

Cardiff School of Computer Science & Informatics

Addressing The Loopholes: How The Recent Legislation Change Will Effect The Sports Nutrition Industry

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Abstract

The following project is an analytical project aimed at deducing how sports nutrition manufacturers can successfully launch a product developed focusing on quality, innovation and effectivity into the sports nutrition industry. Through the inclusion of Soft Systems Methodology, Market Research and System Dynamics I will develop a model to deduce the optimal product to launch into the industry to achieve successful revenue levels, while keeping a major focus on the quality of the product itself. I will also manufacture the final deliverable to be delivered in the viva Examination.

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1.0 Introduction

1.1 Introduction: Last Semesters Work

This paper entails a follow on study of both the background and market research completed last semester and looks to build upon these findings to utilize new techniques which will be discussed in this paper. Due to the legislation change, there has been a need to undertake extensive research to gauge the current status of the market and of the opinions of the individual components within the market, including consumers, directors and employees. The Interim Report detailed the crucial background research needed to understand the legislation change and provided an insight through the Interviews and Questionnaires of the changes that have been developing within the market. This was viewed as a trial run and the findings from this research have allowed an adaptation and re-launch of the questionnaires this semester to gain crucial information needed for the Systems Dynamics methodology. Reviewing the previous findings, I have been able to update and adapt the questionnaire, increasing the relevancy of questions and also of the main focus that is being utilized in this semester. The survey has been altered in order to provide a greater level of understanding of the changes that have occurred due to the change in legislation. Also, the focus has been placed on developing greater level of awareness from the analysis, not only to provide the platform for moving the research paper on but to ensure that there would be consistency throughout the following questionnaires, allowing for increased effectiveness in the aims and results achieved during the analysis. It was crucial to enhance the effectivity of the market research technique chosen as this would have a direct impact on the systems thinking model that is to be developed this semester which effectively impacts the final deliverable. Therefore the accuracy of the initial research is key to developing the most effective sports nutrition product for the market. Based on previous paper feedback, there were some comments which have forced the needed to re clarify the problem itself and explain in more detail what the paper wishes to achieve.

1.2 Introduction: Re Clarification of Problem

During a budget meeting within the House of Commons on 21st March 2012 a new legislation was announced to be active as of 1st October 2012 which outlined that all sales of sports nutrition products following this date will be subject to the standard rate of VAT at 20%, previous to this these products were exempt from VAT. The change has adapted the way the industry operates, where before there was a big focus on the quality and the effectiveness of the products; manufacturers are now focusing their efforts more on the reduction of cost price.

The following project is an analytical project aimed at deducing how sports nutrition manufacturers can successfully launch a product to be developed focusing on quality, innovation and effectivity into the industry. The focus will be maintaining a high quality product while working on a stricter cost price, due to the change effectively increasing cost price by 20%. Although the main focus of this paper is based on the analytical aspect, focusing on systems thinking models, soft systems methodology and sentiment analysis, there will be a final deliverable in the form of a sports nutrition product manufactured based upon the findings of the research completed within this paper. The product will be designed to maintain successful revenue levels in the post-legislation period, making allowances for the addition of VAT which now has to take place, while still aiming to provide the high quality and effectiveness that has become synonymous with the sports nutrition industry. The final deliverable should provide a balance of quality, effectiveness and fair price which should deliver a strong level of customer satisfaction on launch.

2.0 Background

2.1 Background: VAT on Sports Nutrition Products

The problem which induced the following paper was a result of a budget meeting within the House of Commons dated 21st March 2012 where the Chancellor announced a new legislation to become active as of the 1st October 2012 which would result in all sales of sports nutrition products being subject to the standard rate of VAT at 20%, previous to this these products were exempt and no VAT was charged. From many perspectives within the market, the change itself has caused a major reform within the industry; especially the individuals who were actively involved in the industry itself, major adaptations have been noticed. An in depth overview of the changes can be seen in my previous interim report for this paper. There are sections in this paper which may not be fully understood without reference to the interim report.

First of all, to properly understand the change, it is important to understand why this VAT charge was implemented. In announcing the proposed changes and laying out the plans for change, the government was keen to stress that a key aim of the move to subject sports nutrition products to a standard rate of VAT was to minimise anomalies within the industry. With some products already being regarded as standard rated, the products which were zero-rated carried an obvious benefit in the market place. This led to argument and debate between different manufacturers and suppliers. By changing the legislation to ensure that the standard rate applies across the board, the government believes it is introducing equality across the industry.

However, many people both within and outside of the sports nutrition industry believes that the government is introducing this VAT level in an attempt to generate more income. In a review of the overall VAT package, focus was carried out on closing loopholes and correcting any anomalies that were present in the UK market and which would have an impact on the UK budget.

The findings from the UK showed that removing the zero-rate from sports nutrition drinks would lead to a notable increase in the amount of income that was generated to the government. The Exchequer impact of the 20% VAT rate was predicted to be an increase of £5m for the 2012/13 period, a rise of £10m in the 2013/14, 2014/15 and the 2015/16 period while there would be an increase of £15m to the Exchequer for the period of 2016/17. It is this, as opposed to striving for equality that may well be the driving force behind the change. (HMRC, 2012) While the report indicated that there would be a positive impact for the economy, the findings were keen to point out that the government believed that there would be a minimal negative impact in the companies who are operating in this industry.

With respect to the economic impact of this VAT move, the government stated that there may be a slight increase in the price of these products and in keeping with the basics of supply and demand. This would lead to a fall in the level of demand for sports nutrition drinks. However, it pointed out that they believed there would be a negligible overall impact on the macroeconomic culture in the United Kingdom thanks to the move. The findings indicated that between 1,000 to 2,000 companies in the country would be negatively impacted upon thanks to the costs associated with familiarising themselves with the change in legislation, in reviewing the guidance, in implementing changes in system and in altering the pricing of their products. (HMRC, 2012)

There was immediate opposition to the governmental findings and an alliance called the UK Specialists Sports Nutrition Alliance was set up on the 29th of March 2012 and it features some of the biggest names in the industry, including My Protein and Maximuscle. The alliance responded to the government's claims of a 'small impact on firms' as being deeply flawed and unrealistic. In the first quarter of 2013, data from ACNielsen indicated that there had been a dramatic slowdown in the growth of sports nutrition, which had been a marked aspect of the industry in recent times. (Halifax, 2012)

It has been unfortunate for the industry that the rise in VAT has coincided with a rise in the price of whey protein. The second half of 2013 had seen the price of whey protein rise by 17%. Alongside a VAT increase this has caused a major increase in the sale price of whey protein products within the industry, and as a result, manufacturers have faced no alternative but to lower the quality of the products in an attempt to reduce the cost price in order to remain competitive. Another factor that the industry has argued against the VAT prices is with respect to improving the health of the nation. It would be fair to say that Britain is suffering an obesity epidemic and helping to improve the health of people would have a positive impact in lowering the stress being placed on the National Health Service. In response to this, the government has pointed out that the 20% VAT increase is being imposed on the products that are promoted or advertised as being an aid in enhancing a person's physical level of performance, in reducing the level of recovery time required after working out and when used to increase muscle mass or bulking up. (HMRC, 2012) The 20% VAT rate is not being imposed on products that are used within a controlled weight loss regime or programme being targeted at people who are looking to slim down and lose weight. This means that products such as Diet Whey Protein are not being subjected to the 20% VAT rate. However, this contradicts the original proposal by the government of introducing a greater level of equality across the board.

3.0 Methodology

Throughout the course of this paper I will incorporate many methodologies, although a diverse range of methodologies is used they each have their purpose justified, all methodologies used are interlinked for a specific reason.

Systems Characteristics

There are specific characteristics which are present in all systems; all systems include a set of interacting or independent entities which form the system itself. Other key characteristics include:

- Objective: Every system has an objective which it aims to achieve; the purpose of the system outlined in this report is to implement a solution to the problem outline in section 1.2 of the report.
- Every system has a specific standard which is the acceptable level of performance for that given system.
- Environment: Every system operates or co-exists within an environment, it is important for a system to adapt itself to the given environment it may encounter. Due to the System Dynamics methodology incorporating Human Behaviour the system included in this report will be an open system.
- Systems have a boundary, a limit to the functionality achievable through the system itself. Beyond these limits the system has to interact with other systems.
- Systems have behaviour characteristics, they are designed to process inputs to provide outputs, these 'processes' can come in many forms depending on the methodology used, examples of processes will be provided in this section of the report.
- Systems interact with users or other systems through an interface, these interfaces are also how users could potentially operate the system.
- Systems have interconnectivity features which allow the different components of the system to work together to form the system as a whole.

(Liusha, 2012)

Through the use of both Soft System Methodology and System Dynamics I am able to incorporate all of the features discussed above into the system to ensure the characteristics are formally implemented correctly and the system is effectively more efficient.

3.1 Methodology: Soft Systems Methodology

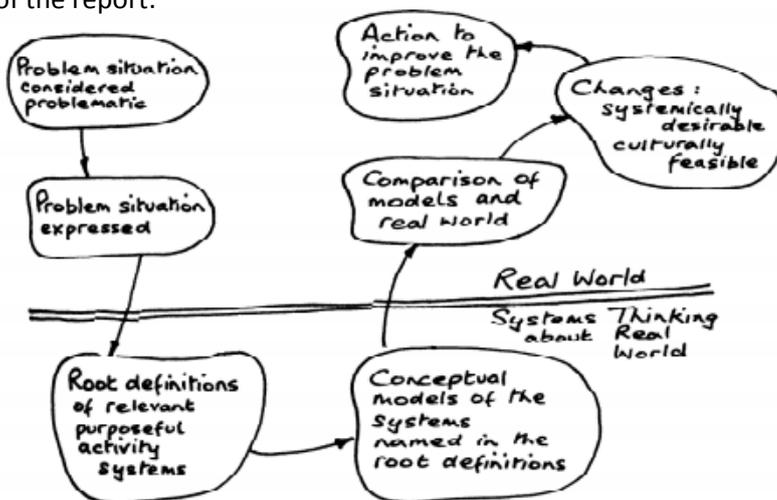
Soft System Methodology, founded in 1966 by a team of academics from the University of Lancaster, is a methodology used to analyse and solve complex problematic situations, particularly effective within complex organisational structures. It focuses on the power of reductionism; complex systems can be displayed as a complex set of entities or structures and explained by another, simpler set. Soft Systems Methodology reflects the notion of a hermeneutic cycle, an individual's understanding of a system as a whole is established with reference to the individuals understanding of the individual components that form the system itself. One understanding cannot be established without reference to the other.

It was developed as a result of the team’s attempt to tackle management problem situations using a systems engineering approach, which proved extremely difficult to apply in real world situations. These real world situations were often too complex for the use of a system engineering approach. A system is designed to accomplish an objective and it is extremely difficult to define an objective for a complex system using a system engineering approach, an example of this can be found in Soft Systems Methodology in Action by Peter Checkland and Jim Scholes:

“The treaty of Rome boldly declares that the Common Agricultural Policy (CAP) has three equally important objectives; to increase productivity in the agricultural industry; to safeguard jobs in the industry; and to provide the best possible service to customers.” (Checkland & Scholes, 1999)

If we analyse the statement, the phrase ‘equally’ causes a problem in terms of development, any progress towards either three goals will be at the sacrifice of the other two, therefore the objectives are not well defined. This is where Soft System Methodology is an approach that is more adaptable to complex real world situations. It enables the ability to unravel complex systems to gain a clear understanding of the system itself and the goals or objectives of the systems, a more appropriate objective for the defined system may have been to maintain a balance between all three objectives which remains politically acceptable.

Soft Systems Methodology promotes understanding which will help in the resolution of problems; it can be broken down into seven stages, for this particular methodology we will use stages 1 to 4 as we will only be using the methodology as an analytical methodology to assist the systems dynamic section of the report:



(Williams, 2005)

Stage 1: Problem Situation Considered Problematic

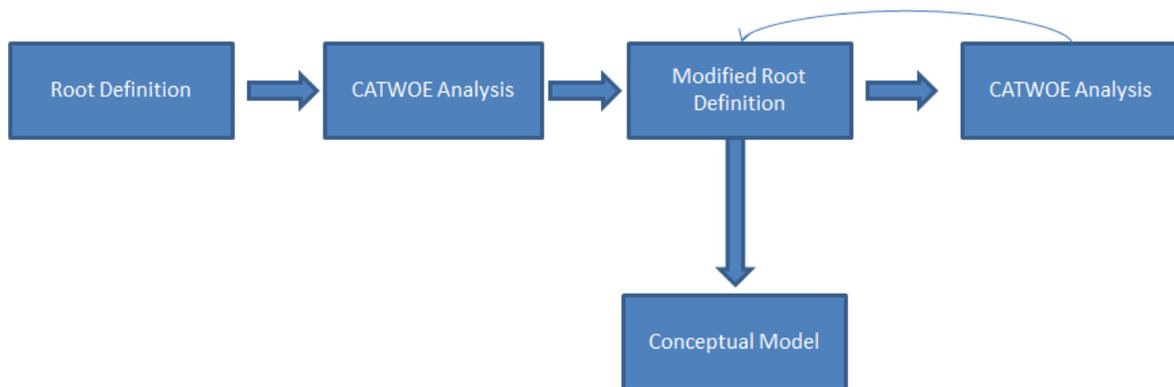
The first stage of the seven stage approach to Soft System Methodology is to explore the problem, here we are not physically defining the problem more assessing the problem area that is of interest to the project, so in this case, this was completed in both the background research in the interim report and in the background section of the following paper. A considerable amount of data was retrieved through the market research last semester during the interim report and that data has proved essential in the development of the Soft System Methodology approach, often the first stage is also the longest, and this has proved the case, the scope of this stage reflects back to the initial proposal for the project as this is where the research began.

Stage 2: Problem Situation Expressed

The second stage is where I began to express the problem situation; this was done in the form of a rich picture, using drawings and images to express the problem situation itself, the data needed for the creation of the rich picture would be gained from the research undertaken in stage 1. The rich picture for the problem expresses in this paper is displayed in section 3.1.1 of the report.

Stage 3: Root Definitions of Relevant Purposeful Activity Systems

It is important to state that the Soft System Methodology approach contains two separate methods of thinking or environments, the real world environment and the systems thinking about the real world environment. The real world environment is where the majority of the seven stages of SSM are completed however for stage three and four we have to move ourselves into the latter. The first step within this stage is to understand the perspectives of the different activities we can gain from the rich picture itself, the goal of the root definition is to address these activities as a whole. In order to develop a rich root definition we use a CATWOE analysis loop. A CATWOE analysis is a structured breakdown of different sections of the root definition and enables the identification of what the system is attempting to achieve, by constantly reevaluating both the CATWOE analysis and Root Definition you will achieve a more specific and accurate root definition to progress to stage 4. The root definition for the problem I outlined, alongside the CATWOE analysis can be found in sections 3.1.2 and 3.1.3 of the report.



(Wilson, 1993)

Stage 4: Conceptual Model of the System Named in Root Definition

The conceptual model is derived from the root definition defined in stage 3, which is why it is vital to ensure the root definition was both rich and reflective of the problem I was looking to model. They take the form of activity models, each activity is linked to another and their relationship displayed visually with dependencies. However where a regular activity model will model what activities happen in the real world, a conceptual model, being modeled in a 'systems thinking about the real world' environment, will describe what activities take place if the relevant root definition was an accurate representation of the work of a system. (University, 200-)

The conceptual model should include and incorporate all the stages of the CATWOE analysis used to form the root definition if you are using Brian Wilson's approach to Conceptual Modeling rather than Peter Checkland's approach. The model includes Control Actions and Constraints which have to be considered when modeling the conceptual model to ensure the system has a purpose. The conceptual model developed for this paper can be seen in section 3.1.4 of the paper.

