

A CUSTOMIZED INTEGRATED BUSINESS PLANNING TOOL FOR ADVANCE CALL (PTY) LTD

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EXECUTIVE SUMMARY

Advance Call (Pty) Ltd, a boutique call centre company, records enormous amounts of data regarding their day-to-day operations. The valuable potential contained within this data to assist them in not only their daily operational decisions, but also long-term strategic planning decisions were recognized by Advance Call. From the comprehensive literature review conducted, a conclusion was drawn that a customized integrated business planning (IBP) tool would satisfy the needs of Advance Call. The objective of this tool can be translated to the imitation of the high-level interdependencies within the company in order to assist in planning activities. For this reason it was found that a system dynamics simulation methodology, utilizing AnyLogic simulation software, would be the most appropriate approach for developing the tool. The development process is set out in the proposed framework for the tool, a conducted data analysis and the conceptual design of the solution. The report concludes with the final solution design and recommendations for the future.

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1. BACKGROUND ON ADVANCE CALL

Advance Call (Pty) Ltd, here forth referred to as Advance Call, is best profiled as a boutique call centre company. The company specialises in the conceptualization, development, implementation and operation of unique communication solutions.

Over the past decade, Advance Call grew into an established South African market leader in two respective call centre fields: Facilities and Infrastructure Maintenance, and Business Process Outsourcing call centres.

The Facilities and Infrastructure Maintenance call centres serve as a central point of communication to 17 429 South African National Government facilities. These government facilities includes: border ports of entry, correctional facilities, courts of law, defence force installations, Home Affairs offices, harbours and police stations. Once a call is received, the call centres aim to improve the efficiency, effectiveness and responsiveness of solving the logged problem.

In the field of Business Process Outsourcing call centres, the most prominent Advance Call solution is that of the Public Sector Payment Assistance Hotline. The aim of this service is to fast-track overdue payments from the Government to small, medium and micro sized enterprises (SMME's).

Advance Call's experience extends not only to the above mentioned call centre fields, but also to the field of Emergency call centres.

Advance Call strives towards service excellence. At the present the company averages a call answering time of five seconds and call duration time of one minute and fifty seconds. Their services also adhere to the ISO 9001:2008 standards set. ISO 9001 audits have indicated an Advance Call customer satisfaction level of 99% (Advance Call, [1]).

This drive of the company towards service excellence and the need to maintain their ISO 9001:2008 quality standard, is observed in the constant monitoring of the call centre's performance. For this reason Advance Call records enormous amounts of data regarding the daily operations.

Advance Call recognized the valuable potential contained within this data, which can be unlocked to assist them in not only their daily operational decisions, but also long-term strategic planning decisions.

2. PROJECT AIM

A tool which can assist Advance Call in strategic planning, tactical planning and scheduling of their resources, needs to be developed.

The following project objectives are set as a foundation to the process of realizing the project aim:

- The tool to be developed must operate on an interactive basis in a user friendly environment.
- The tool must be customized according to Advance Call needs.
- The end product must comprise of the following three respective components, namely: strategic, tactical and operational planning.

3. PROJECT SCOPE

The scope of the project is depicted in Figure 1. A summary of what will be expected of each phase follows.

During the first phase of the project a comprehensive understanding of both Advance Call and the general call centre environment needs to be developed. This exploration phase is aimed towards identifying the user requirements for the tool to be developed.

The second phase comprises of conducting an extensive literature review on existing business planning tools, the best practices and resources to construct such tools. Conclusions draw from the sources studied, end of the phase.

