GAME OVERVIEW

1.4.1 What is Fizzy Drinks

Fizzy is a dynamic management simulation that was designed to apply and develop strategic thinking, proactive approach, and potent decision-making skills. Fizzy is a beverage game founded on January 1st, 2020 that specializes in probiotic soda. There are three other companies competing in the same field that were established on the same date namely Mepsi, Santa and Kprite. At the end of the first year of competition, the market shares of the four companies are somewhat the same. The player is hired as the new CSO in line with the company's new growth goal.

1.4.2 Fizzy Drinks Goals

The player has three main targets that they are expected to achieve by the end of the year 2023. The first of these is to make Fizzy the industry leader in terms of revenue, market share and

profits. The second goal is to double production capacity, equity and total assets. The third and final goal is to triple the share price. The player is expected to make six strategic decisions every three months to reach their goals.

1.4.3 Fizzy Drinks Decisions

The player is expected to make six strategic decisions every three months to reach their goals:

i. The first decision is the product price. The price of the product should be determined in a way that both preserves the company's competitive power in the market and enables them to make the desired profit.

ii. The second strategic decision the player will make is the amount of production. As the production decision is expected to be balanced with the anticipated demand, it must match targeted costs and quality levels. Moving away from 80% of the production capacity and constantly changing the production amount will increase production costs, and continuously producing above 90% of the capacity will negatively affect product quality. Nevertheless, the increase in production with the production capacity over time may decrease unit costs in the long run with the effect of economies of scale.

iii. The third expected decision is the investment decision. While investment decisions are expected to be made to obtain supply-demand balance, the financial capabilities of the company are expected to be taken into consideration. In case of high indebtedness, capacity investments may be postponed. However, it should not be neglected that if no investments are made for a long time, fixed assets will be out of use and production capacity will decrease due to depreciation.

ix. The fourth decision is the borrowing decision. Borrowing is done from contracted banks in the form of a 3-year loan. The principal of the debt is repaid in equal monthly instalments within 3 years. Interest on the debt is also collected monthly. The interest rate of the bank loan is 4.5% for each quarter. If the company is in a shortage of cash when the bank loan is not used, emergency borrowing from other sources is resorted to. In this case, the periodic interest of the

borrowings is 9%. Therefore, bank loan is more attractive as an interest rate, but unlimited borrowing cannot be made. The maximum loan amount that the bank can give you is determined by the company's credit rating.

v. The fifth expected decision is the budget for quality improvement expenditures. This budget is determined for 3-month periods and used completely. If a product positioning for the high-income group is made, it will be advantageous to set the quality improvement budget higher. In addition, increasing and decreasing this budget often may reduce the efficiency of quality improvement activities.

vi. The sixth strategic decision in the system is budget development. This budget is determined for 3-month periods and used in its entirety. The expenditures made within the budget are utilized to increase the automation level and production efficiency of the company. These improvements enable us to reduce product unit costs in the medium to long term. If price competition in the sector becomes important to us, it will be useful to set this budget higher [5].

1.4.4 Fizzy Drinks Performance Perspectives

1.4.4.1 Inventory management perspective

Inventory management embraces aspects such as controlling and supervising purchases from costumers and suppliers sustaining the storage of stock, overseeing the amount of order fulfilment and product sale. Generally, the company’s inventory management definition may vary according to the type of products it sells and the mechanisms you sell them through [13]. In the Fizzy Drinks game when the inventory is enough the sales and demand values end up being equal. When sales falling below demand it means that the company is losing customers due to low inventory levels in this case inventory should be increased [5].

1.4.4.2 Financial perspective

In this perspective the company aims at ensuring that it has a return on the investments and controls the risks involved in running the business. The objectives can the reached by satisfying

the needs of all players involved with the business such as customers, shareholders, suppliers. The shareholders are a key part of the business since they are main providers of capital they should be satisfied when the company achieves financial success [14]. In Fizzy Drinks a profit margin can be identified by taking the difference of price and unit cost and this margin should be firmly monitored to ensure that enough profit is being made and the price should be adjusted based on the cost information, the competition strategy and stock levels [5].

1.4.4.3 Quality management perspective

Quality perspective manages the affairs required to obtain a proper level of quality. This requires a company to have a quality strategy, create and implement quality planning and assurance, quality improvement and quality control. Overall quality management prioritizes long-term targets the execution of short-term objectives [15]. In Fizzy, 'Quality on Line' is the quality measured right after the production. 'Quality on Shelf' is the quality of random items in stock. 'Perceived Quality' is the quality assessed by marketing research without subjects testing the product and answering based only on their perception of the product [5].

2. BACKGROUND

2.1 CAUSAL LOOP DIAGRAMS

System Dynamic programming, a perspective on System theory was developed by Forester in 1961 in process of the management science analysis theme that focuses on creating a base to deal with management issues. This theory aims at elucidating troublesome behaviour and the way it unfolds. Causal loop diagrams are part of this theory's techniques that helps practitioners model the internal formation of a system [18]. In that context CLDs are sentences formed by distinguishing the main variables in a system (the nouns) as well as pointing out the causal relation among them by means of links (the verbs). By connecting several loops, a concise story about an issue or problem can be created. A causal loop diagram embodies four basic elements the variables, the links between them, the sign of the links (which demonstrate how the variables correlate) and the sign of the loops (which illustrates what type of behaviour the system will bring out). By pointing out a problem or issue in the causal outlook you can raise awareness on the structural forces that produce cryptic behaviour [6].

2.1.1 Casual Loops Steps

Let's take the example of a HR team that has overseen integrating a Total Quality approach in a company. Originally, there was much eagerness towards the program, the demand for training was eminent and there was a noticeable success in various local line teams. However, as time went by the success of TQM programs seemed to decline and interest in TQM activities diminished. The goal is to find what was the cause of this unforeseen demean.

2.1.1.1 Create variable names

The first step in creating a causal loop narrative is to point out the variables or nouns that are relevant to the problem. Remembering that a variable is something that can change overtime. In the TQM example, TQM activities and the need for TQM Training are crucial elements of the story. Upon further research the team also acknowledged that the perceived threat of the new

program was a major element as was the resistance by middle managers and their disposition to change.

2.1.1.2. Draw the links

After the variables are picked out the next step is to fill in the verbs by linking the variables together and deciding how one variable impacts the other. In systems thinking terms the variables are designated as negative or positive.

2.1.1.3. Label the loops

When the links in the loop are formed the type of actions it will produce can be established. And we can identify which type of causal loop we have.

2.1.1.4. Talk through the loop

Once the causal loop diagram is completed it is best to walk though the loops and tell a story to ensure that the loops follow the approach being described. In the TQM example, the loops tell the following story first TQM activities led to a rise in TQM training which resulted in more TQM activities throughout the company. Nonetheless as the number of activities grew the perceived threat also escalated which led to increased resistance by middle managers and decline in the overall TQM activities [6].

2.2 TYPES OF CAUSAL LOOPS

The are two basic types of causal loops in system thinking which are Balancing and Reinforcing. To determine if a loop is reinforcing or balancing you can multiply the signs, if the result is positive, it is a reinforcing loop and if the result is negative, it is a balancing loop.