Stage 5: Comparison of Models and Real World

Now that the conceptual model has been developed the next stage is to move back into the real world environment and compare the model created with reality. There are many methods of undertaking this step; the most popular is the use of a matrix approach to question the conceptual model's activities.

Breaking down each activity within the model to determine the following:

- Does this activity / step take place in the real world
- How does this activity perform in the real world
- How do you identify and measure its performance
- Is this process useful

(Williams, 2005)

Stage 6: Action to Improve the Problem Situation

Stage 6 is where we look at two different factors, possible interventions are discovered through stage 5 and we then assess whether the changes meet two criteria's, if they are desirable in principle and feasible to implement. (Checkland & Scholes, 1999)

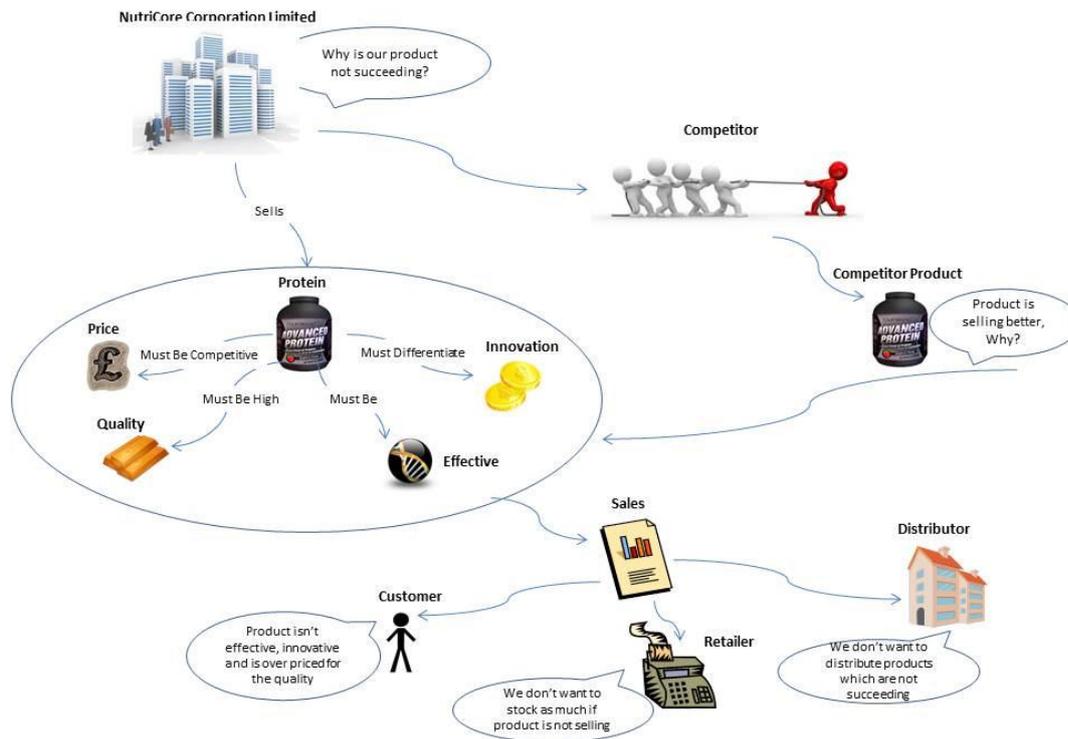
There are multiple ways of doing this; one method is to run through stages one to five again using different root definitions and conceptual models to then when comparing them to real world situations in stage five again, it may display some contradictions in the possible solutions. Another method and a more efficient approach is the combination of Soft System Methodology with another methodology, such as System Dynamics. This was the approach taken in this particular report as I believed it was the most relevant and represented the best qualities which I was aiming to achieve through undertaking this report. (Williams, 2005)

Stage 7: Changes: Systemically Desirable Culturally Feasible

This where the changes are implemented and the cycle end, or a new cycle begins to reevaluate the system to ensure the adaptations have improved the system itself.

3.1.1 Methodology: Soft Systems Methodology: Rich Picture

The phrase 'a picture speaks a thousand words' can be related to rich pictures in the sense that rich pictures use drawing or images to display complex problems rather than text. Intuitive consciousness communicates more easily in impressions and symbols than in words (University, 2013)



Above is a rich picture of the problem situation within NutriCore Corporation Limited, where they launch a product onto the market which isn't succeeding due to multiple variables of the product not being correctly issued.

3.1.2 Methodology: Soft Systems Methodology: Root Definition

A NutriCore Corporation Limited owned system operated by the Research & Development Department, to Launch and maintain an effective, high quality & innovative protein product that will sustain good revenue levels following the legislation change within the industry, by Identifying weaknesses in the product through means of analysing new research and comparison to competitor's products, and implementing changes to ensure product success, while considering Budget, Resource, Legislation, Legal and Scientific constraints.

3.1.3 Methodology: Soft Systems Methodology: CATWOE Analysis

C – Consumers, Retailers, Distributors

Customers: These customers or consumers who will be the users of this system are effectively the Consumers, Retailers and Distributors within the Sports Nutrition Industry, these can be split again into two main categories, consumers, effectively the users who will be physically consuming the product supplied, and the customers, who will be purchasing the product such as the retailers and distributors operating within the market.

A – Research & Development Department

Actors: The main department responsible for implementing changes to the product will effectively be the Research and Development Department for NutriCore Corporation Limited. As the industry

changes so will the product; the system will be continuous and will therefore have to be implemented by a specific department within the company.

T – Launch and maintain an effective, high quality & innovative protein product that will sustain good revenue levels within the sports nutrition industry.

Transformation: Effectively the changes that the system will bring about or the main goal of the system will be to launch and maintain an effective, innovative & high quality protein product into the sports nutrition industry that will maintain good revenue levels in the post legislation period.

W – Identifying weaknesses in the product by means of analysis of new research and through comparison to competitor’s products, and implementing changes to ensure product innovativeness.

Weltanschauung: The method in which the system will implement changes to achieve the ‘T’ is by identifying weaknesses within the current product that is being offered to the customers and consumers. This could be in the form of price weaknesses or quality to price weaknesses, such as sacrificing a small amount of quality to make a large price gain would be a weakness which could be exploited if the goal was to reduce cost price when minimising quality loss. The ultimate goal is to have a balance of Effectiveness, Quality and Innovation. The way in which the system will analyse weakness will be in the form of analysing new research that is released, which could prove a new ingredient on the market to be more effective than the an ingredient being used at the moment, or in the form of competitor analysis.

O – Managing Director of NutriCore Corporation Limited

Owners: The decision maker, who has the authority to stop or make adaptations to the system, would be NutriCore Corporation Limited.

E – Budget Constraints, Resource Constraints, Legislation Constraints, Legal Constraints, Scientific Constraints.

Environmental Constraints: The external constraints and limitations for the system will be in the form of Budget constraints, Resource Constraints, Legislation Constraints, Legal Constraints and Scientific Constraints. Budget Constraints will apply when working to a cost price for the product, in an ideal world I would like to make the product as high a quality as scientifically possible, however, when looking to launch a product to maintain good revenue levels that goal isn’t possible as cost price has to be restricted. Resource Constraints apply in the form of the amount of ingredients possible to purchase, at some point there will be shortages of a specified ingredient therefore our systems needs to be able to adapt to counteract this constraint. Legislation constraints apply to the product, these constraints can include the addition of VAT which will have an impact on the product itself. The legal constraints are in the form of manufacturing, health and safety and marketing laws; I must ensure that the product complies with all these specific laws. Scientific Constraints is a constraint which is applied to Consistency and Taste of the product. Quality is a key characteristic the product must incorporate, however the product must comply with taste and consistency specifications to appeal to customers.

3.1.5 Approach: Soft Systems Methodology: Activity Comparison Table

As the Soft System Methodology approach is based on a company which is yet to launch it is impossible to compare the activities in the conceptual model to that of actual real world activities, therefore I have given a 'road map' like comparison of what we can assume the real world activities will be.

ID	Activity	Real World Activity
1	Determine the capability required to implement activities	Determine how many employees it would take to implement the activity within the company and what they will need to implement this to the company.
2	Define Research & Development Department	Identify the Research and Development Department of the Company, who the employees of the department are, etc.
3	Allocate new activities to Department	New tasks distributed to department regarding changes to product, reduction in price, increase in price, etc.
4	Asses Capabilities	Look at employee's skill level and deduce who will be the most appropriate based on the information we receive.
5	Monitor the Match of Capabilities to Requirements	Monitor employee's capability levels to ensure that the changes are being carried out successfully.
6	Take Control Action To Match Capabilities to Requirements	Control the allocation of Tasks and Activities based on the skill level of the user within the department, so a novice would not be able to implement a specialist ingredient change to a product.
7	Identify Retailers Expectations	Company must identify what the retailer expects from the company itself when supplying goods, company cannot continue to supply a retailer with a greater demand than the company can supply. If a company such as Tesco ask the company to supply 1000 tubs a week where they can only produce 200 tubs per week, then retailer's expectations are too high.
8	Identify Consumers Expectations	Consumer expectation identification is in regards to Quality, Effectiveness, Price, Innovation, etc. A consumer demands a lot from the product and to remain competitive within the industry the company must identify the expectations of the consumers.
9	Identify Distributors Expectations	Company must also identify what a distributor will expect by distributing company products, alongside demand there is also a case for cost price, if the distributor demands the product to be sold at X price where the cost of manufacturing the product is greater than X then the expectations are too big from the distributor.
10	Monitor Product Performance	Research & Development department must monitor the performance of the product based on the expectations derived from all three customers discussed above.
11	Take Control Action To Achieve Expectations	Control action to ensure if there is any changes that need to be made due to a requirement or expectation not being met, then the change takes place to rectify the situation.

ID	Activity	Real World Activity
12	Define High Quality	Research what makes a product high quality.
14	Asses Quality of Product	Asses the quality of the company's product based upon the results obtained from the research. Lab Studies can be made on product to assess quality of ingredients.
15	Take Control Action to Ensure Product is High Quality	Changes need to be implemented if there is a problem with the quality of the product itself, implement the changes based on the feedback received from this process.
16	Define Effective	Research what makes a product effective within the industry.
17	Asses How Effective Product Is	Asses the effectiveness of the company product by comparison to the research obtained within the previous step, Scientific Analysis can also be made on product to asses this,
18	Take Control Action to Ensure Effectiveness of Product	Changes must be implemented to ensure product remained effective throughout its shelf life.
19	Identify Scientific Constraints	Identify ingredient constraints for adding too much of a specific ingredient could make the blend too thick or too thin, additional ingredients apart from protein must be researched such as flavorings and colorings and thickeners.
20	Identify Legislation Constraints	Research legislation if any changes occur then must be able to identify them before implementation. For example if VAT changes again then must identify changes.
21	Identify Legal Constraints	Identification of legal constraints, an example would be , a company is not legally bound to add VAT to sales until they turnover in excess of £79,000 in a calendar year.
22	Identify Budget Constraints	There is only a specific budget the company will have to spend on specific tasks or in regards to how expensive they can make the product, the company must identify these measures.
23	Identify Resource Constraints	Identify constraints in regards to resource constraints within the company, for example, if the company doesn't have the correct machinery to implement a specific change to a product, such as a new tub design, then these have to be identified.
24	Asses Impact of constraints on Launching and Maintaining New Product	Asses the impacts of all these constraints in regards to launching and maintaining the new product after launch.
25	Decide how to react	Company must decide how to implement the constraints into the product to ensure there product doesn't violate these constraints.
26	Notify Controllers	This is where each employee within the department is notified of the constraints for each task and which are relevant to the activity they are completing or implementing.

ID	Activity	Real World Activity
27	Assemble Activity Constraints Information	Gather information regarding the constraints which are relevant to each activity undertaken by the department.
28	Monitor Conformance	Monitor the environmental factors that affect the activity and ensure that the activity being implemented doesn't breach the constraints.
29	Take Control Action to Monitor Conformance	Control action to ensure the monitoring of the conformance being carried out is done effectively and if there is a problem then allows the interruption of the process.
30	Define NutriCore Corporation Limited	Understand the core values of NutriCore, the company itself, what assets it may hold and the products it offers.
31	Determine Owners Performance Expectations	Understand the expectations of the company, to sell X amount of tubs per week could be an expectation for the company at an early stage.
32	Determine Performance Measures	Determine how the company is performing in terms of sales of products, stock, share price, etc.
33	Monitor Product Performance	Compare the results from previous activity with company expectations.
34	Take Control Action To Achieve Expectations	Take a control action to implement changes if expectations are not being met.
35	Define Product	Research the product the company offers
36	Obtain New Research	Obtain and process new research from scientific articles and medical journals to obtain new research related to the ingredients the product uses or the product itself.
37	Determine Weaknesses Within The Product	Identify weaknesses within the product by comparing the product to the new research obtained which could highlight weaknesses such as specific ingredient
38	Define Feasibility	Define the meaning of feasible with regards to changes to implement into the product.
39	Asses The Feasibility of Correcting Weakness	Asses if the weaknesses highlighted are feasible to correct, making an adaption which would decrease cost price minimally but would require heavy investment into new computer systems or machinery may not be feasible for the company.
40	Implement Correction if Feasible	If the weaknesses highlighted are feasible to implement, such as changing the percentage of two ingredients to make the product more effective, then changes will be implemented.
41	Monitor Weaknesses within Product	Monitor the product to ensure research obtained and weaknesses within product are kept to a minimal, especially the weaknesses which are feasible to change, these should be implemented efficiently and quickly.

ID	Activity	Real World Activity
42	Take Control Action to ensure weaknesses are being rectified	Control action to ensure the weaknesses that should be changed within the product are rectified.
43	Define Sports Nutrition Industry	Research the sports nutrition industry, ensure the industry is well defined by the company and they understand the industry they are operating in.
44	Identify Competition Within Industry	Constant process to identify potential and legitimate competitors to the company, as the market dynamics change so will the competition so this is an ongoing process. Must ensure company identifies competition within the industry they operate.
45	Assemble Knowledge of Other Products Offered by Competition	Research and develop knowledge of the products offered by the competition, gather background research on how effective, the quality and price of the products to the competitor.
46	Derive Performance Measures by which competitors products can be assessed	Derive a performance measure to analyze the quality, effectiveness and innovation of the competitor's products.
47	Define Innovative	Research and define the term innovation.
48	Asses Owners Products Innovativeness	Determine whether the company's product is innovative and offers something different to that of the competition.
49	Asses Competition Products Balance of Quality, Effectiveness & Price	Asses the competitions products quality, effectiveness and price for future use of comparison with the company's product to easily analyze if the product we are offering is better than that of the competition.
50	Monitor Performance Measures Competition Set For Products	Gain information about the measures competitors go through to ensure they product is of a high quality, is effective and works towards a strict cost price.
51	Monitor Owners Products Innovativeness	Monitor the company product to ensure it is different to that of other products being offered on the market, the product should strive to be innovative as this is a key requirement for the company.
52	Take Control Action to Ensure Product is Innovative	Control action to ensure the company's product is innovative and different compared to other products being offered on the market by competitors.

3.2 Methodology: System Dynamics

System dynamics is a computer-aided approach to policy analysis and design. It applies to dynamic problems arising in complex social, managerial, economic, or ecological systems -- literally any dynamic systems characterized by interdependence, mutual interaction, information feedback, and circular causality (Society, 2011). System Dynamics is a methodology used to understand the behaviour of a system over time. It enables you to not only visualize a complex world or system but to also simulate it; what differentiates system dynamics from any other methodology is the use of feedback loops, stocks and flows. The stocks represent real life variables, systems dynamics enables the ability to monitor the performance or behaviour of these stocks to better understand and predict their future values.

Feedback Loops

Connected elements within the influence diagram, displayed in section 3.2.1 of the paper, form feedback loops, they can be both negative and positive feedback loops.