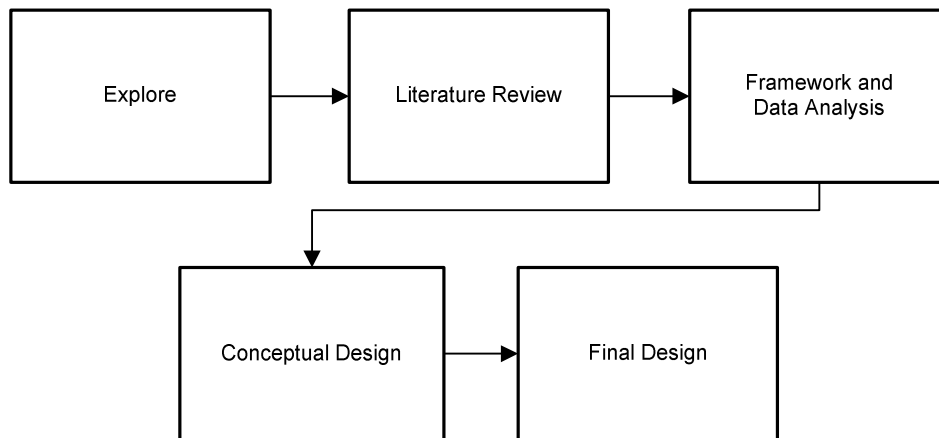


Figure 1 Project Phases

In the third phase a framework for the proposed solution will be developed. The framework consists of the three components mentioned above, namely: strategic, tactical and operational planning. The scope of the strategic component extends to assisting in the decision making process between alternatives. Listing some of the fields envisaged for needing assistance: improving service quality standards, demand management and forecasting. The strategic component will process data in such a manner that the high-level effect on the company's resources and key performance indicators (KPI's) will be displayed. For the tactical planning component assistance needs to be provided in compiling the aggregated operations resource plan which is aligned with the above described strategic decisions made. The operational component will include providing proposed weekly and daily workforce schedules. Data analysis will also be conducted to determine the data that is available, the data that needs to be gathered and how the data will be used.

The fourth phase entails the development of the conceptual design. The design needs to be tested and validated against the user requirements set before the physical construction of the proposed solution is pursued in phase five: Final Design. After the physical tool is again tested and validated by using existing Advance Call data and the scenario's designed, the working tool would be handed over.

It is important to note that the tool to be developed is not an operations management optimizing tool. It can rather be described as a tool that will enable true integration of business functions in planning activities, through generating estimations of key factors considered in the decision making process.

Figure 1 serves as a roadmap through the report.

4. EXPLORE

The aim of this section is to gain more insight into the working, components and current capacity of Advance Call. A summary of general information on Advance Call, recent changes and the various service solutions are provided.

4.1. The Environment

Two types of call centres can be identified: inbound and outbound. A differentiation can be made based on the functions each has to offer. Inbound call centres receive calls and an outbound call centre makes outgoing calls. The services solution Advance Call provides consist of a combination of both inbound and outbound. For instance, the inbound call centre obtains information from the caller, such as logging of a breakdown for a geyser. The outbound call centre in turn reports the breakdown to the relevant parties for repairs to be done.

In the case of Advance Call, the process requires of the operators to carry out both functions. Each of the call centres has their own specialized solutions, each with its respective call process flow. An example of such can be seen in Appendix B: Breakdown, Logging and Tracking Processes. However, for the purpose of this project a high-level understanding of the basic call process flow is suitable. Figure 2 depicts the flow of a basic

Advance Call process of a call. An operator receives a call and obtains the necessary information from the caller. After the call is received the operator needs to report the call to an appropriate third party, such as a contractor. When the call is resolved, the contractor needs to inform the operator to close the call. The operator also carries the responsibility to follow up with the contractor to ensure a call is successfully closed as soon as possible.

4.2. Service Solutions

At the moment the services provided by Advance Call can be divided into four main call centres with five customized solution designs. The first call centre is the Repair and Maintenance Call Centre (RAMP). The RAMP call centre is responsible for logging, tracking and reporting breakdowns for more than 1142 government facilities. The above mentioned breakdowns refer to geysers, power, mechanical and such. A subcomponent to RAMP includes the RAMP lifts, which supply a service to more than 523 elevators in government facilities nationwide. The customer base of the RAMP service can be distributed over at least 300 consultants. This is quite large compared to the other call centres that only serve one main customer.