2.2.1 Balancing Loops

A balancing loop has the aim of moving the ongoing state (present scenario) to a wished state (target or goal) by means of some activity (steps taken to reach the goal). The balancing loops

is one of the basic designs of systems thinking. For example, if you have a business and decide to boost the sales by 10%, a balancing loop has been generated.

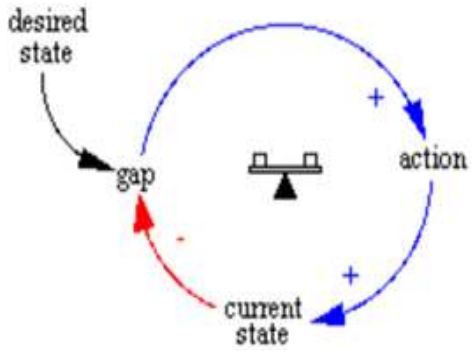

Figure 2.1 Balancing loop

The wished state interconnects with the present state to create a gap. While the wished state is supposed to be improved during this consideration. The gap formed by the difference between wished state and ongoing state is the incentive for change and the bigger the gap the prominent is the need to act, the measures taken add to the ongoing state. The current state subtracts from gap and reduces it. When the initiative is successful in changing the ongoing state to a stage where is near to the wished state the gap is lessened to zero and there is no need for further action [7].

2.2.2 Reinforcing Loops

Reinforcing loop is a loop in which an act creates an outcome that produces more of the same act thus ending up with development or depreciation. The reinforcing loop is another basic structure of system thinking with the first one being balancing loop.

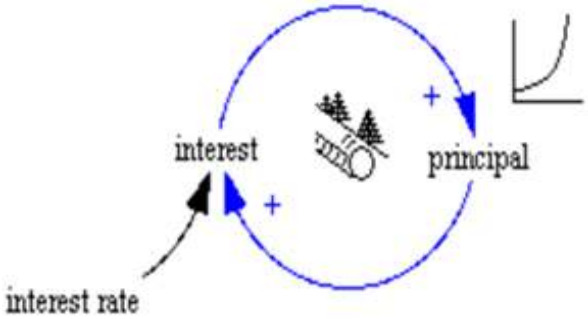

Figure 2.2 Reinforcing loop of a savings account

Considering that the principal of a savings account deals with interest rate and sums to it. The interest rate in this scenario is presumed to be constant. The interest then aggregates to the principal making it increase. In the following period the cycle repeats but now the principal is greater that it previously was so its interaction with the interest rate adds an even greater amount to the interest. This great interest adds to the principal [8].

2.2.3 Growth Loops

Growth loops are closed systems created to guarantee that every input undergoes a series of predetermined steps to genera an output. That output is then reinstated as an input and since this a closed loop system the process reruns itself.

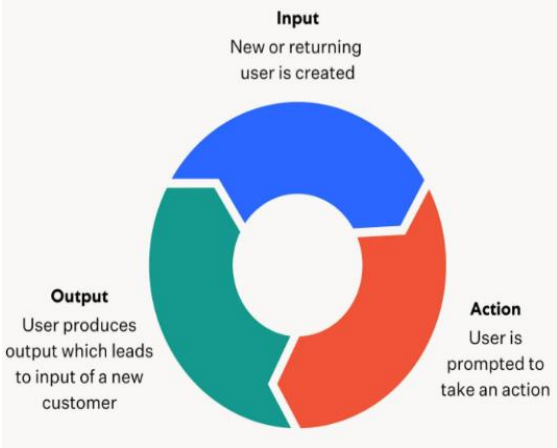

Figure 2.3 Growth loop

Let's consider this in more practical terms. A potential new customer takes notice of your products through automated marketing messages the customer is likely to suggest it to a friend and share the content, this would be output of the repeating cycle. These loops are becoming crucial for product growth and long-term sustainability and the measures taken to increase engagement and get customer satisfaction are rewarding [20]. Growth loops can be beneficial in:

i. Having a low-cost substantial growth. Growth loops consist of strengthening systems for growth. On the previous example when a customer advertises the products to new people it can be considered a low-cost compounding growth.

ii. Providing a unique model that can not be easily duplicated and hence is secure. Growth loops are exclusive to each business. Developing a model that will improve product functionality, customer support and managing an app to sell the products [21].

3. STRATEGIC ALTERNATIVES

Alternative strategies are strategies that a business creates to set the direction for which material and human resources are applied for a better chance of achieving selected targets. Generally, a company establishes alternative strategies when it is not thriving and is seeking a new direction to increase profits, or to avoid bankruptcy and dissolution [9]. Strategic alternatives point out distinct courses of action a company may eventually take on. These strategies centre around the question of whether to carry on or alter the business enterprise an organization is currently in or better the effectiveness and efficiency so that the company achieves its corporate goals in its field. The use of alternative strategies is critical for the success of a company although they are influenced by external factors such as raise in competition and demand seasonality [19].

3.1 TYPES OF STRATEGIC ALTERNATIVES

Strategy making requires identification of the methods a company can go about to tackle the performance goals, attain competitive advantage, weaken competitors and grant long term success of the organization. There are mainly four levels of strategies for the different lines of production or management in a diversified company.

Figure 3.1 Four level strategies

3.1.1. Corporate Level Strategy

Corporate level strategies determine in which markets a company will operate. Corporate strategy is planned by the higher management of diversified organizations which is known as a group of companies. This strategy details the company's overall direction in terms of its numerous product lines and businesses. Corporate strategies state the long-term goals and often includes all factory units under the same production chain.

3.1.2 Business Level Strategy

Business level strategy sets the premises in which a company will participate in. It is a business segment level approach, designed by senior managers of the segment. This strategy highlights the intensification of a company's competitive position of services or products. Business strategies are based of competitive and cooperative strategies. The focal points of the business strategy are product development, integration, innovation, market development and diversification.

3.1.3 Functional Level Strategy

A functional strategy is the division sectional strategy created for each organizational company. This strategy highlights a specific functional area of a company. That is designed to meet some targets of a business unit by maximizing the productivity of the resources available. The main goal of this strategy is to gain competitive advantage by developing a distinctive competence to provide an organization.

3.1.4 Operating Level Strategy

Operating level strategy is carried out at the operating units of a company. An organization may design an operating strategy for its factory, small sections within a department. Generally, field level managers undertake an operating strategy to achieve short term goals. In larger companies the operating managers are guided by mid level managers when developing operating strategies [9].

3.2 PORTERS GENERIC STRATEGIES

Porter's generic strategies were developed in 1980 by Michael Porter, this concept details in what way company gains competitive dominance in its market scope. The two main types of generic strategies are lower cost/cost leadership and higher cost/differentiation. The two basic types of competitive strategies merged with the scope of ventures in which a company prompts three generic strategies to attain outstanding achievements in an industry's cost dominance, differentiation and focus [10].