People seldom realize the pervasive existence of feedback loops in controlling everything that changes through time. Most people think in linear, nonfeedback terms. (Forrester, 2009) If we take into account Figure 1, it displays a real world perception of how a problem is solved, perception being the key word. People gain information about the problem; decide on an action which produces a result, and then believe that is the end of the problem.



Figure 1 - Linear Means of Solving a Problem

A far more realistic perception is displayed below in Figure 2, where information about a problem is received; an action is allocated to fix the problem which produces a result. This result then leads to cause future problems which form a feedback loop. There is no beginning or end in the complex reality than we exist within. Feedback loops are often joined together by nonlinear couplings that often cause counterintuitive behaviour. (Society, 201-)

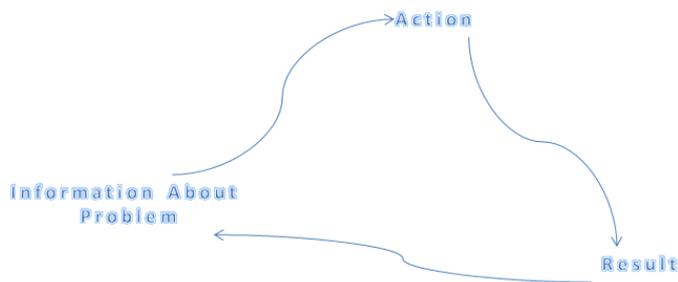


Figure 2 - Feedback Loop Displaying Means of Solving a Problem

Closed systems are controlled by two different types of feedback loops, positive loops and negative loops. The existence of positive feedback loops within a system is vital in terms of growth, often you find an action provides a result which increases the action. However, it can also lead to a decline in stock value; it provides an unbalancing effect of the variables contained within the loop where negative feedback loops focus more on stability within the system. Although they are referred to as ‘balancing loops’ this is not always the case as a poorly defined feedback structure can lead to an unbalancing effect within the closed system.

3.2.1 Approach: System Dynamics: Influence Diagram

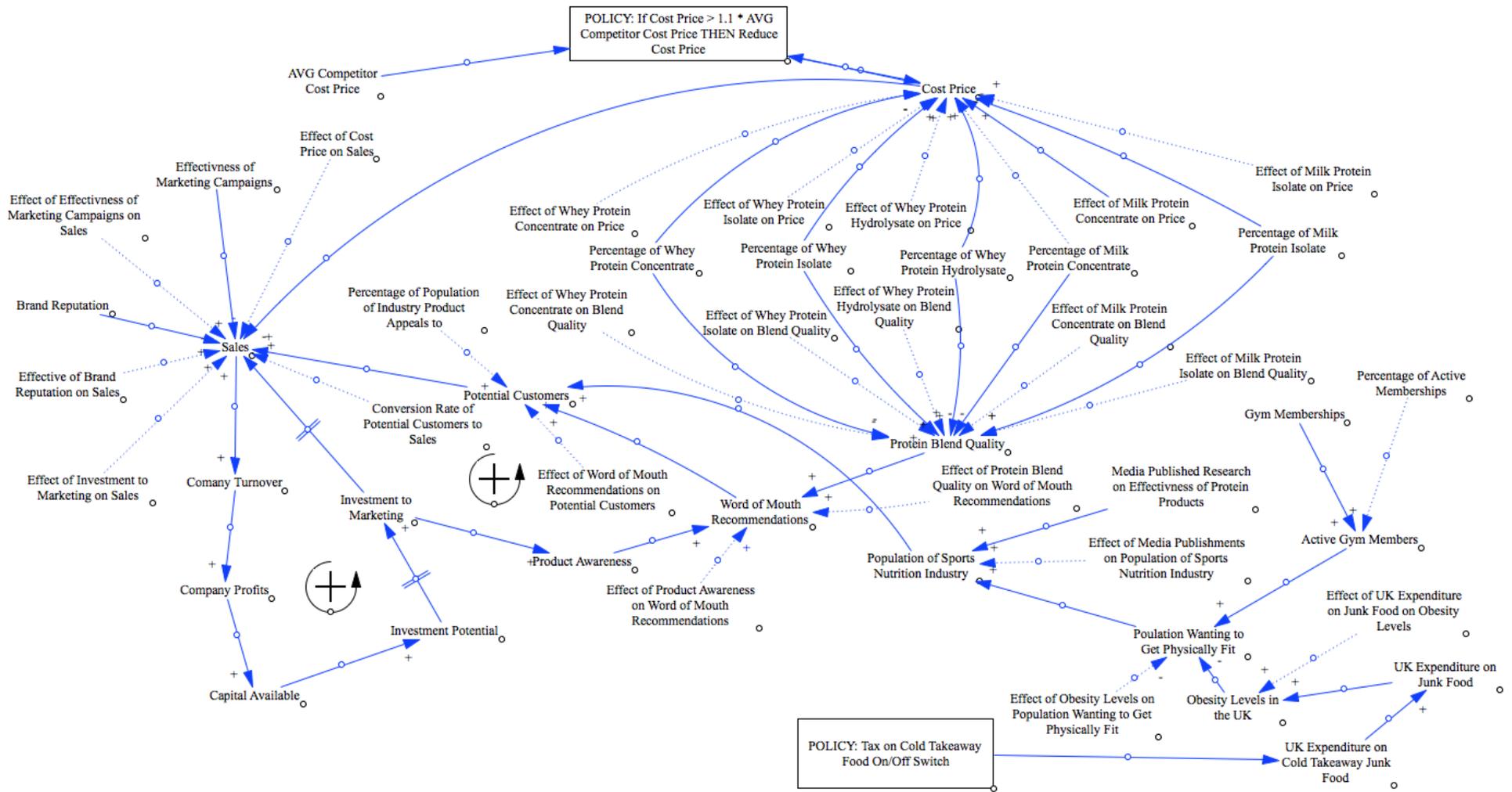
Influence Diagrams is a means of visualizing how interrelating variables that form a system effect one and other, which then form closed loops. This is how we display both positive and negative feedback processes. Below is an Influence Diagram structured to compliment the Soft System Methodology method used previously in the paper. There are two types of relations shown in the influence diagram alongside two policies and two delays.

Policies: Used in the influence diagram as an ‘IF’ statement for variables. Usually apply an action if the IF statement is true.

Delays: Displayed as a || in the middle of the relationship arrow, this shows when a variable influences another variable but after a delay in time. For Example, Investment to Marketing will Increase Sales, however the sales will not increase in unison with the increase in investment. They will develop over time.

Fixed Relationships:  Used to display physical relationships between two variables within the diagram.

Quantify Relationships:  Used to quantify relationships between two fixed relationships. As certain variables may not be measured with the same units a relationship must be quantified. For example, Price and Quality may be linked, however price is measured in currency where quality is not. Therefore another variable is created ‘Effect of Quality on Price’ which will display how both variables effect one and other.



3.2.2 Approach: System Dynamics: Influence Diagram Justification

Sales  **Company Turnover (+ Polarity)**

Justification One: The first relationship within the Influence Diagram which I will explain is the relationship between sales and company turnover. As the sales of the company increase so will the company's turnover, this is a relationship which is common across every business. Also as sales decrease so will the company turnover.

Company Turnover  **Company Profit (+ Polarity)**

Justification Two: This relationship displays the relation between Company Turnover and Company Profits; company profit is calculated by deducting the company outgoings from company turnover, if we assume the company outgoings do not exceed company turnover then the more turnover a company makes the more profit the company will make, the same can be said for the opposite where if the company turnover decreases so will the company profit.

Company Profit  **Capital Available (+ Polarity)**

Justification Three: This relationship displays the interaction between the company's profit and the capital available, as the company's profit increases so does the capital available. The capital available is essentially the amount of money in the company that is ready to be invested or spent.

Capital Available  **Investment Potential (+ Polarity)**

Justification Four: This relationship we are assessing the Capital Available and Investment Potential of the company. As the Capital Available increases the investment potential of the company will also increase, as the company can also consider larger investments with the more capital they have available, the same can be said for the opposite where the decrease in capital available will lead to a decrease in the investment potential of the company.

Investment Potential  **Investment to Marketing (+ Polarity) //DELAY**

Justification Five: This particular relationship has a delay in the interaction of both variables. As the Investment Potential of the company increases so will the amount of money invested to marketing the company, this is a logical assumption made by myself however the relationship does make logical sense. The same can be said for the opposite, where a decrease in the investment potential of the company will lead to a decrease in the investment made by the company to marketing the brand, there is a delay between the investment potential increasing and the investment being made due to the fact the company needs to weigh up the options available for investments.

Investment to Marketing  **Sales (+ Polarity) //DELAY**

Justification Six: This relationship shows the relation between Investment to Marketing and Sales, as more money is invested to marketing the brand it effectively increases the number of sales, due to more potential consumers being aware of the brand itself, this is a logical assumption however it has relevance within any business sector. The same can be said for a decrease by the company in marketing investments will lead to a decrease in sales. There is a delay in either action as an increase in marketing wouldn't lead to instant sales; the sales would increase over time.

Effect of Investment to Marketing on Sales  **Sales (+ Polarity)**

Justification Seven: This relationship is used to quantify the relationship between investment to marketing and sales, where one will be calculated using a currency the latter will be represented by a physical integer. Therefore a relationship between the two must be explained to justify the direct link between the two.

Brand Reputation  **Sales (+ Polarity)**

Justification Eight: This relationship displays the connection between the brand reputation and the sales of the company. An increase in the reputation of the brand will effectively lead to an increase in sales for the company. The same can be said for a decrease in the reputation of the brand will effectively decrease the sales the company will make.

Effect of Brand Reputation on Sales  **Sales (+ Polarity)**

Justification Nine: This relationship is to quantify the previous relationship, as Brand Reputation and Sales do not use the same units we need to justify the relationship between both to display how brand reputation will have an effect on sales.

Effectiveness of Marketing Campaign  **Sales (+ Polarity)**

Justification Ten: This relationship looks at the relation between the affectivity of the marketing campaign used by the company and the sales of the company. Essentially the more effective a marketing campaign is the more sales that will be achieved, as effectively marketing campaigns are used for a single purpose, to increase company sales, even if they are not designed to directly do this, there will be a relation to sales in there. On the flip side, the less effective the marketing campaigns are the more sales will drop.

Effect of Effectiveness of Marketing Campaign on Sales  **Sales (+ Polarity)**

Justification Eleven: This relationship justifies the relation between Affectivity of Marketing Campaign and Sales, as they are both measured with different units. Where one maybe using a percentage to measure and the second using a physical integer we need to quantify the relationship to give them a physical relationship which is justified.

Investment to Marketing  **Product Awareness (+ Polarity)**

Justification Twelve: Here I am making the assumption that an increase in investment to marketing will lead to an increase in the product awareness within the market. The way I have justified this is in relation to a similar company operating within the Sports Nutrition industry. Maximuscle are renowned for investing a large amount of money into advertising their brand within the industry, they targeted to normalise their brand through media advertisements, working towards a ROMI (Return of Marketing Investment) of 185%, by increasing the product awareness they effectively gain more potential customers through other avenues. (Travis, 2012) The same can be justified for a decrease in investment to marketing leading to a decrease in product awareness.

Effect of Investment to Marketing on Product Awareness  **Product Awareness (+ Polarity)**

Justification Thirteen: This relationship is to quantify the relationship between Investment to Marketing and Product Awareness as effectively they both operate using different units and therefore a relationship must be justified.

Product Awareness  **Word of Mouth Recommendations (+ Polarity)**

Justification Fourteen: This relationship displays the relations between Product Awareness and Word of Mouth Recommendations. A recent study has shown that a higher investment to social media advertising actually increases the word of mouth recommendations of the company itself, this can be justified with the following relationship where an increase in product awareness will lead to an increase in word of mouth recommendations as product awareness is directly influenced by investment to marketing. (FoodServiceWarehouse, 2012)

Effect of Product Awareness on Word of Mouth Recommendations  **Word of Mouth Recommendations (+ Polarity)**

Justification Fifteen: This relationship is used to quantify the relationship Product Awareness and Word of Mouth Recommendations, as product awareness will not be measured on the same units as word of mouth recommendations a relationship between the two therefore needs to be justified.

Protein Blend Quality  **Word of Mouth Recommendations (+ Polarity)**

Justification Sixteen: This relationship displays the relations between protein blend quality and word of mouth recommendations, a recent study displayed that the quality of your product is directly linked to the amount of word of mouth recommendations being made in regards to your product, an obvious yet effective relationship. (Faulds, 2011). The same can be said for a decrease in the quality of your product leading to a decrease in word of mouth recommendations.

Effect of Protein Blend Quality on Word of Mouth Recommendations  **Word of Mouth Recommendations (+ Polarity)**

Justification Seventeen: As protein blend quality is measured on a scale of 0-100, and word of mouth recommendations is based on population we need to quantify the relationship itself, therefore this relationship is to justify both variables being linked together.

Word of Mouth Recommendations of Product  **Potential Customers (+ Polarity)**

Justification Eighteen: This relationship is used to justify the relationship between Word of mouth recommendations for the product and Potential Customers. Word of Mouth is an extremely useful and cheap means of gaining potential customers in the sense that it doesn't cost to gain a Word of Mouth Recommendation regarding you product, an increase in the recommendations obtained by word of mouth will increase potential customers where a decrease would decrease potential customers. (Lithium, 201-)

Effect of Word of Mouth Recommendations on Potential Customers  Potential Customers (+ Polarity)

Justification Nineteen: This relationship is used to quantify the relationship between both Word of Mouth Recommendations and Potential Customers as not all Word of Mouth Recommendations will convert into a potential customer, therefore this value will often be a percentage of conversions to justify the relationship.

UK Expenditure on Cold Takeaway Junk Food  UK Expenditure on Junk Food (+ Polarity)

Justification Twenty: This relationship displays the relation between the amount of money spent on cold takeaway food, which is not subject to VAT due to a legislation loophole, and the amount of money spent on Junk Food in the UK economy, the reason I have included this is to add a Function in the iThink simulation where I will see how much of a difference a VAT charge on these types of food will have on the sports nutrition industry. An increase in UK Expenditure on Cold Takeaway Food will lead to an increase in the UK Expenditure on Junk Food.

UK Expenditure on Junk Food  Obesity Levels in the UK (+ Polarity)

Justification Twenty-One: This relationship displays the connection between the UK Expenditure on Junk Food to the Obesity Levels in the UK. Junk food has been researched and proven to cause a direct link to obesity levels, the amount of calories we consume through bad macronutrient sources increase our likelihood of putting on excess weight which will eventually lead to obesity problems, therefore this link is justified on a positive polarity where an increase in the UK Expenditure of Junk Food will lead to an increase in Obesity Levels in the UK. (Health, 201-)

Effect of UK Expenditure on Junk Food on Obesity Levels  Obesity Levels in the UK (+ Polarity)

Justification Twenty-Two: This relationship is used to quantify the connection between the UK Expenditure on Junk Food and Obesity Levels in the UK, as they operate using different units the relation needs to be justified.

Obesity Levels in the UK  Population Wanting To Get Physically Fit (- Polarity)

Justification Twenty-Three: This relationship displays the relation between obesity levels and the amount of individuals wanting to get physically fit, as obesity levels increase there will be less individuals wanting to get physically fit, a recent article by the BBC concluded that obese individuals actually feel less inclined to lose weight than overweight individuals, therefore as more individuals are getting obese it will cause a drop in the amount of people wanting to get physically active and fit. (BBC, 2006)

Effects of Obesity Levels in the UK on Population Wanting to Get Fit  Population Wanting To Get Physically Fit (- Polarity)

Justification Twenty-Four: This relationship is to justify the above relation, as obesity levels will affect the population in a specific way it needs to be justified by another variable.

Gym Memberships  **Active Gym Memberships (- Polarity)**

Justification Twenty-Five: This relationship displays the relation between Total Gym Memberships and Active Gym Memberships. Only a specific percentage of total memberships are active, as it has been proven that not all people who take out gym memberships actually use the facilities on offer to them. A recent survey by Which proved that the UK actually waste £37,000,000 a year on unused gym memberships, where they sign up to use a gym and never attend. (Which?, 2011)

Percentage of Active Memberships  **Active Gym Memberships (- Polarity)**

Justification Twenty-Six: Again this relation, as above is used as a percentage to relate the above relationship to the influence diagram, only a specific percentage of users who have gym memberships actually attend, it is estimated that 4 out of 5 gym members do not use their memberships and these are in fact 'inactive members'. (Which?, 2011)

Active Gym Memberships  **Population Wanting to Get Physically Fit (+ Polarity)**

Justification Twenty-Seven: This relationship is used to connect the Active Gym Memberships to the Population of Individuals Wanting to Get Physically Fit, the more active gym members there are the more people that will want to get physically fit, as this is the main reason in which people join the gym, to get more physically active.

Population Wanting to get Physically Fit  **Population of Sports Nutrition Industry (+ Polarity)**

Justification Twenty-Eight: This relationship is used to relate the population wanting to get physically fit to the population using sports nutrition products. As fitness and sports nutrition are interlinked as the population wanting to get physically fit increases so will the population using sports nutrition drinks. The same can be said for a decrease in the first variable will lead to a decrease in the latter. With more health and fitness magazines now promoting sports nutrition products the two industries are interlinking, therefore a growth in one industry typically means a growth in the latter. (Health, 201-)

Media Published Research on Effectiveness of Protein Products  **Population of Sports Nutrition Industry (+ Polarity)**

Justification Twenty-Nine: This relationship is used to relate the Media Published Research on protein's benefit at reducing weight, adding muscle and improving performance to the Population using sports nutrition products. If there is new research to prove the benefits that protein has on body composition then it will induce people to start using these sports nutrition products, therefore an increase in the media published researched will lead to an increase in the population that use sports nutrition products, while the same can be said for the opposite where a decrease in the first variable will lead to a decrease in the latter. These can be justified by looking at the following study on how social media can increase sales for a company. (Hopkinson, 2013)

Population Using Sports Nutrition Products  **Potential Customers (+ Polarity)**

Justification Thirty: This relationship justifies the connection between the population using sports nutrition products and the potential customers for the product, as more people start using sports nutrition products then effectively there will be more potential customers for the product.

Percentage of Population of Industry Product Appeals to  **Potential Customers (+ Polarity)**

Justification Thirty-One: This is used as a calculation to work out how many of the population using sports nutrition products will feel inclined to purchase the product on offer by the company.

Potential Customers  **Sales (+ Polarity)**

Justification Thirty-Two: As potential customers increases so will the sales of the company, this is a justification made across all business sectors as new sales are allocated across the sector. The same can also be said for a decrease in Potential Customers leading to a decrease in Sales for the product.

Conversion Rate of Potential Customers to Sales  **Sales (+ Polarity)**

Justification Thirty-Three: As the conversion rate increases it effectively means that the company will be converting more potential customers into sales therefore sales will increase. This relationship is used to justify the relationship between Potential Customers and Sales. (McElwain, 2001)

Cost Price  **Sales (- Polarity)**

Justification Thirty-Four: As the price of your product decreases the sales of the product will increase, due to value for money being a factor it is an obvious relationship. The same can be said for an increase in price leading to a decrease in sales. This is a key relationship as it justifies the purpose of the paper itself; the VAT has added 20% to the price of sports nutrition products leading to a decrease in sales for many companies. This relationship can be justified from the Interim Report where a questionnaires and interview process was made with companies within the industry who found their sales decrease as the VAT was applied. (Zemanta, 2009)

Effect of Cost Price on Sales  **Sales (- Polarity)**

Justification Thirty-Five: This is used to justify a relationship between the two. As cost price is measured with currency where sales is a physical integer there needs to be a quantifiable relationship between the two.

Percentage of Whey Protein Hydrolysate  **Protein Blend Quality (+ Polarity)**

Percentage of Whey Protein Isolate  **Protein Blend Quality (+ Polarity)**

Percentage of Whey Protein Concentrate  **Protein Blend Quality (- Polarity)**

Percentage of Milk Protein Isolate  **Protein Blend Quality (+ Polarity)**

Percentage of Milk Protein Concentrate  **Protein Blend Quality (- Polarity)**

Justification Thirty-Six: The following relationships justify the ingredients used for the protein blend and how they will effect the quality of the blend based on their percentage values, Whey Protein Concentrate and Milk Protein Concentrate are the cheap forms of protein, used to reduce cost price, these forms of protein have not been processed in any form where the other three have been processed using microfiltration and enzyme digestion to reduce Carbohydrate and Fat content within the protein powder to essentially make them more 'pure'. Therefore we are taking the assumption that any added Concentrate form of protein will reduce the quality the higher the percentage where any isolate or Hydrolysate form will increase the quality of the blend. (University, 200-) These can be justified by looking at Appendix IV.

Effect of Percentage of Whey Protein Hydrolysate on Blend Quality  **Protein Blend Quality (+ Polarity)**

Effect of Percentage of Whey Protein Isolate on Blend Quality  **Protein Blend Quality (+ Polarity)**

Effect of Percentage of Whey Protein Concentrate on Blend Quality  **Protein Blend Quality (- Polarity)**

Effect of Percentage of Milk Protein Isolate on Blend Quality  **Protein Blend Quality (+ Polarity)**

Effect of Percentage of Milk Protein Concentrate on Blend Quality  **Protein Blend Quality (- Polarity)**

Justification Thirty-Seven: Different forms of protein will have a different effect on the quality of the product, although with the previous relationship we see that Concentrate forms reduce quality and Isolate and Hydrolysate forms increase quality we have to put a physical value to the amount of quality increase or decrease by each ingredient, as Whey Protein Isolate would have a different effect on the quality of the brand than increasing the level of Whey Protein Hydrolysate, these are used to standardise the percentage level with the quality of the product. These can be justified by looking at Appendix IV.

Percentage of Whey Protein Hydrolysate  **Cost Price (+ Polarity)**

Percentage of Whey Protein Isolate  **Cost Price (+ Polarity)**

Percentage of Whey Protein Concentrate  **Cost Price (- Polarity)**

Percentage of Milk Protein Isolate  **Cost Price (+ Polarity)**

Percentage of Milk Protein Concentrate  **Cost Price (- Polarity)**

Justification Thirty-Eight: The following relationships, similar to that of the Ingredients to protein blend quality relationships link the ingredient to the price. It is important to justify an increase in the concentrates form will decrease unit price purely on the basis we are assuming that the blend would have to be made up with other ingredients if not concentrates, therefore if you decrease the amount of Whey Protein Concentrate you Increase another ingredient such as Whey Protein Isolate, so the blend gets more expensive. The same can be said for the opposite where if you increase the

amount of Whey Protein Concentrate so you will be using less Isolate/Hydrolysate forms so the blend would get cheaper. These can be justified by looking at Appendix IV.

Effect of Percentage of Whey Protein Hydrolysate on Blend Quality  **Cost Price (+ Polarity)**

Effect of Percentage of Whey Protein Isolate on Blend Quality  **Cost Price (+ Polarity)**

Effect of Percentage of Whey Protein Concentrate on Blend Quality  **Cost Price (- Polarity)**

Effect of Percentage of Milk Protein Isolate on Blend Quality  **Cost Price (+ Polarity)**

Effect of Percentage of Milk Protein Concentrate on Blend Quality  **Cost Price (- Polarity)**

Justification Thirty-Nine: These relationship show the relation between each specific ingredient and how they effect the unit price of the product, same assumption has been made as with previous relationship where we assume that the protein blend is made up of only these 5 ingredients therefore an increase in a lower quality ingredient will lead to an increase in a better quality product which will effectively cost more. Different ingredients will effect the unit price in different ways therefore these relationships are made to standardise the relationships and show the different levels of how each ingredient effects the unit price. These can be justified by looking at Appendix IV.

AVG Competitor Price per Unit  **POLICY**  **Cost Price**

“If Unit Price > 1.1 * AVG Competitor Unit Price THEN Reduce Cost Price”

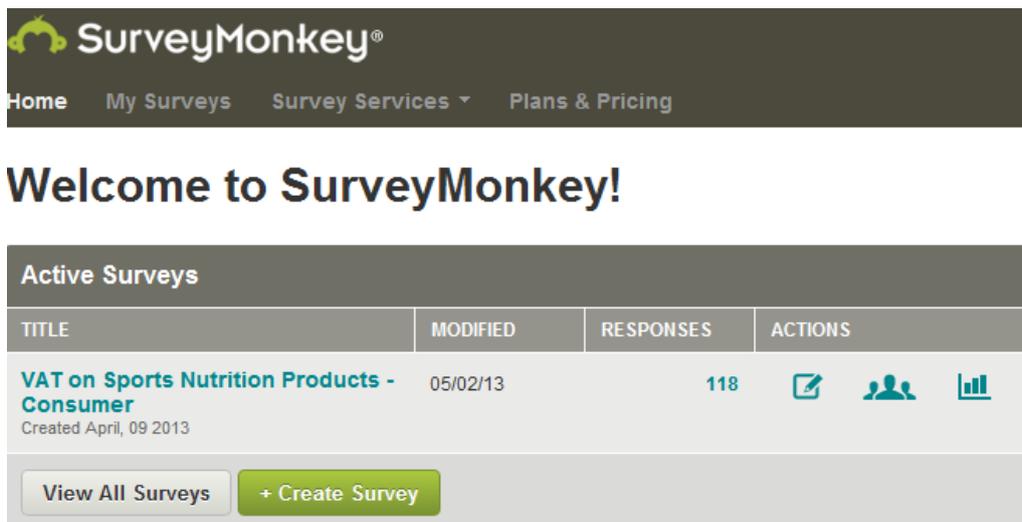
Justification Forty: This relationship, different to the rest is a POLICY, keeping a constant check on the AVG Competitor Price per unit, and if our unit price is more or equal to 110% the price of the competitors product then we lower our price to become more competitive, obviously this will have an effect on the quality of our protein product, however as a major part of our problem was to launch and maintain a **successful** protein product we must ensure we remain competitive within the industry.

POLICY – Ability to add a tax switch On/Off on Pasty Tax to display how the tax would affect the sales of sports nutrition products.

3.3 Methodology: Market Research

The market research undertaken this semester has been restricted to only focus on Consumer responses in order to gain a better understanding of the market to enable me to develop a system dynamics model which is discussed in section 3.3 of the report. I was able to achieve 118 responses to the survey set out this semester, which will prove extremely useful when modelling future methodologies as it gives me a better understanding of consumer behaviour within the industry.

The survey constructed this semester, as seen in Appendix I and Appendix II was drafted into seven questions, each with a specific purpose in regards to the development of my system dynamics methodology in section 3.3 of the report. Unfortunately due to being limited to a basic account on Survey Monkey, I am only able to analyse the first 100 responses received from the surveys.



The screenshot shows the SurveyMonkey interface. At the top, there is a navigation bar with the SurveyMonkey logo and links for Home, My Surveys, Survey Services, and Plans & Pricing. Below this is a large heading "Welcome to SurveyMonkey!". Underneath, there is a section titled "Active Surveys" which contains a table with the following data:

TITLE	MODIFIED	RESPONSES	ACTIONS
VAT on Sports Nutrition Products - Consumer Created April, 09 2013	05/02/13	118	  

At the bottom of the "Active Surveys" section, there are two buttons: "View All Surveys" and "+ Create Survey".

3.3.1 Methodology: Market Research: Review of Surveys

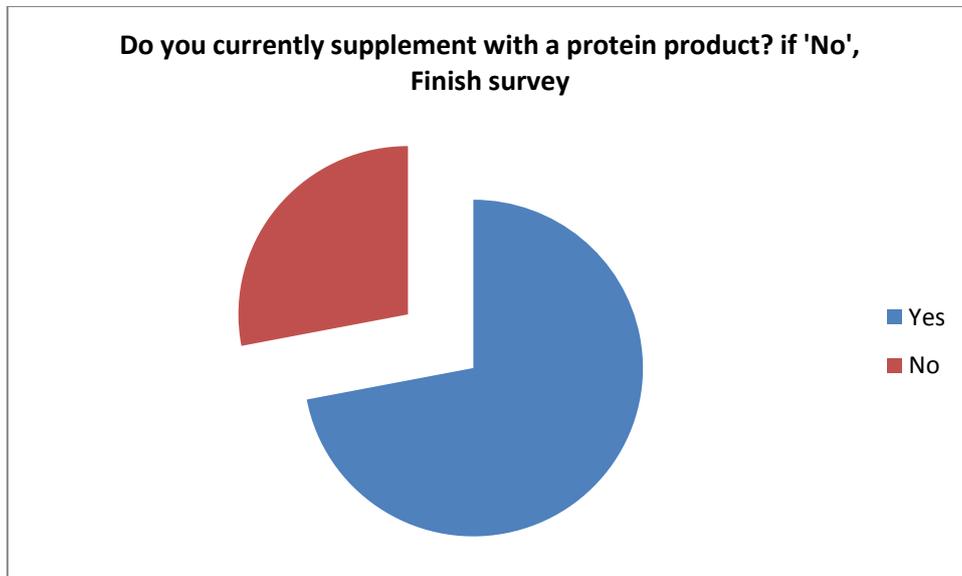
Question 1: Do you currently supplement with a protein product? if 'No', Finish survey

The first question was designed to deduce if the individual conducting the survey consumes any form of sports nutrition supplement, as individuals who didn't use these product would be of no further use to the research, it must be stated that individuals who were asked to undertake the survey had a high probability of using these product and where not randomly selected. The link to the survey was posted in fitness forums and through direct contact with individuals who I believed had a high probability of using the products in question, and that was reflected in the results.