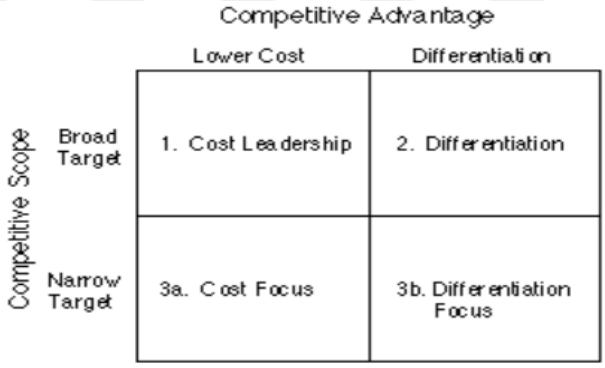

Figure 3.2 Sources of competitive advantage

3.2.1 Lower Cost

In lower cost strategies also known as cost leadership a company has the aim of becoming low-cost manufacturer in its field. The tools of cost dominance are vast and rely on the configuration of the industry. This strategy involves the push towards economies of scale, favoured access to raw materials, proprietary technology and more. A low-cost manufacturer should take advantage of all sources of cost leverage. If a company is able to reach and sustain cost dominance then it becomes an outstanding performer in its field, given that it can lead prices at or close to industry average [10]. Companies that are successful in cost leadership usually have:

i. Access to funds required to invest in technology that lower the costs.
ii. A very functional logistics and low-cost base materials, facilities, labour.

iii. A method of cutting costs below of other competitors [11].

3.2.2 Higher Cost/Differentiation

In high-cost competitive strategies, a company attempts to be distinctive in its industry in aspects that are widely valuable by its customers. It selects one or more features that many buyers deem as important and distinctively places itself to meet these requirements. The company is recompensated for its distinctiveness with a high-end price and higher quality [10]. To create an effective strategy, companies need to:

i. Do a good research and development and be innovative.
ii. Have the ability to provide high quality products or services.
iii. Efficient sales marketing so that the market discerns the benefits offered by differentiated offerings [11].

3.2.3 Focus

This generic strategy counts on the selection of a limited competitive scope in the industry. The company choses a section or group of sections in the industry and adjusts its strategy to serving them to the segregation of others. The focus strategy has two variations:

i. Cost focus where a company is after cost leverage in its aimed section.
ii. Differentiation focuses on where an organization pursues differentiation in its target section with both variations of the focus strategy leaning on variations between the focusers aimed sectors and other sectors in the industry [10].

3.3 PORTERS FIVE FORCES

Porters five forces is a business examination model which assists in explaining why diverse industries can undergo distinct levels of success. The five forces model is applied to examine the industry structure of a business and its corporate structure. Porter established five forces that

help shape each market and field in the world. The five forces are often applied to measure rivalry intensity, profitability and attractiveness of a field or market.

3.3.1 Competition in the Industry

The first force touches on the number of rivals and their capability to undermine a company. The greater the number of rivals as well as the number of products and services they provide the lower the power of a company. Buyers and suppliers analyse a company's rival to check if they are qualified to give better deals or lower prices. In contrast, when competition is low a company has greater ability to charge higher prices and get better deals to reach higher sales and profits.

3.3.2 Potential of new Entrants in the Industry

A company's strength is also impacted by the power of new entrants in the industry. The laborious and costly it is for a competitor to enter an industry and be a powerful rival, the more a recognized company's place may potentially be threatened. A field with greater challenges to enter is ideal for established companies within that field since they would be easily able to set higher prices and negotiate better deals.

3.3.3 Power of Suppliers

This model tackles how effortlessly suppliers can boost costs of inputs. It is influenced by the number of distributors of main inputs of a product or service, how uncommon the ins and outs are and how much it costs a company to shift to other distributors. The smaller number of suppliers to a field the more a company would rely on one distributor. Subsequently, the supplier becomes relevant, creates input costs and pushes for other benefits in trade. Besides when there are a lot of distributors or low-cost shifting costs between competing distributors, a company may keep its input costs lower and increases profitability.

3.3.4 Power of Customers

The strength consumers have to push prices, or their ability to influence change is one of the five forces. It influences the number of buyers or consumers the business has, how important each client is and the cost of taking measures to attract new customers. A narrow and strong client base gives each new customer the power to bargain for lower prices. It is easier for a company that has narrow and self-reliant customers to charge higher prices to increase profits.

3.3.5 Threat of Substitutes

The last five force targets substitutes. Alternative products or services should be applied when a company's products and services are threatened. Companies that produce goods or services for which there are no potential substitutes will have more ability to increase prices and lock in favourable terms. When potential substitutes are available customers will have the option to buy from competitors and the company's power may diminish [12].

3.4 STEPS TO CHOSEE THE RIGHT ALTERNATIVE STRATEGY

The procedure to identity the best strategic alternative may change according to the company's size, industry characteristics and style of management. In a small organization most decisions are made by the owner or by the Chief executive. The decisions help them know what they should do in each scenario. Which business practices should be added or what existing practises should be left behind. The success or failure of the company depends on technical competence and the experience of the Chief executive. The decisions in a small company are usually made very fast and are influenced by suppliers and bureaucrats with whom they in deal with. In the other hand in medium to large organizations the strategies used to choose the right strategy involve brainstorming sessions, holding meetings, consult experts and holding meetings with senior employees and the business consultant [19].

For each alternative strategy analyse how the strategy should be used to:

a. Manage supplier power.
b. Manage buyer customer power.
c. Gain competitive dominance.
d. Minimize risk of substitution.
e. Reduce the risk of a new entries.

Lastly the generic strategy that has the strongest points should be selected [11].

4. FIZZY GAME SIMULATION PROBLEM

4.1 METHODOLOGY FOR SOLVING THE PROBLEM

Considering that the problem in the Fizzy game is to make the Fizzy Drinks the best competitive probiotic soda brand. The first step of the solution is to identify the main causal loops on the game to better understand the relationship between the strategic decision variables. The second step is to choose the best strategy for the six strategic decisions such as product price, amount of production, investment decision, borrowing decision, budget for quality improvement and system development budget. The third steep is simulating the game. The fourth step is analysing the results to verify if the ratios conform to requirements. Since there are two groups low-income and high-income, two different alternative strategies should be implemented to ensure that both groups' expectations are met. The results of the simulation can be used verify how the decisions affect the success of the company.

4.2 CAUSAL STRUCTURE OF FIZZY DRINKS GAME

Evaluation of the interrelationship between the strategic decisions on the game were attained by constructing causal loop diagrams. Which is also helpful to identify which aspects should be given more attention and which variables hold more power. The causal loops created support effective decision-making skills and the success of Fizzy. The loops described in this section are basic and extended growth loops, balancing loops and reinforcing loops. Firstly, I started by identifying the variables that have a relationship and followed by creating and labelling the loops and finalized by giving a description of each loop and its possible impact on the game.