1. Do you currently supplement with a protein product? if 'No', Finish survey.

[Create Chart](#) [Download](#)

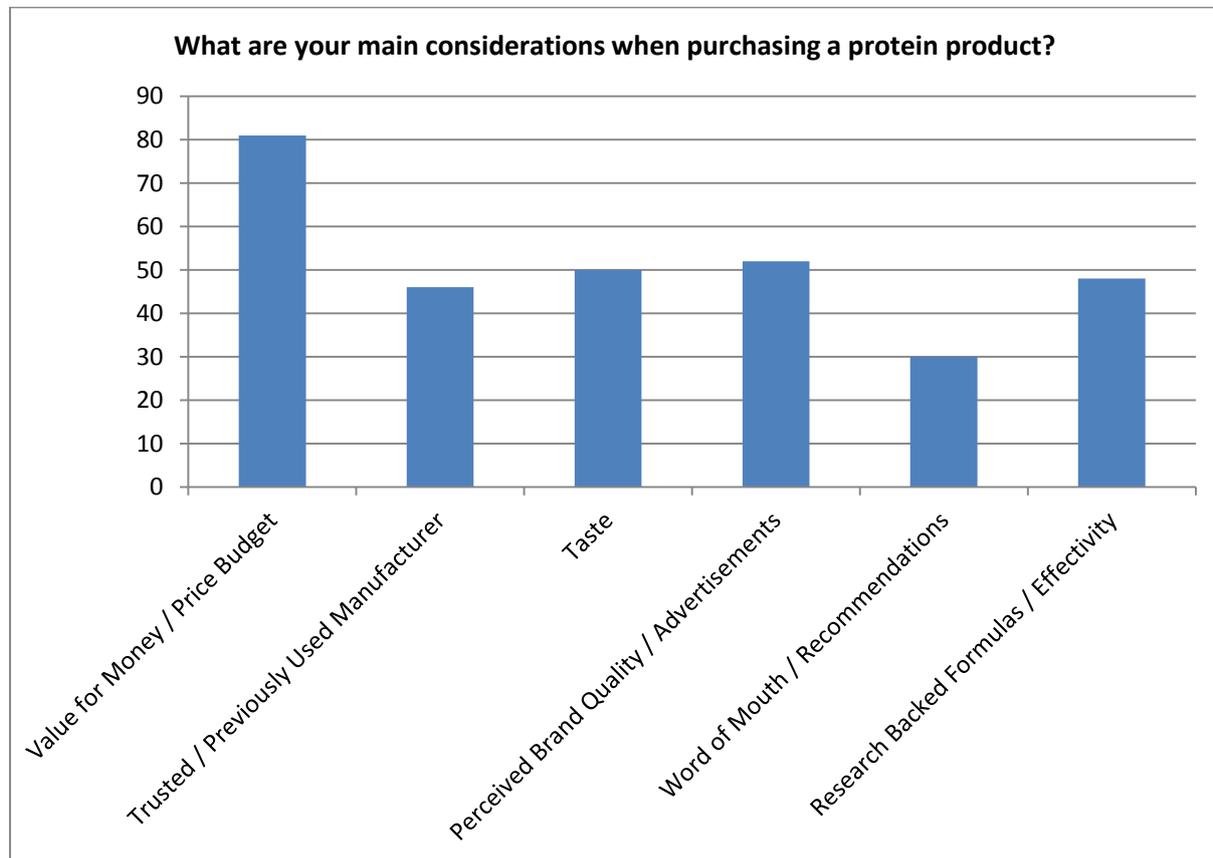
		Response Percent	Response Count
Yes		72.0%	72
No		28.0%	28
		answered question	100
		skipped question	0



As we can see 72% of individuals who took the survey currently supplement with a protein product, all individuals who do not supplement with a protein powder skipped the following questions to ensure accuracy of the responses are considered.

Question 2: What are your main considerations when purchasing a protein product?

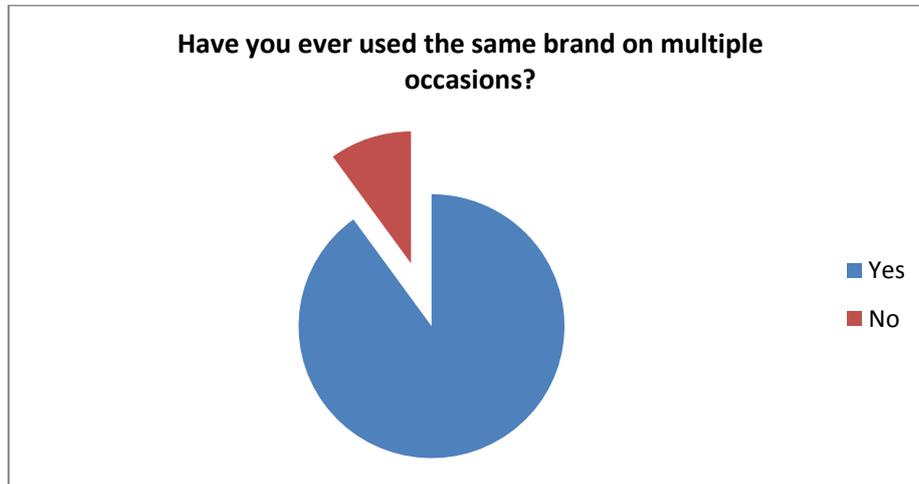
This question was designed to gain an understanding of the considerations consumers take before purchasing their product and what they look for when deciding what product they would like to purchase, this is an extremely useful detail which can influence the manner in which a product is advertised or manufactured.



This was a multiple choice question and users had the ability to select multiple options so the results do not total to 100%. As we can see from the results most consumers purchase dependant on a price budget and value for money, also Perceived Brand Quality, Trusted or Previously Used Manufacturers, Research Back Formulas and Effectivity and Taste where considered by almost half of the consumers where Word of Mouth had a minimal effect compared to the other options. Therefore more of an emphasis should be placed on the first four than the latter when developing the iThink model, and how these variables will affect the sales of the company.

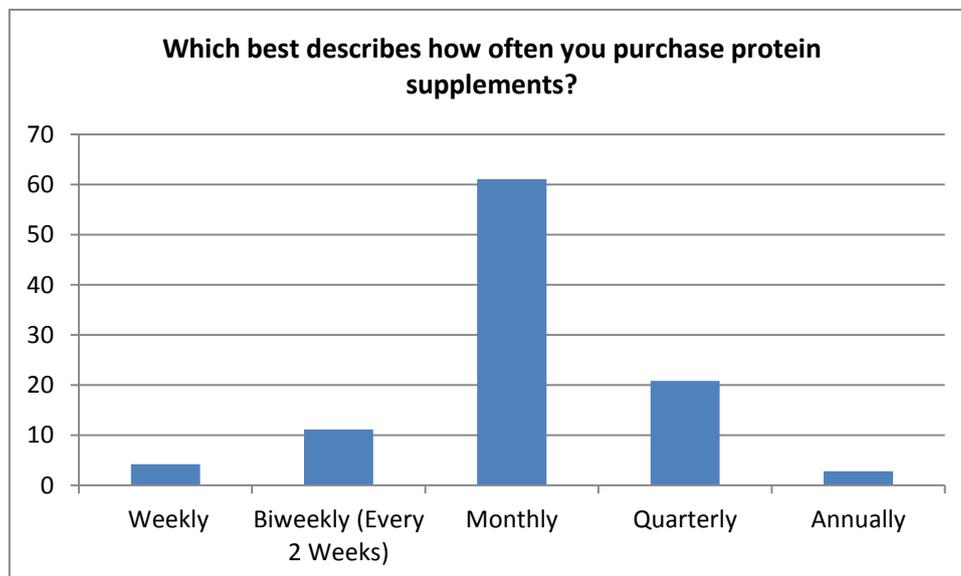
Question 3: Have you ever used the same brand on multiple occasions?

This question, a very simple yet extremely important question was derived to establish brand loyalty, the question was a yes or no answer and the results proved that a high percentage of consumers have used the same brand on multiple occasions, which enables the use of repeat orders within the iThink simulation.



Question 4: Which best describes how often you purchase protein supplements?

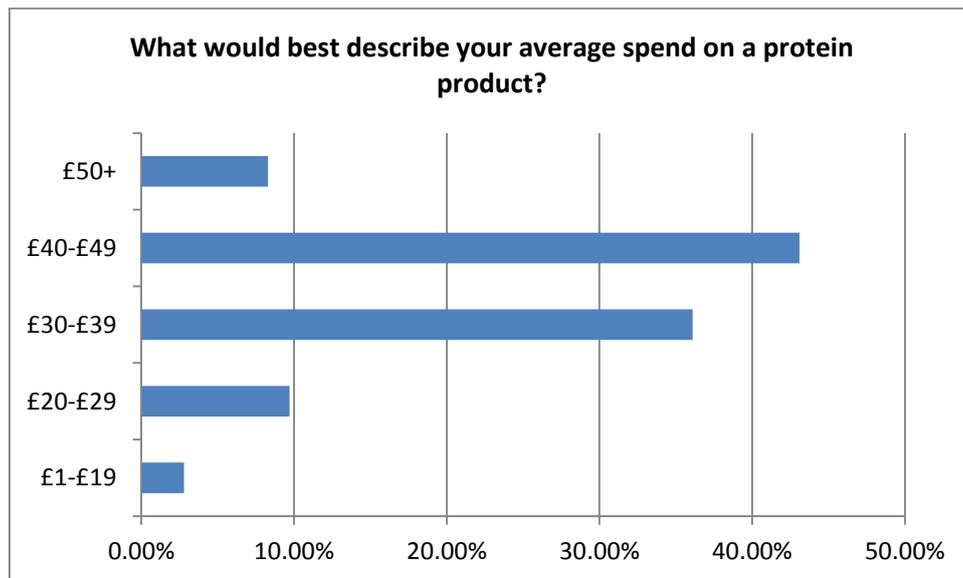
Once we have concluded the brand loyalty aspect of the consumers the next stage is to consider how often they purchase their products, to deduce how much of an impact repeat orders will have on the company sales. The question was split into 5 different options and the results are displayed below.



As we can see by analysis of these results, over 60% of the consumers undertaking this survey purchase their supplements on a monthly basis; this is extremely useful data which could be exploited in the system dynamics model at a later stage.

Question 5: What would best describe your average spend on a protein product?

The following question, and possible one of the most important questions is used to gather information regarding a consumers average spend on a protein supplement, this is of vital importance when developing the product, as it is essential you target a price range which will satisfy a high percentage of the consumers within the industry. Based on the results received from this analysis if we launch a product between the price of £30-39 it will be In the price range of 87.5% of the consumers who undertook the study.



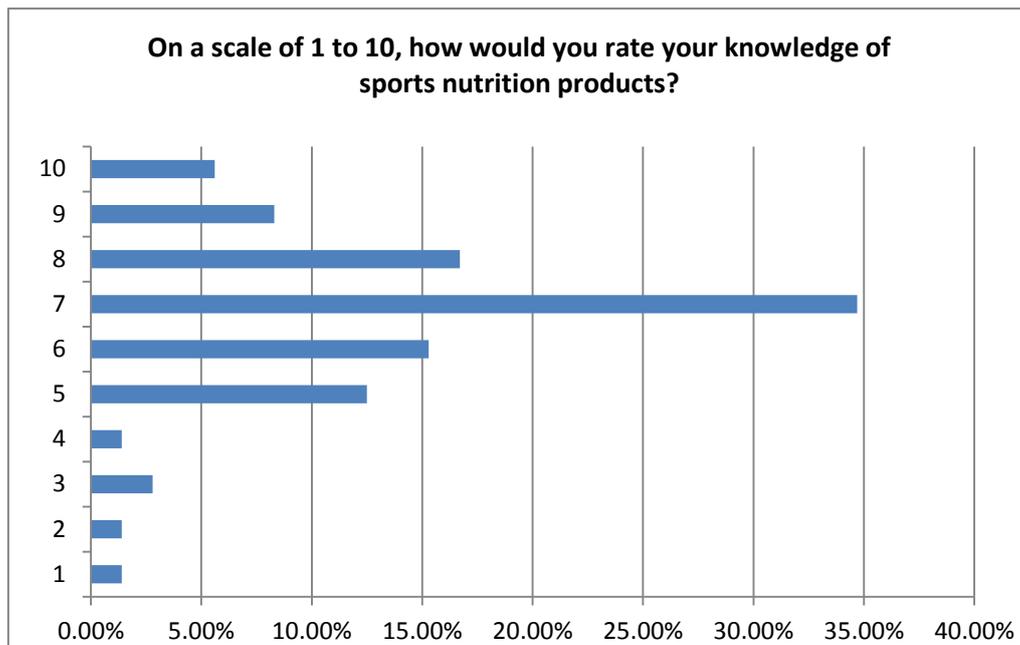
Question 6: There was a recent legislation change which now states that all sales of sports nutrition products will be subject to VAT at the standard rate of 20%, would you be willing to pay VAT additional to the price mentioned above?

As a start-up company earning less than £79,000 annually there is no need to charge VAT on sales, this question is designed for when the company exceeds that income barrier and has to start applying VAT to sales, does the price barrier included by the consumer above conclude the price Excluding VAT or Including VAT.



Question7: On a scale of 1 to 10, how would you rate your knowledge of sports nutrition products?

The final question is designed to gather the consumers knowledge of the protein supplements they are consuming, it also opens up the project to future work exploring marketing methods for the product, it was designed to gauge the average level of knowledge of a consumer, and that way the marketing techniques used and effectivity and quality of the product can be reflected to match the consumers knowledge of the supplement itself. There would be no need advertising ingredient names contained within the product if the average level of knowledge is minimal.



4.2 Implementation: System Dynamics Interface

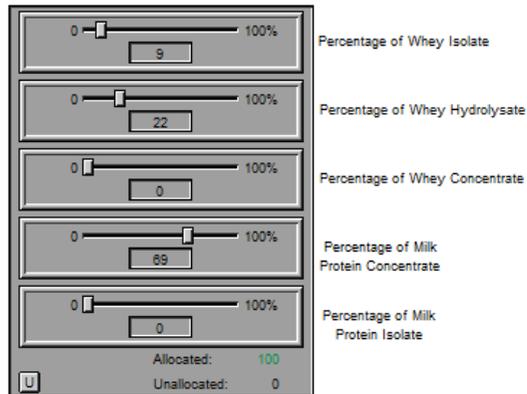


Figure 1 – Ingredient Slider

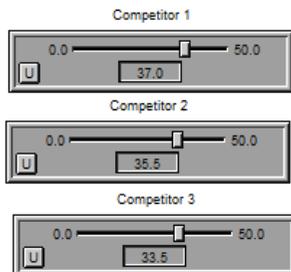


Figure 2 – Competitor Product Price Slider



Figure 3 – Investment to Marketing Slider

15:12 07/05/2013 Table 1 (Untitled Table)

Months	Sales	Potential Customers	Protein Blend Quality	Price Check	Unit Price
1	110.53	9,892.31	80.83	0.00	28.39
2	152.20	18,056.40	80.83	0.00	28.39
3	222.71	25,581.21	80.83	0.00	28.39
4	315.18	32,828.84	80.83	0.00	28.39
5	429.52	38,889.05	80.83	0.00	28.39
6	561.99	45,160.80	80.83	0.00	28.39
7	701.47	50,672.45	80.83	0.00	28.39
8	858.12	55,642.45	80.83	0.00	28.39
9	1,015.55	60,804.16	80.83	0.00	28.39
10	1,182.34	64,991.19	80.83	0.00	28.39
11	1,348.87	69,336.04	80.83	0.00	28.39
12	1,522.36	73,126.80	80.83	0.00	28.39
13	1,700.62	75,785.40	80.83	0.00	28.39
14	1,886.23	79,519.26	80.83	0.00	28.39
15	2,065.85	83,222.77	80.83	0.00	28.39
16	2,242.43	86,397.81	80.83	0.00	28.39
17	2,440.85	89,640.82	80.83	0.00	28.39
18	2,630.56	92,240.50	80.83	0.00	28.39
19	2,814.26	95,190.04	80.83	0.00	28.39
20	2,961.67	97,446.25	80.83	0.00	28.39
21	3,103.74	98,754.57	80.83	0.00	28.39
22	3,269.46	98,754.54	80.83	0.00	28.39
23	3,411.34	98,736.92	80.83	0.00	28.39
24	3,525.04	99,845.62	80.83	0.00	28.39
25	3,658.20	97,623.48	80.83	0.00	28.39

Figure 4 – Output Table for Simulation

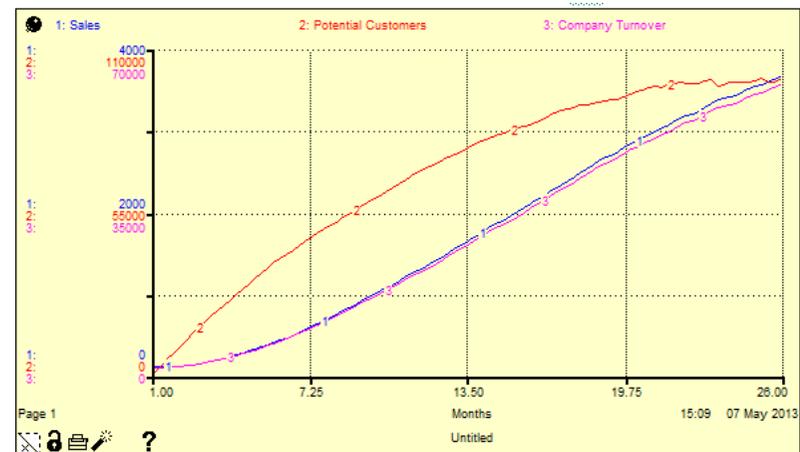


Figure 5 – Output Graph for Simulation

Figure 1

This product itself is made up of five different types of proteins, they form what is called a 'protein blend', the percentage of each ingredient can be altered however this will effect the quality, price and overall success of the product itself. This allows us to simulate the iThink program using different percentages of each ingredient to find an optimal balance for the product itself. All five ingredients used must total 100% inclusion for the simulation to run.

Figure 2

The second figure displays the competitor product price slider, the user inputs the price of the three biggest competitors and the program works out the average and then runs the simulation based on the average price of the competitor products. If NutriCore Corporation Limited's product is considerable cheaper then it will reflect on the output of the simulation. The simulation will adapt the output to reflect the similarity of price between competitors and NutriCore's product.

Figure 3

The third figure displays the company's investment to marketing the product itself; the program can simulate figures between £0 and £100,000 with increments of £1,000. The output from the simulation will vary depending on the level of investment itself, this reflect real world business where an increase in marketing increases the product awareness which evidently leads to more sales.

Figure 4

The fourth figure represented within the user interface is the output table; the simulation was simulated over a period of 26 months. The output table displays all the outputs from selected variables over a month by month period.

Figure 5

The final figure reflects the output table itself in a graphical format; the variables can be different to that of the variables in the output table to monitor the performance of other variables if the company wished to do so.

4.3 Implementation: System Dynamics Simulation Equations

Interface	Map	Model	Equation
<input type="checkbox"/>			<p>Potential_Customers(t) = Potential_Customers(t - dt) + (Increase_in_Potential - Decrease_in_Potential) * dt INIT Potential_Customers = 1000 INFLOWS: <input checked="" type="checkbox"/> Increase_in_Potential = IF(Potential_Customers>Population_of_People_Using_Sports_Nutrition_Products)THEN (0)ELSE(IF(Price_Check=0)THEN(Population_of_People_Using_Sports_Nutrition_Products*Effect_of_Investment_to_Marketing_on_Potential_Customers)ELSE((Population_of_People_Using_Sports_Nutrition_Products*Effect_of_Investment_to_Marketing_on_Potential_Customers)/RANDOM(2,4)))</p> <p>OUTFLOWS: <input checked="" type="checkbox"/> Decrease_in_Potential = IF(Price_Check=1) THEN(IF(Effect_of_Investment_to_Marketing_on_Potential_Customers<0.06) THEN(Potential_Customers*RANDOM(0.70,1.70)) ELSE(Potential_Customers*RANDOM(0.10,0.50)))</p> <p>ELSE(IF(Effect_of_Investment_to_Marketing_on_Potential_Customers<0.06)THEN(Potential_Customers*RANDOM(0.10,0.60)) ELSE(Potential_Customers*RANDOM(0.05,0.10)))</p>
<input type="checkbox"/>			<p>Sales(t) = Sales(t - dt) + (Increase_in_Sales - Decrease_in_Sales) * dt INIT Sales = 100 INFLOWS: <input checked="" type="checkbox"/> Increase_in_Sales = Potential_Customers*(Conversions/100) OUTFLOWS: <input checked="" type="checkbox"/> Decrease_in_Sales = IF(Price_Check=1)THEN(Sales*RANDOM(0.10,0.20))ELSE(Sales*RANDOM(0.05,0.10))</p> <p><input type="checkbox"/> AVG_Competitor_Price = (Competitor_1+Competitor_2+Competitor_3)/3 <input type="checkbox"/> Company_Turnover = Sales*Sale_Price <input type="checkbox"/> Competitor_1 = 0 <input type="checkbox"/> Competitor_2 = 0 <input type="checkbox"/> Competitor_3 = 0 <input type="checkbox"/> Effect_of_MPC_on_Price = 0.185 <input type="checkbox"/> Effect_of_MPC_on_Quality = 0.36 <input type="checkbox"/> Effect_of_MPI_on_Price = 0.285 <input type="checkbox"/> Effect_of_MPI_on_Quality = 0.79 <input type="checkbox"/> Effect_of_Price_Difference_on_Conversions = IF(Price_Difference<=5)THEN (-4) ELSE (IF(Price_Difference<0)THEN(-0.5)ELSE (IF(Price_Difference>5)THEN(2)ELSE (IF(Price_Difference>0)THEN(1) ELSE(0))))</p> <p><input type="checkbox"/> Effect_of_Protein_Blend_Quality_on_Conversions = IF(Protein_Blend_Quality<=60)THEN(1)ELSE(IF(Protein_Blend_Quality<80)THEN((Protein_Blend_Quality/100)+1)ELSE((Protein_Blend_Quality/100)+2))</p> <p><input type="checkbox"/> Effect_of_WPC_on_Price = 0.205 <input type="checkbox"/> Effect_of_WPC_on_Quality = 0.64 <input type="checkbox"/> Effect_of_WPH_on_Price = 0.375 <input type="checkbox"/> Effect_of_WPH_on_Quality = 0.88 <input type="checkbox"/> Effect_of_WPI_on_Price = 0.295 <input type="checkbox"/> Effect_of_WPI_on_Quality = 0.91 <input type="checkbox"/> Investment_to_Marketing = 0 <input type="checkbox"/> Percentage_of_Milk_Protein_Concentrate = 0 <input type="checkbox"/> Percentage_of_Milk_Protein_Isolate = 0 <input type="checkbox"/> Percentage_of_Whey_Concentrate = 0 <input type="checkbox"/> Percentage_of_Whey_Hydrolysate = 0 <input type="checkbox"/> Percentage_of_Whey_Isolate = 0 <input type="checkbox"/> Population_of_People_Using_Sports_Nutrition_Products = 359264 <input type="checkbox"/> Price_Check = IF(Unit_Price)>(1.1*AVG_Competitor_Price)THEN(1)ELSE(0) <input type="checkbox"/> Price_Difference = AVG_Competitor_Price-Unit_Price <input type="checkbox"/> Protein_Blend_Quality = (Percentage_of_Milk_Protein_Concentrate*Effect_of_MPC_on_Quality)+(Percentage_of_Milk_Protein_Isolate*Effect_of_MPI_on_Quality)+(Percentage_of_Whey_Concentrate*Effect_of_WPC_on_Quality)+(Percentage_of_Whey_Isolate*Effect_of_WPI_on_Quality)+(Percentage_of_Whey_Hydrolysate*Effect_of_WPH_on_Quality)</p> <p><input type="checkbox"/> Sale_Price = Unit_Price*1.6 <input type="checkbox"/> Unit_Price = (Effect_of_WPC_on_Price*Percentage_of_Whey_Concentrate)+(Effect_of_WPH_on_Price*Percentage_of_Whey_Hydrolysate)+(Effect_of_WPI_on_Price*Percentage_of_Whey_Isolate)+(Percentage_of_Milk_Protein_Concentrate*Effect_of_MPC_on_Price)+(Percentage_of_Milk_Protein_Isolate*Effect_of_MPI_on_Price)</p> <p><input checked="" type="checkbox"/> Conversions = <input checked="" type="checkbox"/> GRAPH((Product_Awareness*Effect_of_Protein_Blend_Quality_on_Conversions)*Effect_of_Price_Difference_on_Conversions) (0.00, 0.4), (10.0, 0.6), (20.0, 0.8), (30.0, 1.00), (40.0, 1.20), (50.0, 1.40), (60.0, 1.60), (70.0, 1.80), (80.0, 2.00), (90.0, 2.20), (100, 2.40)</p> <p><input checked="" type="checkbox"/> Effect_of_Investment_to_Marketing_on_Potential_Customers = <input checked="" type="checkbox"/> GRAPH(Investment_to_Marketing) (0.00, 0.03), (10000, 0.04), (20000, 0.03), (30000, 0.05), (40000, 0.07), (50000, 0.09), (60000, 0.1), (70000, 0.13), (80000, 0.2), (90000, 0.27), (100000, 0.34)</p> <p><input checked="" type="checkbox"/> Effect_of_Investment_to_Marketing_on_Product_Awareness = GRAPH(Investment_to_Marketing) (0.00, 0.00), (10000, 20.0), (20000, 36.0), (30000, 50.0), (40000, 61.0), (50000, 70.0), (60000, 77.0), (70000, 83.0), (80000, 87.0), (90000, 92.0), (100000, 94.0)</p> <p><input checked="" type="checkbox"/> Product_Awareness = GRAPH(Effect_of_Investment_to_Marketing_on_Product_Awareness) (0.00, 5.00), (10000, 14.0), (20000, 33.0), (30000, 48.0), (40000, 58.0), (50000, 69.0), (60000, 76.0), (70000, 84.0), (80000, 88.0), (90000, 91.0), (100000, 95.0)</p>

4.4 Implementation: Justification of System Dynamics Simulation Equations

Converter: Percentage of Whey Protein Concentrate

Converter: Percentage of Whey Protein Isolate

Converter: Percentage of Whey Protein Hydrolysate

Converter: Percentage of Milk Protein Concentrate

Converter: Percentage of Milk Protein Isolate

These converters hold the percentages of each ingredient for the blend; they are represented using the slider displayed in the user interface which ensures the percentages collectively all to 100%.

Converter: Effect of WPC on Price

Converter: Effect of WPI on Price

Converter: Effect of WPH on Price

Converter: Effect of MPC on Price

Converter: Effect of MPI on Price

These converters display the effect of each ingredient on the overall price, the details for the values inserted in these converters can be justified by Appendix V, where an email from the company is displayed showing the price information per percentage.

Converter: Effect of WPC on Quality

Converter: Effect of WPI on Quality

Converter: Effect of WPH on Quality

Converter: Effect of MPC on Quality

Converter: Effect of MPI on Quality

These converters display the effect of each ingredient on the quality of the final product, as above the email shown in Appendix V enabled me to insert a variable value that was relevant for the simulation itself.

Converter: Unit Price – This converter holds the information regarding the price of the product itself based on the ingredients chosen, it uses a simple mathematical equations by multiplying the inclusion of each ingredient with the cost of the ingredient derived from the ‘Effect of x on Price’ converters, ‘x’ being each individual ingredient.

Converter: Protein Blend Quality – This converter contains the details regarding the overall quality of the blend based on a scale of 0-100. It uses both the percentage of each ingredient and the effect of that ingredient on the quality, and uses a mathematical equation for each ingredient to get an overall quality value.

Stock: Potential Customers – This stock interprets the number of potential customers our product appeals to, it is calculated by taking the starting value of 1000, which is an estimate for the potential customers on launch, and then it has both an inflow (Increase In Potential) and an outflow (Decrease In Potential), the stock is calculated over time.

InFlow: Increase in Potential – The first thing we look at when we derive the inflow is if the ‘Potential Customers’ is greater than the ‘Population of People Using Sports Nutrition Products’ as it will be illogical to have more potential customers than the market itself, it also enables us to input a limit for the growth of the product. If the stock is greater than the population then the input is 0, and only outflow can happen on the stock until it falls below the maximum again. If the stock is less

than the population then we can assume there is room for growth, we first calculate whether our product is less than 110% of the cost price of the companies 3 biggest competitors, as if it is exceptionally more expensive then it will have a negative effect on the potential new customers, however if it is within these boundaries then we take the 'Population of People Using Sports Nutrition Products' and multiply it by the 'Effect of Investment to Marketing on Potential Customers' which is a decimal value of how effective our marketing campaign is.

OutFlow: Decrease in Potential – Very similar to the inflow the outflow is calculated based mainly on if the product is less than 110% of the cost price of its 3 biggest competitors, after taking this into consideration the next factor will be the level of investment, obviously if the company is a higher cost price than the competitors however the product is heavily marketed then it will have a smaller effect on the number of customers lost than if it was more expensive and lightly marketed.

Converter: Effect of Investment to Marketing on Potential Customers – This converter is represented by a graphical function; it considers all possible levels of investments and gives a fixed output for each. The graph itself is based on Appendix III, a graph displaying how advertisement effect customer clicks on Google; I found the source relevant to the variable used.

Converter: Investment to Marketing – this converter, displayed previously in the interface, holds the details of the company's level of investment which is controlled by the slider displayed in the user interface for the software itself.

Converter: Effect of Investment to Marketing on Product Awareness – This converter contains data of how the investment to marketing effects the product awareness, I used the product life cycle seen as a logical assumption, as investment to the product in the early stages is made the awareness increases and it will then peak. The same logic can be taken with marketing the product to gain awareness, what does make sense is the higher the investment level the higher the product awareness within the industry, therefore I analysed stages 1 to 3 of the product lifecycle to base the values for the graphical function used in this converter. (Krueger, 2012)

Converter: Product Awareness – The product awareness is equal to the converter used previously 'Effect of Investment to Marketing on Product Awareness' as this was effectively the converter used to calculate the product awareness itself. The values are equal to a percentage of the industry.

Converter: Competitor 1 – This contains details of the price of the first competitors product and is adjusted using the slider in the user interface displayed previously.

Converter: Competitor 2 – This contains details of the price of the second competitors product and is adjusted using the slider in the user interface displayed previously.

Converter: Competitor 3 – This contains details of the price of the third competitors product and is adjusted using the slider in the user interface displayed previously.

Converter: AVG Competitor Price – Calculated the average of the three prices to be used for comparison to NutriCore Corporations Limited's product.

Converter: Price Difference – Deduction of two converters, 'AVG Competitor Price' and 'Unit Price' to work out the difference in price. 'Unit Price' is described below.

Converter: Effect of Price Difference on Conversions – The following converter contains details on the effect the level of price difference will have on the conversions of potential customers to

customers, I used an 'IF' statement to a range of values and give an output based on the price difference. The higher the price difference the higher the conversion rate for customers to sales. (McElwain, 2001)

Converter: Effect of Protein Blend Quality on Conversions – The quality of the blend will effect the percentage of conversions from potential customers to sales. The current converter uses 'IF' statement to deduce the quality and the output will be dependent on the quality level of the blend.

Converter: Conversions – The conversions variable bases the output based on the quality level of the blend, price differentiation compared to that of the competitors average and product awareness. It is displayed as a decimal number based on a percentage. Based on a recent study a good 'conversion' rate for businesses was thought to be between 2 and 3% per impression, therefore I have implemented these figures into the simulation where if all the factors are good then it typically uses a conversion rate around the upper end of this number. (McElwain, 2001)

Converter: Population of People Using Sports Nutrition Products – This converter contains the population of the market potential; the total population was calculated based on information received from Key Note (Note, 2012) the population was based on the total value of the industry in 2012 and the average consumer spend and how often consumers purchase the product, which was stated in the market research completed previously. The population was therefore calculated at 359, 264. This was based purely on the sales of protein powder supplements alone.

Converter: Price Check – This converter is used as a POLICY, it calculated whether the price of the company's product is more than 110% of the AVG competitor price. If so its value is '1' and if not it has a value of '0'. It is then possible to query the converter to assess whether the price is of the product is too high.

Stock: Sales – This stock interprets the number of sales the company has made over time. I made the assumption the company has made 100 sales to begin to predict growth more accurately than starting from 0.

InFlow: Increase in Sales – With the inflow to the sales stock we consider the potential customers stock and the conversions stock, it is a very simple mathematical formula where we multiply the potential customers by the conversions as a decimal number and that will give us our inflow for the sales of the product.

OutFlow: Decrease in Sales – We cannot assume that every customer who purchases the product will only use this product in future therefore we have an outflow from the sales stock, the outflow take's the Price Check variable into account and if competitors products are cheaper than the outflow will be randomized between a higher percentage than if the competitors products where priced similarly to that of the company's product.

Converter: Sale Price – This converter holds the details for cost price of the product, I am making the assumption that the sale price of the product is 1.5 multiplied by the unit price, as companies tend to work between this types of profit margin.