4.2.1 Basic Growth Loop

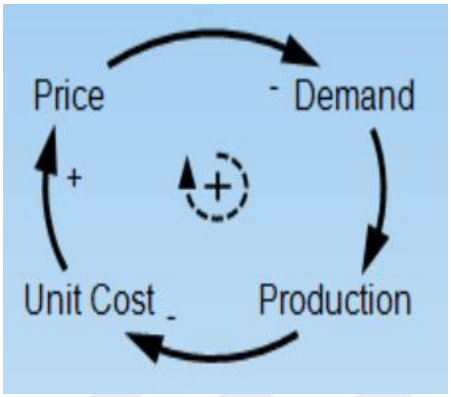

Figure 4.1 Fizzy Drinks basic growth loop

This Basic Growth Loop shows the causal relationship the variables of price, demand, unit cost and production have among each other and its impact on the success of the products by ensuring the products get to new customers while remaining cost effective. We can observe that sales volume, unit cost and competitors price have an impact on price decision. Primarily a wholesale price which corresponds to 100 bottles of soda is set and the price of each can of probiotic soda is determined by quantity of customer demand. When price increases demand decreases choosing the best competitive price is important for fizzy to stay ahead of the other brands of soda such as Kprite, Mepsi and Santa. Moreover, the demand also influences supply because production rellies on the quantity the customers are willing to buy. Preferably, production should be around 80% of the capacity to keep production costs low, and capacity should be high enough to cover demand forecasts in the short run. Unit cost is set depending on production quantity and demand which means that unit cost tends to decrease when production capacity is high. Price should be adjusted based on competition strategy, cost information and stock levels to ensure that enough profit s being made.

4.2.2 Extended Growth Loop

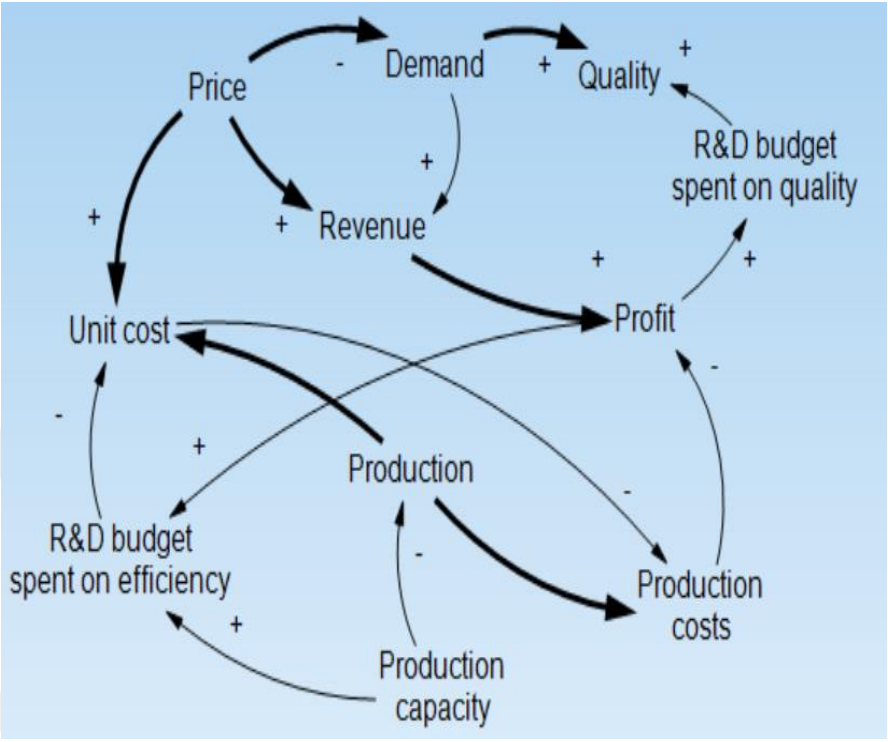

Figure 4.2 Fizzy extended growth loop

This loop is an extended version of the loop on Figure 4.1 that illustrates the relationship between the key variables in Fizzy that contribute to substantial growth. In case of revenue an increase in price generates more revenue and profit. Which may occur when there is a development on quality due to a greater investment on R&D to help improve the quality of the products therefore result in higher demand. When it comes to production, production rate directly affects unit cost and product quality. The more complex it is to produce a good, the more labour it takes and the higher may it cost to produce it. In terms of R&D impact in efficiency it helps the business to remain profitable and competitive by improving the existing processes and products. Additionally, production capacity is influenced effectiveness in maintenance and reliability of the equipment.

4.2.3 Fizzy Drinks Balancing Loop

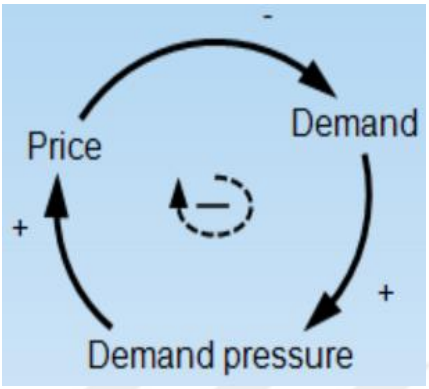

Figure 4.2.1 Price vs demand balancing loop

The law of demand states that at higher prices consumers will demand less of a product and at low prices customers will demand more of a product therefore have more profit. Taking into consideration the demand pressure which is the ratio of the number of beverages available for each brand of soda.

4.2.4. Fizzy Drinks Reinforcing Loops

Figure 4.2.2 R&D reinforcing loop

R&D budget is often used to develop unconventional products, to enhance production efficiency and product quality. A favourable investment in R&D will result in greater sales and consequently generate more revenue.

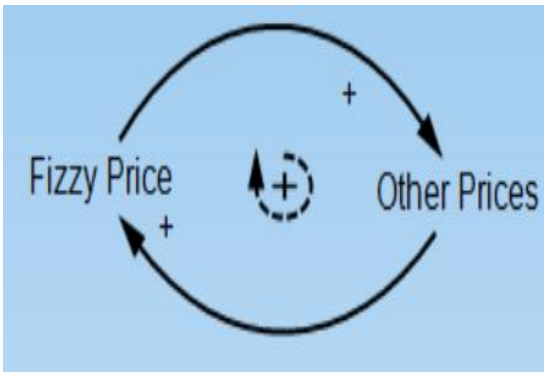

Figure 4.2.3 Price reinforcing loop

Considering all the factors that impact the production when the price of the other brands of soda increases the price of Fizzy Drinks products will also increase to be able to compete with the other brands while remaining profitable.

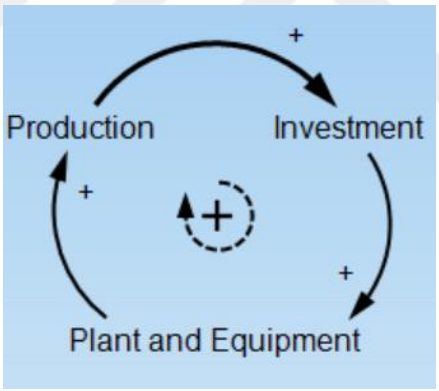

Figure 4.2.4 Plant and equipment reinforcing loop

A low or bad investment regarding plant and equipment may result in machine failure and downtime and cause malfunctions that can lead to dangerous situations. Which are factors that jeopardize the production process by delaying delivery of the products, affecting the quality, leaving the customers unsatisfied and losing revenue. However, when there is a proper investment in plant and equipment production increases, there are no delays on the delivery of the products to the customers and malfunctions are avoided by undergoing proper maintenance and by purchasing adequate equipment.

4.3 IMPLEMENTATION OF ALTERNATIVE STRATEGIES ON FIZZY GAME

Since the focus of this research is to verify the efficacy of the Fizzy Drinks simulation game two different generic strategies were used and its results were also evaluated. There are four sections on the game's admin panel. The first one demonstrates graphs that correspond to data for internal analysis. The second one illustrates graphs in terms of market analysis. The third one displays financial statements where you can observe the financial performance represented in dark and light green faces (good), yellow faces (average) and red faces (bad). The fourth and last section presents six decisions the player must make before simulating the game. The strategies used were low-cost that targets low-income customers and high-quality strategy that targets high-income customers.