Converter: Company Turnover – This calculated the company turnover by multiplying the sales by the sales price of the product itself.

4.5 Implementation: Outputs of System Dynamics Simulation

As a means of displaying the simulation itself is effective I have prepared three separate simulations to display the outputs for each. There will be a live demonstration with more detail in the Viva Examination to present the simulation itself.

Simulation 1: Low Quality Product. Low Investment, Higher Price Than Competitors Average.

Percentage of Whey Protein Concentrate – 31%

Percentage of Whey Protein Isolate – 5%

Percentage of Whey Protein Hydrolysate – 0%

Percentage of Milk Protein Concentrate – 57%

Percentage of Milk Protein Isolate – 7%

Investment to Marketing – £11,000

Competitor 1 Price - £19.50

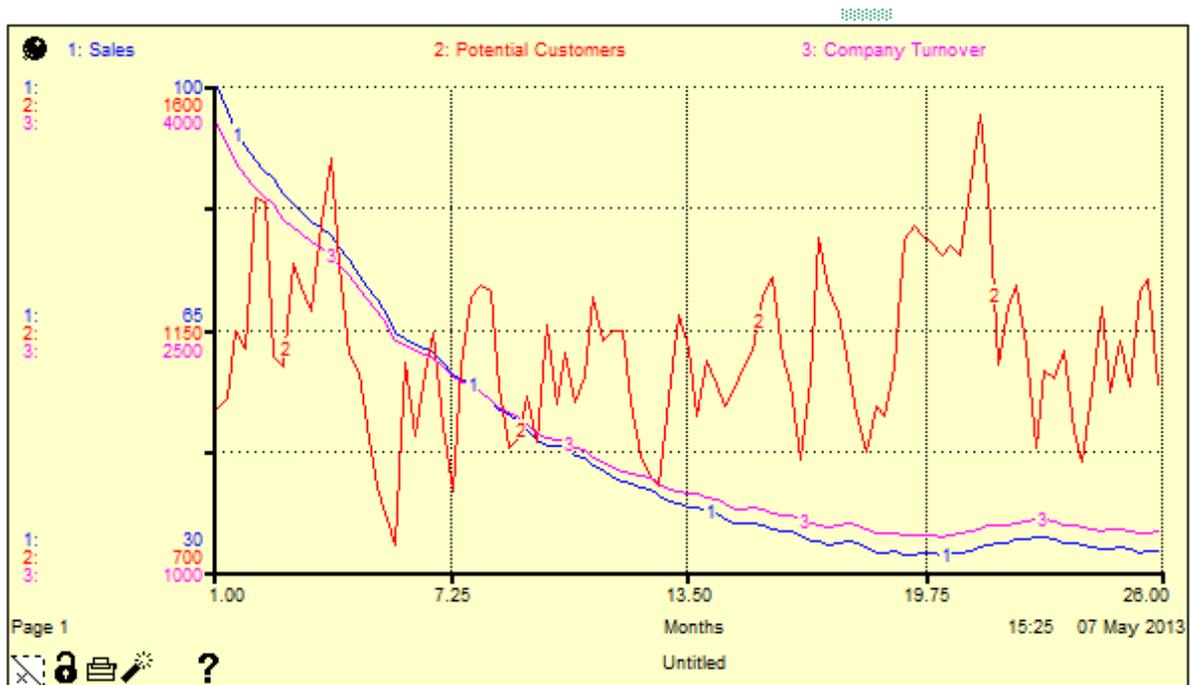
Competitor 2 Price - £18.50

Competitor 3 Price - £17.50

In the first simulation we will generate a poor quality product, alongside a low investment where the competitor’s products are extremely cheap compared to the industry average. Therefore the results should be poor and I would expect the sales to drop extremely low during the simulation.

Simulation 1 Outputs:

Months	Sales	Potential Customers	Protein Blend Quality	Price Check	Unit Price
1	89.30	1,392.21	58.66	1.00	23.56
2	82.91	1,272.34	58.66	1.00	23.56
3	78.34	1,486.82	58.66	1.00	23.56
4	71.10	967.03	58.66	1.00	23.56
5	63.53	1,085.28	58.66	1.00	23.56
6	60.11	969.58	58.66	1.00	23.56
7	55.82	1,229.84	58.66	1.00	23.56
8	51.49	944.58	58.66	1.00	23.56
9	47.94	1,007.86	58.66	1.00	23.56
10	45.04	1,208.81	58.66	1.00	23.56
11	42.37	1,013.71	58.66	1.00	23.56
12	39.85	1,020.84	58.66	1.00	23.56
13	38.40	1,090.61	58.66	1.00	23.56
14	36.64	1,084.26	58.66	1.00	23.56
15	35.57	1,096.80	58.66	1.00	23.56
16	34.03	1,318.88	58.66	1.00	23.56
17	33.83	989.88	58.66	1.00	23.56
18	32.60	1,077.52	58.66	1.00	23.56
19	32.36	1,307.37	58.66	1.00	23.56
20	32.86	1,414.42	58.66	1.00	23.56
21	34.00	1,191.12	58.66	1.00	23.56
22	34.88	1,070.95	58.66	1.00	23.56
23	33.66	902.60	58.66	1.00	23.56
24	33.24	1,125.34	58.66	1.00	23.56
25	32.83	1,047.36	58.66	1.00	23.56



As we can see the quality of the product was 58.66, which is a very low quality product, however the price reflected that with a price per unit of £23.56; however this was more than 110% of the average price of the competitors which has a negative effect on the sales. The sales dropped considerably with month 26 sales totalling 32.83, a drop from 100 in month 1.

Simulation 2: High Quality Product, High Investment to Marketing, Price Within Competitors Range

- Percentage of Whey Protein Concentrate – 24%
- Percentage of Whey Protein Isolate – 55%
- Percentage of Whey Protein Hydrolysate – 10%
- Percentage of Milk Protein Concentrate – 2%
- Percentage of Milk Protein Isolate – 9%

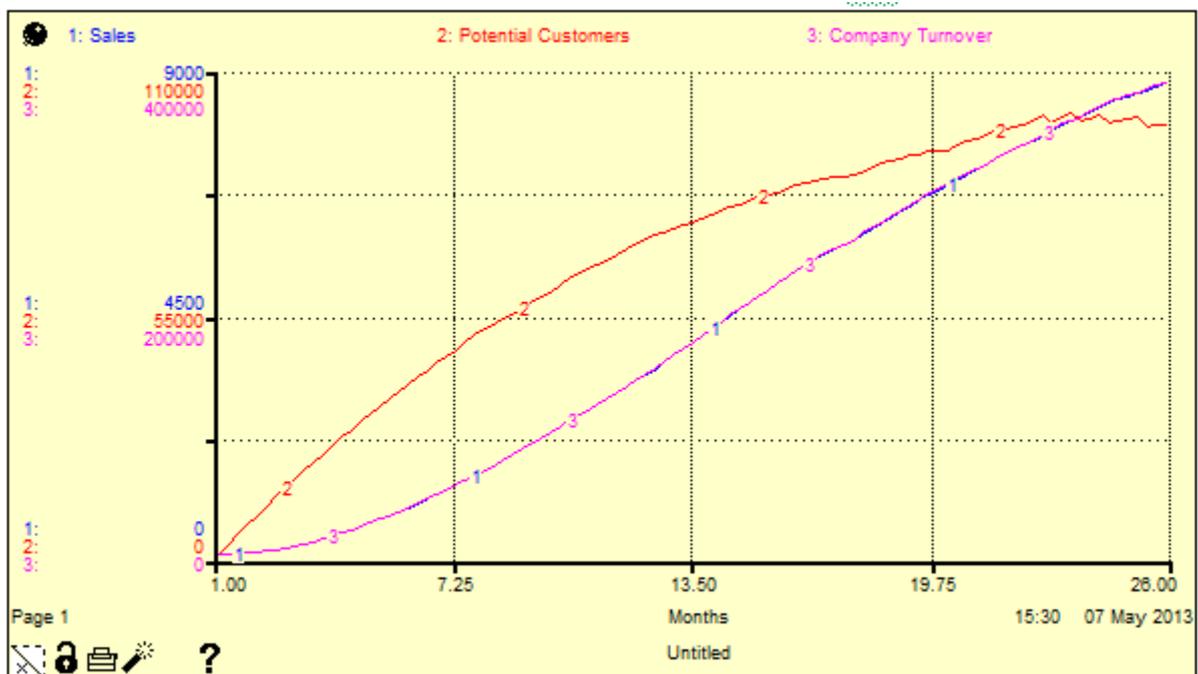
Investment to Marketing – £53,000

- Competitor 1 Price - £36.50
- Competitor 2 Price - £37.50
- Competitor 3 Price - £39.00

From one extreme to the other, we will now look at a very high quality product with a high investment to marketing budget. We will also assume that the competitor's price are extremely high within the industry allowing us to create a better product. I would expect this simulation to provide an extreme jump in sales by month 26 due to the variables we have simulated being extremely beneficial for the company.

Simulation 2 Outputs:

Months	Sales	Potential Customers	Protein Blend Quality	Price Check	Unit Price
1	134.67	9,937.23	82.04	0.00	27.83
2	248.97	18,144.31	82.04	0.00	27.83
3	431.64	25,828.90	82.04	0.00	27.83
4	671.60	32,941.75	82.04	0.00	27.83
5	955.47	39,517.99	82.04	0.00	27.83
6	1,286.66	45,982.06	82.04	0.00	27.83
7	1,642.49	52,118.23	82.04	0.00	27.83
8	2,042.68	56,742.95	82.04	0.00	27.83
9	2,449.49	61,934.28	82.04	0.00	27.83
10	2,851.92	66,752.03	82.04	0.00	27.83
11	3,303.14	71,288.31	82.04	0.00	27.83
12	3,770.90	74,709.03	82.04	0.00	27.83
13	4,252.91	77,955.50	82.04	0.00	27.83
14	4,754.07	80,914.00	82.04	0.00	27.83
15	5,238.10	83,619.51	82.04	0.00	27.83
16	5,645.43	85,861.94	82.04	0.00	27.83
17	6,017.66	87,622.86	82.04	0.00	27.83
18	6,435.89	90,798.96	82.04	0.00	27.83
19	6,827.34	92,496.11	82.04	0.00	27.83
20	7,219.04	95,066.02	82.04	0.00	27.83
21	7,577.88	97,840.28	82.04	0.00	27.83
22	7,918.82	98,811.94	82.04	0.00	27.83
23	8,264.45	99,792.36	82.04	0.00	27.83
24	8,561.19	99,587.04	82.04	0.00	27.83
25	8,803.16	98,262.76	82.04	0.00	27.83



As we can see in the following outputs the sales increased greatly, with a unit price of £27.83 reflecting the quality increase to 82.04 as we used a better ingredient profile on the second simulation to the first. Potential Customers and sales showed extreme growth reflecting the investment to marketing allowing for more potential customers. The lines are represented using different scales which can be seen on the left hand side, as potential customers will always be greater than sales.

Simulation 3: Very High Quality Product, Average Investment to Marketing, More Expensive than Competitor

Percentage of Whey Protein Concentrate –0%

Percentage of Whey Protein Isolate –9%

Percentage of Whey Protein Hydrolysate – 58%

Percentage of Milk Protein Concentrate – 0%

Percentage of Milk Protein Isolate – 33%

Investment to Marketing – £36,000

Competitor 1 Price - £29.00

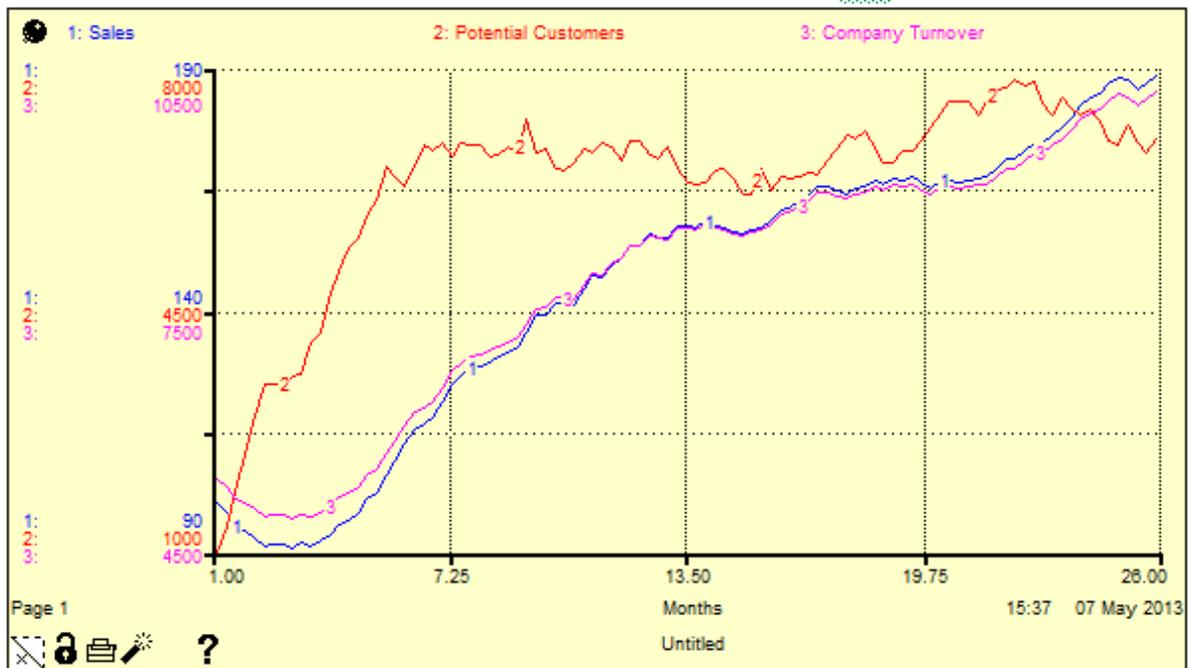
Competitor 2 Price - £29.50

Competitor 3 Price - £30.50

The following simulation is designed to reflect the goal of launching a high quality product, that maybe slightly more expensive than the competitor average (12-15%) and to judge whether the product will succeed. We are looking at an average sized initial investment of £36,000.

Simulation 3 Outputs:

Months	Sales	Potential Customers	Protein Blend Quality	Price Check	Unit Price
1	92.80	2,954.87	85.30	1.00	33.81
2	90.54	3,557.36	85.30	1.00	33.81
3	93.66	4,749.08	85.30	1.00	33.81
4	100.91	5,859.67	85.30	1.00	33.81
5	112.23	6,316.32	85.30	1.00	33.81
6	120.91	6,946.69	85.30	1.00	33.81
7	128.43	6,918.74	85.30	1.00	33.81
8	132.65	6,795.95	85.30	1.00	33.81
9	141.53	6,560.45	85.30	1.00	33.81
10	147.15	6,789.27	85.30	1.00	33.81
11	153.53	6,965.45	85.30	1.00	33.81
12	155.04	6,864.78	85.30	1.00	33.81
13	158.76	6,363.96	85.30	1.00	33.81
14	155.95	6,200.52	85.30	1.00	33.81
15	160.85	6,448.81	85.30	1.00	33.81
16	165.64	6,486.55	85.30	1.00	33.81
17	165.31	6,998.97	85.30	1.00	33.81
18	167.61	6,639.25	85.30	1.00	33.81
19	165.50	7,152.27	85.30	1.00	33.81
20	167.10	7,542.03	85.30	1.00	33.81
21	171.41	7,727.44	85.30	1.00	33.81
22	174.95	7,500.53	85.30	1.00	33.81
23	182.62	7,332.12	85.30	1.00	33.81
24	188.49	6,905.87	85.30	1.00	33.81
25	188.89	6,984.08	85.30	1.00	33.81



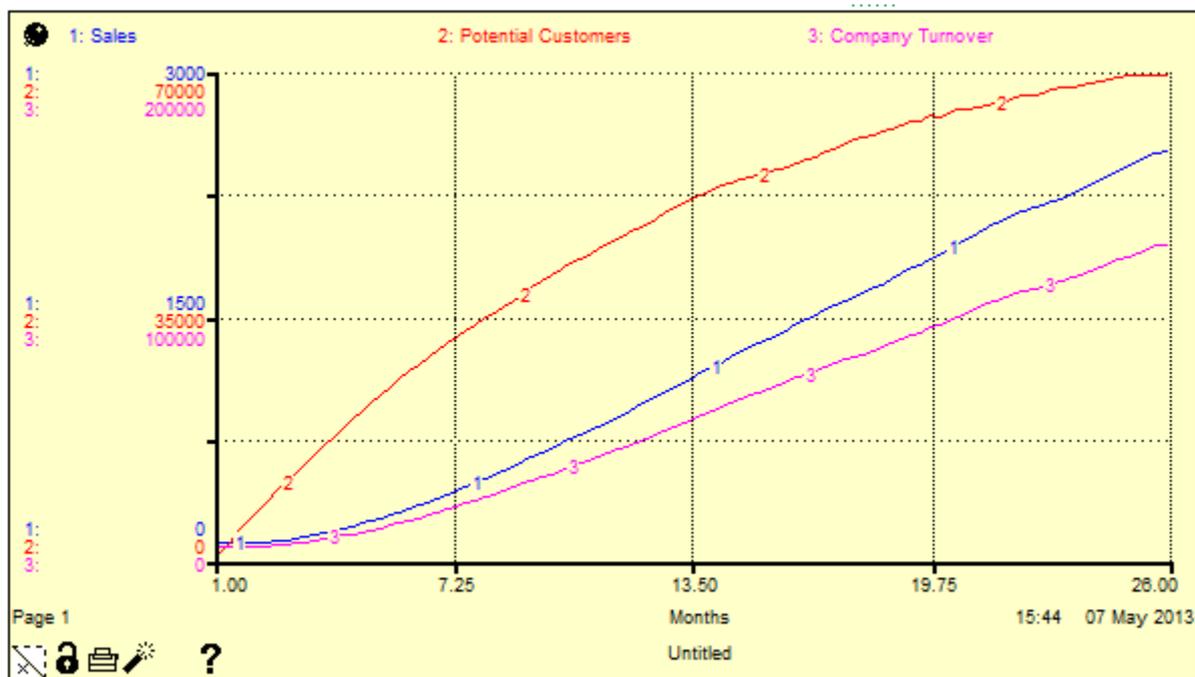
As we can see by the outputs provided the product would be successful, with a high quality profile, a value over 85 which is an exceptionally high quality, however the cost price is more expensive than the boundaries set by the system, however with the combination of the investment to marketing and the quality of the product we can deduce that the product would be a success, although the product is restricting its growth by using this technique and we can see that the initial turnover drops, maybe due to the market needing to realise the quality of the blend before it's a success.

The graph displays the results on different scales; the scales are visible on the left hand side of every graph.

If we run the same simulation however lowering the quality slightly to remain within the 110% barrier of the average price of the competitors we get the following results.

- Percentage of Whey Protein Concentrate –0% to 10%
- Percentage of Whey Protein Isolate –9% to 9%
- Percentage of Whey Protein Hydrolysate – 58% to 48%
- Percentage of Milk Protein Concentrate – 0% to 0%
- Percentage of Milk Protein Isolate – 33% to 33%

Months	Sales	Potential Customers	Protein Blend Quality	Price Check	Unit Price
1	105.56	6,932.39	82.90	0.00	32.11
2	131.23	12,402.39	82.90	0.00	32.11
3	177.28	17,723.52	82.90	0.00	32.11
4	238.64	22,660.16	82.90	0.00	32.11
5	314.00	27,048.16	82.90	0.00	32.11
6	400.99	31,097.34	82.90	0.00	32.11
7	496.32	34,830.88	82.90	0.00	32.11
8	608.02	38,201.13	82.90	0.00	32.11
9	715.04	41,705.75	82.90	0.00	32.11
10	820.83	44,739.05	82.90	0.00	32.11
11	938.55	47,668.32	82.90	0.00	32.11
12	1,065.01	50,623.69	82.90	0.00	32.11
13	1,184.79	53,397.51	82.90	0.00	32.11
14	1,311.67	55,187.73	82.90	0.00	32.11
15	1,424.80	56,515.92	82.90	0.00	32.11
16	1,545.85	58,809.34	82.90	0.00	32.11
17	1,644.78	60,862.58	82.90	0.00	32.11
18	1,765.45	62,425.42	82.90	0.00	32.11
19	1,876.48	63,815.87	82.90	0.00	32.11
20	2,019.44	65,112.51	82.90	0.00	32.11
21	2,138.27	66,517.50	82.90	0.00	32.11
22	2,210.65	67,648.27	82.90	0.00	32.11
23	2,310.16	68,422.05	82.90	0.00	32.11
24	2,428.79	69,661.46	82.90	0.00	32.11
25	2,518.65	69,748.34	82.90	0.00	32.11



As we can see, dropping the quality slightly will keep the quality above the 82 mark which is still a very good quality, however it now falls within the price of the competitor products and the Month 26 company turnover is in excess of £100,000 as seen by the graph, a substantial increase from £10,000+ mark displayed in the previous run. This displays that a small drop in quality to keep the product at a competitive price will pay dividends for the company itself.

5.0 Future Work

The way this project was developed allowed for the use of many additional methodologies to be used in order to develop a much more complete solution. Throughout this project I have incorporated Soft Systems Methodology, Market Research and Systems Dynamics methodologies; I believe they complement each other accordingly however there is avenues I would like to cover in more detail and also new methodologies I would like to incorporate in future.

5.1 Future Work: System Dynamics Model

Although I am happy with how the simulation itself produced feedback and the accuracy of the results produced I do believe there is room for improvement with the system dynamics model. In future I would like to incorporate more variables to model a more accurate representation of how the sales of the product would behave over time. Many logical assumptions were made for the value of each variable and I would like to proceed with a more in depth market research methodology to provide a more realistic value for each variable contained within the simulation model, this would produce a more accurate representation of the success of the product once it has been simulated. It would also be an extremely useful to include more human behavioural variables to the model itself, looking at 'Consumer Perception of Product' and other behavioural variables will prove extremely effective if modelled correctly. Although a single person's actions is unpredictable as a population we are extremely predictable in our behaviour therefore incorporating this into the model will only improve its usability and effectivity.

The conceptual model itself was 'richer' than the iThink simulation, it contained a wider scope of variables and in future I would like to include these within the iThink model. It is both a complex and time consuming task and one that was not possible to model fully throughout the time I allocated to complete the paper, however this is an essential addition to be included in the future.

5.2 Future Work: Sentiment Analysis

Sentiment Analysis is a form of analysis which is essentially the detection of attitudes, which is then processed to achieve a positive and negative score. If the project introduced the ability to include human behaviour within the System Dynamics model as discussed in the previous section the use of Sentiment Analysis will only compliment this. Analysing Consumer Perception, Twitter Feedback, Product Awareness with sentiment analysis will only provide a more in depth view of the interpretation of the consumers themselves. Prior to implementing human behavioural variables into the system dynamics model I believe it would be beneficial to use Sentiment Analysis in order to understand the variables themselves before simulating them within the model.

The use of Sentiment Analysis can be justified in a study completed by Sitaram Asur and Bernardo Huberman where they concluded that you can use Twitter to predict how well a movie do in the first few weeks of its release by analysing users who mention the movie on Twitter. For first week performance they factored the number of tweets regarding its release and the amount of theatres it was released in, and for the success following that they used sentiment analysis to get positive and negative scores for tweets regarding the movie. The method was actually more accurate than Hollywood Stock Exchange with an accuracy of 97.3%. (KUANG, 2010)

This proves that sentiment analysis is an extremely useful methodology which would have complimented the project accordingly; this will be a serious consideration for future implementations to the project itself. This has been a project I have enjoyed, it has also a project I

wish to continue developing, I believe the relevance of the system created could be a useful system within the sports nutrition industry.

6.0 Conclusion

The sports nutrition industry itself is a populated and competitive market, following the legislation change there has been an increase in cost price for both consumers and manufacturers and the only way to provide a more competitive price that reflects the prices offered pre legislation is to adapt the products themselves. Being able to adapt the products to keep a competitive price but still focus on how effective the product is and maintain a high quality level while focusing on the success of the product is a difficult task and is something that had to be modelled through multiple methodologies to ensure the solution was complete. Through the use of Soft System Methodology, Market Research and System Dynamics I believe the outputs received from the project is considerably more accurate than if only a single methodology was used. The Soft System Methodology proved extremely useful in defining the problem itself and comparing the system actions to that of real life scenarios that will happen in future, the market research was extremely beneficial to gauge the consumer, manufacturers and distributors opinion regarding the legislation change and the adaptations they have made to counteract the change, receiving feedback from consumers this semester has only aided in the development of the System Dynamics model which simulated the outputs to conclude the final deliverable. One key finding from the research has been the success of certain protein blends through simulating through the iThink model, where the product inputted to the model provided exceptional feedback based on the graphical outputs, which is a great success for the project itself.

The simulation itself has concluded that neglecting a small out of quality within the product itself in order to keep the product competitive with rival companies will pay dividends in terms of sales and company profits. It has enabled me to conclude the optimal ingredient profile to use for the final deliverable which will be displayed within the Viva examination.

7.0 Reflection

7.1 Reflection: Chosen Methodologies

Soft System Methodology

One of the main reasons I introduced Soft System Methodology (SSM) into the project was the feedback received from the interim report, I think it was clear that my problem situation wasn't justified and defined to the standard expected of me, there was no clear aim for the project; only an open problem which could have been interpreted differently depending on the reader. The use of this methodology has enabled me to narrow the scope of the problem, achieving a richer justification and clarification to describe what the paper aims to solve. The use of a rich picture was extremely useful to give a visual representation of the problem itself. The constant revision of both the Root Definition and CATWOE analysis gave me a clear aim of what I was attempting to solve, and opens up new problems that could occur in the future for the system. Modelling the conceptual model and Activity Comparison table has brought my attention to the efficacy of soft systems methodology for analysing real world problems. Through extensive research of work produced by respected individuals within the SSM field, such as Peter Checkland and Brian Wilson, I have been able to comprehend the concept of the chosen methodology. I found that SSM was useful to give the system itself a structure, as the problem was difficult to perceive and understand the use of SSM

was justified to envisage the problem. The methodology also complemented the inclusion of System Dynamics at a later stage which enabled me to introduce a more complete solution to the problem itself.

Market Research

Although not extensively used within the project, I believe this methodology is where I was able to reflect most on my achievements from the project; I have managed to gain a much deeper understanding of the relevance of market research in launching a new product into an industry. I felt before the project was undertaken that I had a great deal of knowledge in the industry as it is an industry I have been actively involved in since the age of sixteen, however I found from the market research I undertook that I was constantly learning from the feedback I was receiving from consumers within the industry. Understanding the industry in which you look to launch a product can often be as important as the product itself, and therefore, through reflection of this project, if I was to launch a product in future, or assist in the launch of a new product, I will present the relevance of market research within the sector and displaying its importance in the success of the product.

System Dynamics

I found that the System Dynamics methodology was extremely useful in predicting the future behaviour of the system I looked to develop within the SSM model, once I was able to implement the conceptual model into an iThink simulation it was then a case of implementing value to the variables within the model. One of the difficulties when producing an iThink model on a topic where you perceive you have a lot of knowledge is the in bias approach towards variable values other than research backed values. In some cases throughout the project I did implement values into the variables which resulted in the system not producing the correct output, it was only after further research into these variables where I updated the variables to reflect that of research found online or in relevant media that the model began to output relevant results. Systems Dynamics enabled me to visualize the ramifications of adaptations to the product and how the success of the product would vary by adapting the quality, price, ingredients, and marketing investments the company made. This is something which cannot be achieved by another methodology and it proved essential in the success of the project. The inclusion of Sentiment Analysis was something I looked to include within the project alongside the systems dynamics however due to time management and assessing the project quality I believe my efforts would be better spent improving the methodologies I had already included.

7.2 Reflection: What Has Been Learnt

Aside from a more in depth knowledge of the methodologies described above, the project itself has taught me a great deal; including,

Time Management – Undertaking a project of this scale cannot be done on a time scale similar to any other project I have undertaken. The vast amount of research, programming and write ups that need to be carried out to complete a project of this scale requires a more effective time management process. Although I was confident I could complete the project on time I also felt there were always adaptations that could be made to the project itself. Being able to manage my revision, other projects and this project itself has proved difficult, however it has taught me a great deal which I can reflect on in future.

Communication – One of the key skills which I can say has been improved throughout the course of the project is my communication skills. Through conducting interviews with industry distributors last semester to having meetings regarding the project with my project supervisor, I believe my communication skills have improved greatly as a result of completing the project. The preparation for the Viva exam and having to conduct a presentation regarding the project is something which I look forward to, this will test my skills in other areas which have yet to be tested throughout the course of the project.

Feedback – A major difference between the project and any other piece of coursework that has been completed throughout my time at university is the implementation of feedback from both the project supervisor and moderator. It is extremely important that the project reflects their wishes and analysing the feedback and implementing changes to the project based on the feedback received has proved beneficial and relevant in the industry I wish to pursue in future. I believe implementing a change based on feedback is an essential process that has to be carried into my working career.

Professionalism – Through working with large organisations throughout the project I have had to realise the professional attitude that has to be adopted, not on a temporary basis but as a permanent adoption. In order to become respected within the industry and to be acknowledged enough to conduct interviews with large corporations requires the professional attitude expected of the managing directors and managers of the corporations themselves.

7.2 Reflection: Successes and Failures within the Project

Throughout the scope of the project there have been things that have gone well and things that haven't. One of the major successes within the project was the final iThink simulation that was developed, I am extremely happy with the level of detail I was able to introduce to the model however there was still room for improvements to be made in future. I believe throughout the course of this project I have developed a great understanding of both SSM and System Dynamics as separate methodologies but the combination of both into a single solution will be something I will aim to incorporate into future projects. This in itself is a great achievement in my opinion, through undertaking project such as this I do look to complete an exceptional piece of work but what I believe is more important at this stage of my career is the development of knowledge which will benefit me in future, and I believe this project has done that.

I believe failures within a project are more beneficial for my future development than successes, I would learn more from an action that didn't succeed than an action that did, purely because I look at the action in more detail to analyse why it failed. There were many instances within the project, especially in my system dynamics conceptual model and iThink simulation where the system was providing incorrect results to begin with, and it was a case of analysing the simulation as a whole and understanding why the simulation was producing these results. When this happened it widened the scope of the problem, I found further problems which I may not have noticed if it wasn't for the original problem, and all the failures within the simulation have only taught me more regarding the software itself.

7.3 Reflection: What I Would Do Differently

If I was to undertake the project again I think the main change I would make is to the structure of how I developed the solution, I believe developing the Soft System Methodology and Conceptual model in the interim report in order to focus the market research in the final report would have provided much more useful market research feedback. It would have also provided me with more time to focus on developing a richer iThink simulation which could include a much wider scope of variables including the addition of the 'pasty tax' inclusion to visualize how the addition of a tax on junk food will develop the sports nutrition industry. On the whole I believe the project has been a success and I am extremely happy with the final deliverable that has been developed. The project has been a major learning curve and possibly one of the most influential pieces of work I have ever undertaken, the scope of the project has adapted throughout the final year and I am extremely satisfied with both the support I have received and the outcome of the project as a whole and I look forward to producing further work on this project in future.

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