4.3.1 Initial Scenario and Goals

i. Keeping the quality high while maintaining a reasonable price.

ii. Gain competitive advantage compared to other brands.

iii. Currently the best competitor in terms of quality is Mepsi therefore their price is a little higher compared to Fizzy.

iv. The demand is a little higher than production thus the insufficient inventory.

v. Emergency loans increased by 50%. The financial situation is not ideal. These are not enough resources.

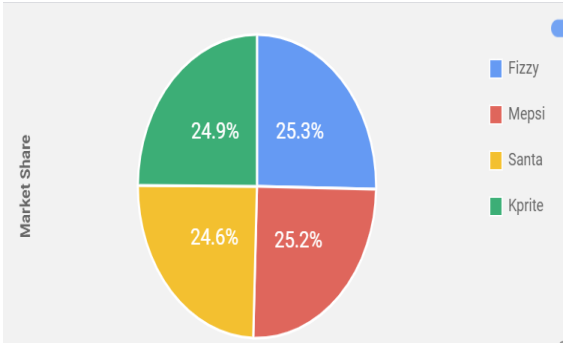

Figure 4.3.1 January 1st, 2021, market share

Figure 4.3.2 January 1st, 2021, financial ratios

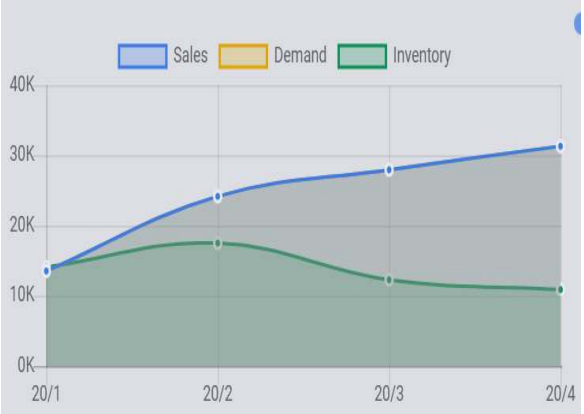

Figure 4.3.3 January 1st, 2021, sales and inventory

4.3.2 High-quality

In this section I focused on improving the quality of the products to be able to meet the needs of high-income customers. To support an improvement in the quality of the products R&D Budget was increased and the efficiency-quality scale was kept at nearly the highest limit. This strategy allowed me to increase my selling price while reducing production costs. By implementing this strategy Fizzy was able to stay ahead of its competitors in terms of quality. When my competitors were attempting to increase the quality of their products, I took extra precautions to prevent it. As long as my competitors where no longer making moves towards improving quality, I proceeded at gradually reducing costs since I was the leader in terms of quality. The focus in the first year was on R&D expenditures, quality did not decrease although

a subtle change in production rate was made to increase efficiency as we got to the second year. Despite it leading the financial ratios to be low in the first year it was the foundation of Fizzy's financial strength for the following years. Because I was marketing products at higher prices than my competitors, I was able to make more profit. Financially, my general strategy was to get a bank loan in the last quarter of the year and pay my investors while remaining profitable. With this strategy I could pay my investors without any decrease in my profit. Additionally, I made a capacity increase by making a slightly higher loan than necessary which led me to easily meet demand in the following year. Apart from the last quarters, I made sure not to use loans unless it was needed. In that order, interest payments were not a huge expense and my loan was as small as possible. Bellow are my yearly evaluation reports:

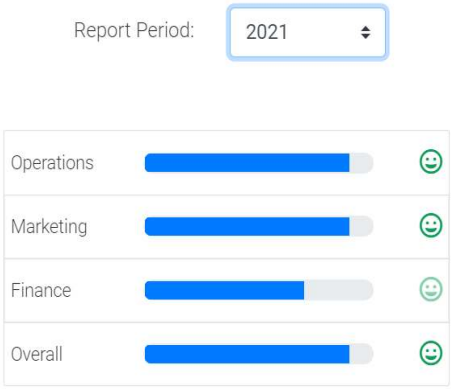

Figure 4.3.4 2021 High-quality evaluation report

Since 2021 was the first year the first two quarters of the year were a little challenging. As I started to execute long-term strategies, stayed away from short-term strategies due to the unsatisfying financial statements and market share. The situation changed when I started applying long-term strategies. My overall strategy was to enhance production quality although R&D and capacity investment caused financial challenges.

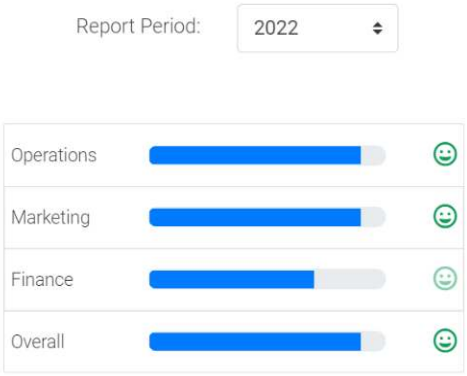

Figure 4.3.5 2022 High-quality evaluation report

The year 2022 was a year of growth. My investments started produce results even though I slowly shifted my focus from quality to efficiency, my quality did go down. But I was able to produce better quality products at a lower cost and reasonable prices.

Figure 4.3.6 High-quality 3-year evaluation report

In 2023, I was able to achieve my business goals and due to my wise investments, they continuously increased instead on decreasing despite the fact that I made an efficiency-oriented production at a rather lower cost. Since I increased my capacity and my investment consistently, I had enough inventory to meet demand. Bellow are the general charts and results:

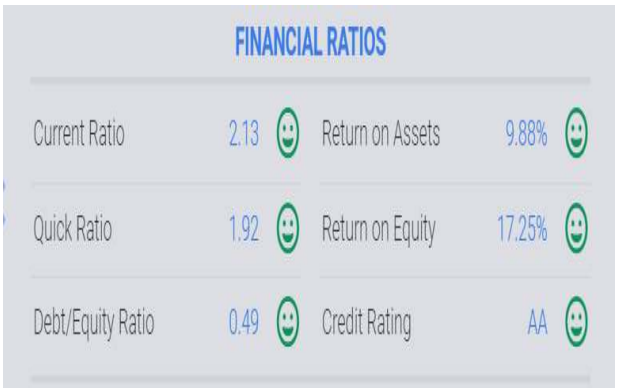

Figure 4.3.7 High-quality financial ratios

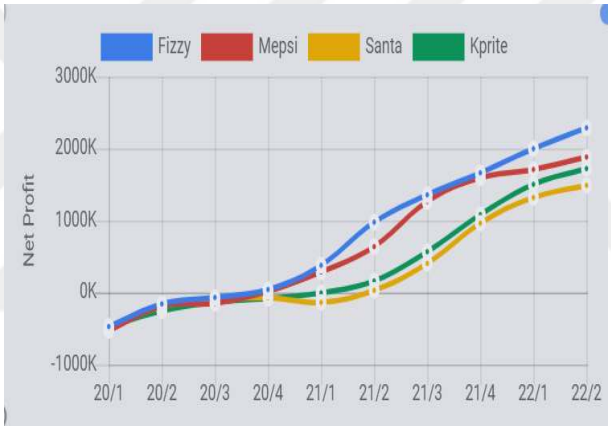

Figure 4.3.8 High-quality net profit

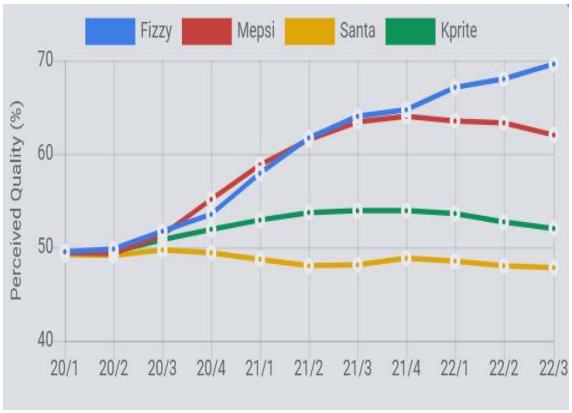

Figure 4.3.9 High-quality perceived quality

Figure 4.3.10 High-quality percentage

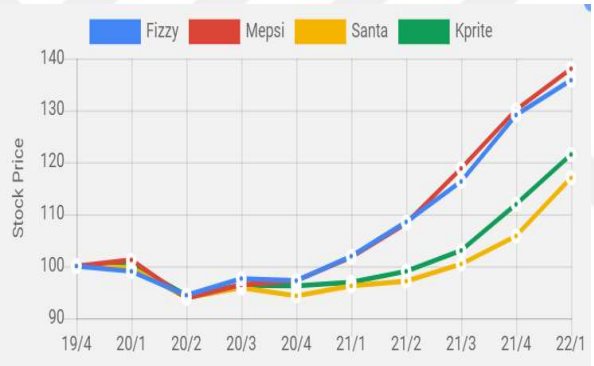

Figure 4.3.11 High-quality stock price

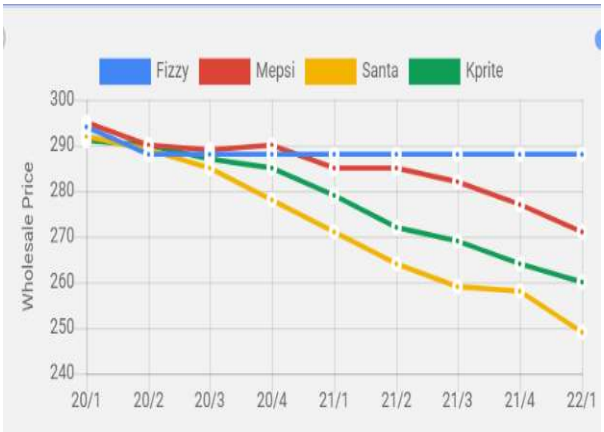

Figure 4.3.12 High-quality wholesale price

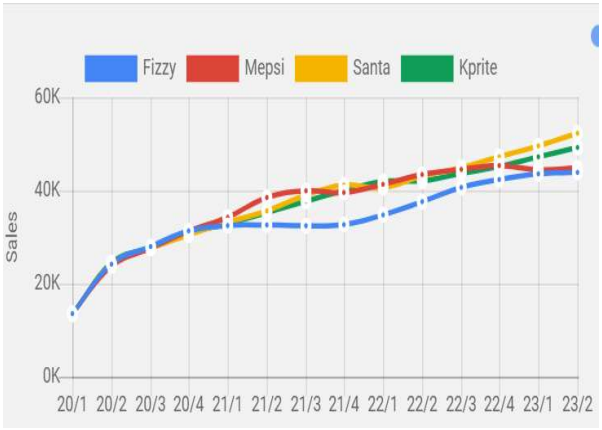

Figure 4.3.13 High-quality sales

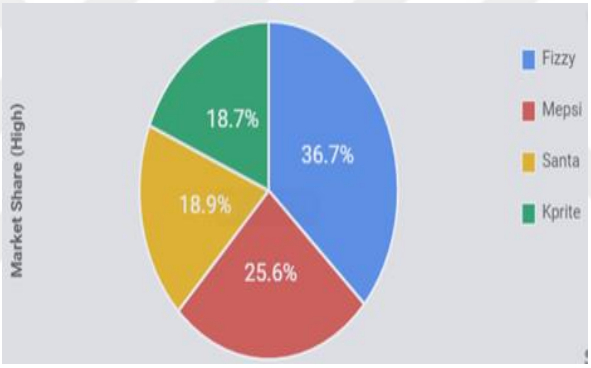

Figure 4.3.14 High-quality market share

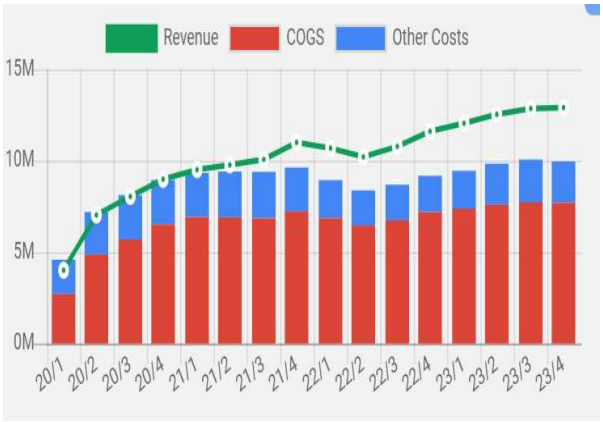

Figure 4.3.15 High-quality revenue and COGS

INCOME		EXPENSES	
Sales Revenue	12,525,322	C.O.G.S.	7,461,293
Interest Income	118,600	R&D Expenses	450,000
		Interest Expense	311,555
		Inventory Cost	214,696
		Other Costs	1,146,889
TOTAL	**12,643,922**	TOTAL	**9,584,433**

Figure 4.3.16 High-quality income and expenses

CASH INFLOWS		CASH OUTFLOWS	
Coll. Receivables	12,488,410	Production Costs	7,489,329
Interest Earned	118,600	Cap. Investments	1,000,000
New Loan	1,050,000	Interest Paid	311,555
		Debt Payments	1,091,667
		Other Payments	1,114,696
TOTAL	**13,657,010**	TOTAL	**11,027,017**

Figure 4.3.17 High-quality cash inflows and outflows

ASSETS		LIABILITIES & EQUITY	
Cash & Equivalents	5,560,848	Emergency Loans	0
Receivables	3,895,523	Short Term Loans	3,429,167
Inventory Value	803,167	Long Term Loans	2,929,167
Plant & Equipment	14,041,364	Equity	17,942,569
TOTAL	**24,300,903**	TOTAL	**24,300,903**

Figure 4.3.18 High-quality asset liabilities and equity

4.3.3 Low-cost

Being that Mepsi's quality was higher in the initial scenario their price was very close to fizzy hence, I lowered the price to increase demand. However, the price should not be a lot lower than the other brands. Since the demand is higher than production, I aimed at gradually lowering the price and increasing production to meet demand. Although I was able to get Fizzy have the highest price my price was always slightly lower than my competitors. This helped me experience a gradual increase in demand and subsequently an increase in investment capacity. In essence, I was able to produce good quality products for less and increase my revenue. One of the challenges I faced was being able to meet demand and sales while lowering the price. I was decreasing the price a lot at first what made unable to meet demand. So, I decided to reduce the price little by little and keep the production at 80% of capacity. To reduce demand, I slightly reduced R&D budget and turned the quality-efficiency scale towards efficiency. After that, I reduced plant investment and increased bank loan to better Fizzy's financial situation. Despite that fact that there were some short-term difficulties, I was able to achieve the goal of providing low-cost products with a higher-than-average quality. Bellow are my evaluation reports and the general graphs:

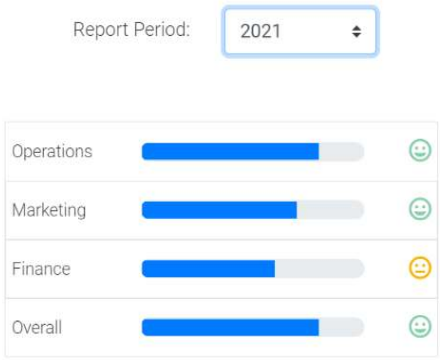

Figure 4.3.19 Low-cost 2021 evaluation report

Applying the low-cost strategy was effective on reaching the goal of meeting low-income customers requirements of providing the best prices while remaining profitable.

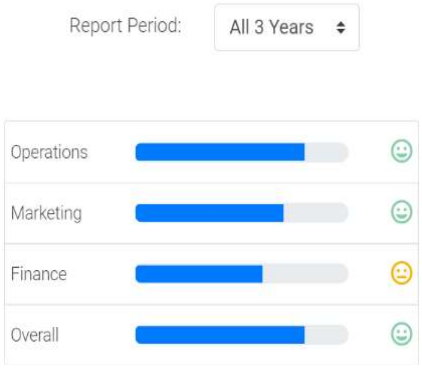

Figure 4.3.20 Low-cost 3-year evaluation report

By using this strategy, I was able to attain good results at the end of the 3-year period. However, attempting to make a significant decrease in price was more effective in a short-term basis than along term basis because it may lead to shortages, inferior product quality and rationing.

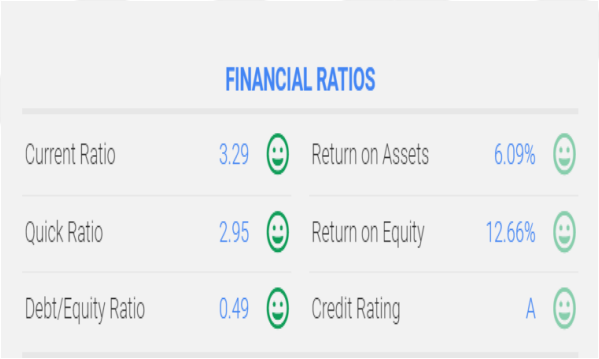

Figure 4.3.21 Low-cost financial ratios

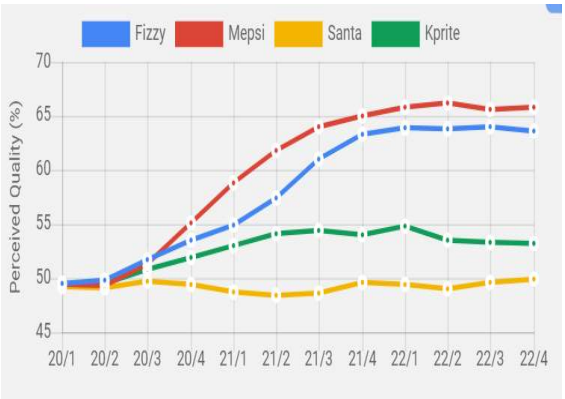

Figure 4.3.22 Low-cost perceived quality

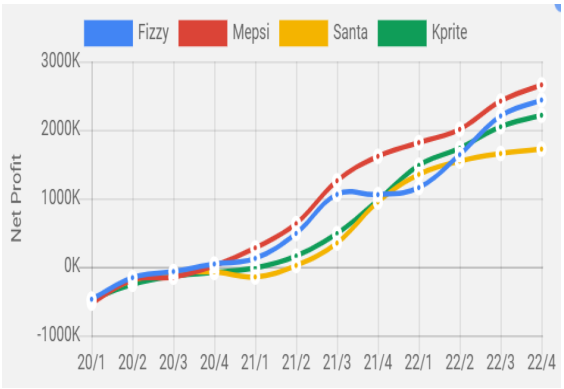

Figure 4.3.23 Low-cost net profit

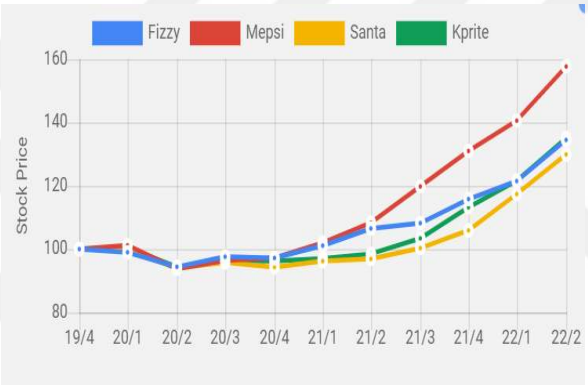

Figure 4.3.24 Low-cost sales and inventory

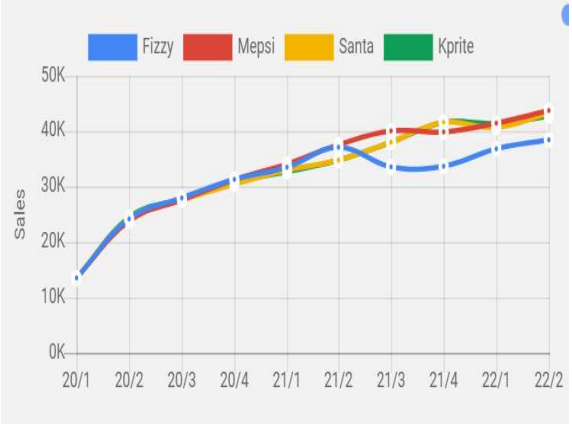

Figure 4.3.25 Low-cost sales

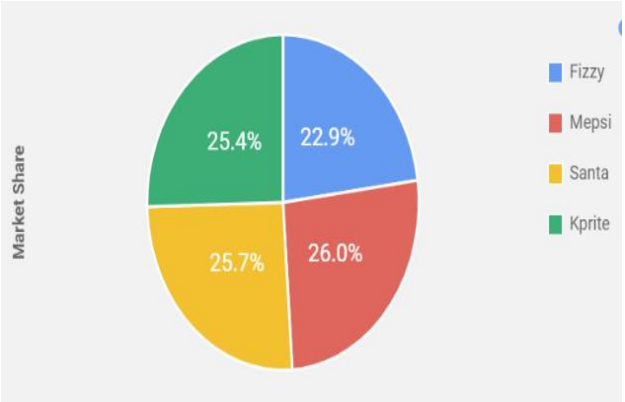

Figure 4.3.26 Low-cost market share

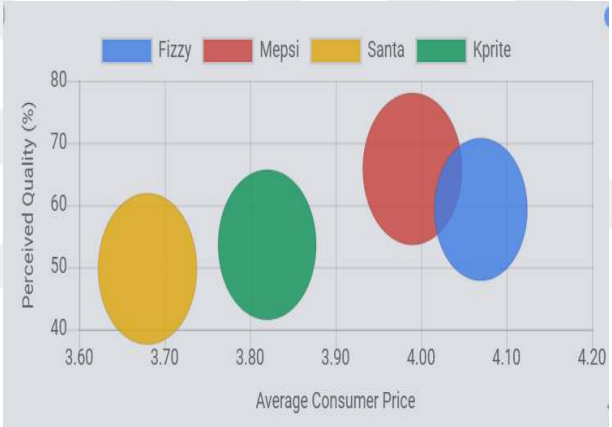

Figure 4.3.27 Low-cost quality percentage

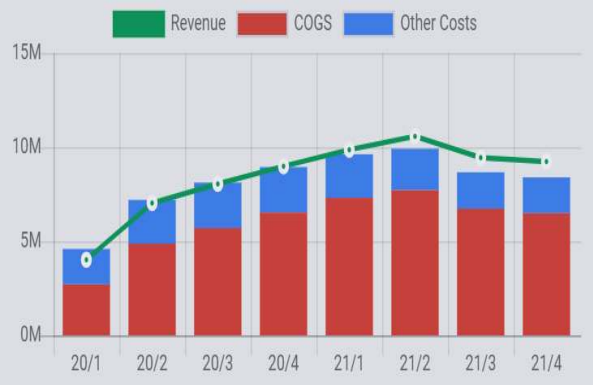

Figure 4.3.28 Low-cost revenue and COGS

CASH INFLOWS		CASH OUTFLOWS	
Coll. Receivables	10,146,592	Production Costs	6,349,120
Interest Earned	37,521	Cap. Investments	900,000
New Loan	1,000,000	Interest Paid	326,648
		Debt Payments	1,341,667
		Other Payments	1,063,792
TOTAL	**11,184,114**	TOTAL	**10,088,499**

Figure 4.3.29 Low-cost cash inflows and outflows

INCOME		EXPENSES	
Sales Revenue	10,258,857	C.O.G.S.	6,319,305
Interest Income	37,521	R&D Expenses	400,000
		Interest Expense	326,648
		Inventory Cost	213,792
		Other Costs	1,049,002
TOTAL	**10,296,378**	TOTAL	**8,308,748**

Figure 4.3.30 Low-cost income and expenses

ASSETS		LIABILITIES & EQUITY	
Cash & Equivalents	4,151,528	Emergency Loans	0
Receivables	3,439,923	Short Term Loans	4,533,333
Inventory Value	973,668	Long Term Loans	2,704,167
Plant & Equipment	12,989,992	Equity	14,317,612
TOTAL	**21,555,112**	TOTAL	**21,555,112**

Figure 4.3.31 Low-cost asset liabilities and equity

5.CONCLUSIONS

In this research I touched on management games and its contribution to learning in the simulation framework and added to the increasing number of papers regarding management simulations. I have argued throughout this paper that CMSs have become a major tool of study in the last decades and can be beneficial to improve soft skills such as creativity, communication, mediation skills and grasping skills and hard skills such as sales, product and service knowledge and project and risk management. Along with introducing causal loops diagrams that focus on showing how distant variables causally interrelate and alternative strategies which are methods that a company develops to achieve their business goals these are the methods applied in this dissertation. Starting by providing a description of each method and their benefits when applied to the simulation problem. The goal of this research was to evaluate the effectiveness of management simulation games focusing on exploring Fizzy Drinks by analysing the structure of the game and its aim of simulation a real-life scenario of a beverage company, the challenges and the strategies applied to make it thrive and become a market leader. To achieve this, I started by constructing causal loops both balancing and reinforcing which showcase the correlation between the variables and how they impact the success of the game. By introducing the basic and extended growth loops of the game. The basic growth loop describes relationship between price, demand unit cost and production which are the strongest variables in Fizzy. This loop highlights how the variables contribute to the growth of Fizzy Drinks as a company. The extended growth Loop that is an extension of basic growth loop details the relationship between all the variables and decisions that impact Fizzy and the necessary decisions to achieve the company's goals. Subsequently, I then created the loops that display the relationship of the other relevant variables on the game. These loops were divided into two groups. Balancing and Reinforcing loops giving a summary of each loop. The purpose of creating the loops was to point out the positive and negative scenarios I would encounter as the CSO of the company and how to prevent potential problems by making the right the decisions and working on achieving the company's goals. The following step was to play the game to get familiar with it and better understand the structure. At first, I focused on trying different strategies to get the good results in terms of financial ratios by getting green faces at the end of the 3-year period. After

succeeding at the achieving that I followed up by applying the alternative strategies on the game taking into consideration the six strategic decisions that must be made every three months as well as gain competitive advantage from the three other brands of soda in the market. Leading off by simulating the game using the High-quality generic strategy with focus on high income customers. The high-quality strategy focused on keeping the quality of the products at the highest quality possible while focusing on remaining profitable and competitive. Using this strategy gave Fizzy the opportunity to gain competitive advantage in terms of quality, provide something unique for the customers, potentially make more profit and increase brand loyalty. Which would lead Fizzy to become one of the best probiotic soda brands in the long run. In terms of results in the high-quality strategy I was able to achieve a total of 12,643,922 TL in income and had a total of 9,584,433 TL in expenses. The second generic strategy was Low-cost strategy that is directed to low-income customers. The low-cost strategy focused on keeping the price relatively low without it affecting production costs and revenue. Using this strategy helped Fizzy obtain cost leadership by being ahead of its competitors in terms of price. To be able to a achieve the best results on the simulation while exploiting this strategy I choose to lean towards efficiency in the quality-efficiency scale and avoided decreasing the price excessively. In terms of results of the Low-cost strategy I got a total of 10,296,378 TL in income and a total of 8,308,748 TL in expenses. Although I was successful in reaching the goals of both High-quality and Low-cost generic strategies. The best long-term and short-term results by the end of 2023 were the ones got by applying the high-quality strategy. Overall exploiting and applying the Porters generic strategies on the game was easy, the only challenge I faced was met all the criteria needed in each strategy for that reason I choose to focus on the main requirements of each scenario, controlled and compared the results every time I run the game. After running the game a couple of times, I selected the best results I got in both strategies, added to the paper and provided an explanation for my results. The future development would focus on identifying under which conditions management simulation games can reach more accurate results when it comes to the real-world business management scenarios. This task will be done by gathering data from real companies, which can help the simulation identify the variables that improve the performance of their business and the most suitable strategies that should be adopted. I mentioned in the methodology part that it was not completely possible to meet all criteria

although it was possible to attain positive results. To prevent such issues in future research I would use real data. This dissertation helped me apply the skills I had on simulation, improve my knowledge about management simulations be able to make business decisions, become the CSO of a virtual company, find solutions for the problem, test and choose the best strategies. Based on these assumptions partitioners should consider management simulations games as an effective tool for learning and their potential to sort out real life business challenges.

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