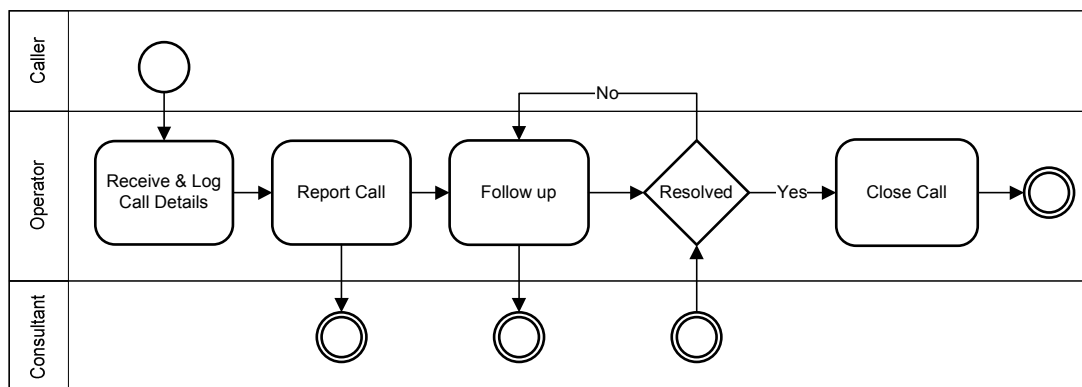


Figure 2 Basic call flow

The second call centre is that of the Day To Day Maintenance Call Centre which serves 16 287 national government facilities. The Dolomite Call Centre aims to address the threat of dolomite underlying the Thaba Tshwane area. This is done in a timely manner in order to prevent the formation of sinkholes. The RAMP, Day To Day and Dolomite call centres can all be classified as Facilities and Infrastructure Maintenance call centre types, which add up to two thirds of Advance Call’s business. The SPAH call centre contributes to the remaining one third. SPAH liaises with 626 national and provincial government departments, local and metropolitan municipalities and public sector institutions. Figure 3 depicts the product distribution.

4.3. Recent Service Solutions Changes

Advance Call recognized that their key business opportunity area for the future is in the Facilities and Infrastructure Maintenance call centre field. Advance Call developed a strategy to realize the opportunity which was launched on 1 May 2012 as the Facilities and Infrastructure Maintenance (FAIM) service. Figure 4 depicts this strategy graphically.

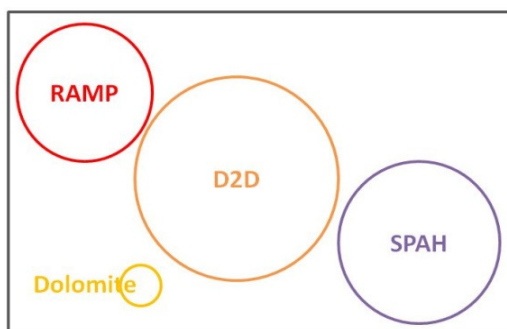


Figure 3 Advance Call Product Distribution

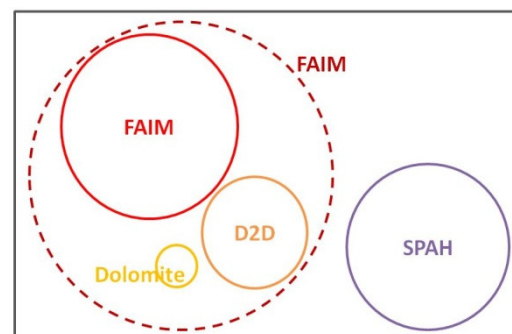


Figure 4 Advance Call Product Distribution Strategy

FAIM will be an extension of the current RAMP call centre. The above mentioned strategy includes the growth of the FAIM product to foresee for the case of the Day To Day call centre coming to an end (see Figure 5). This is due to the fact that compared to the other two Facilities and Infrastructure Maintenance call centres, Day To Day requires the most capacity and in relationship does not generate the most profit.

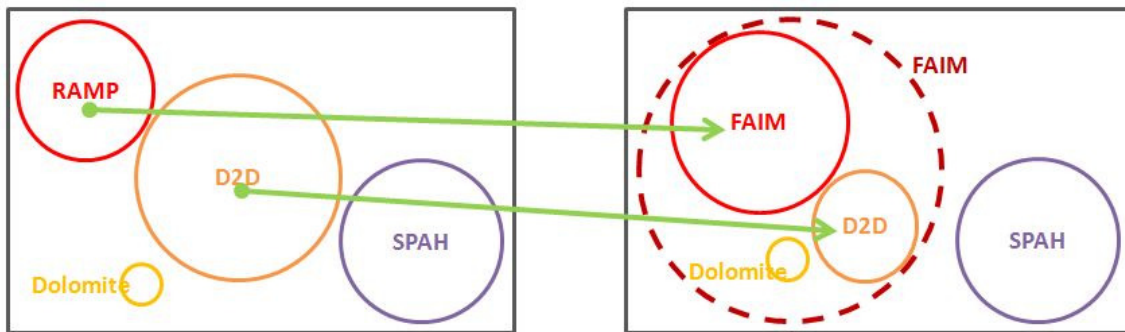


Figure 5 Product Distribution Comparison

The FAIM call centre includes the launch of a new improved solution (see Appendix B: Breakdown, Logging and Tracking Processes). The enhancement to the old product was added with the goal to increase efficiency of the current capacity. As Figure 6 depicts, the consultant now also has the ability via a web based system to close a call. This will decrease the amount of time the operators spend on the following up of logged calls.

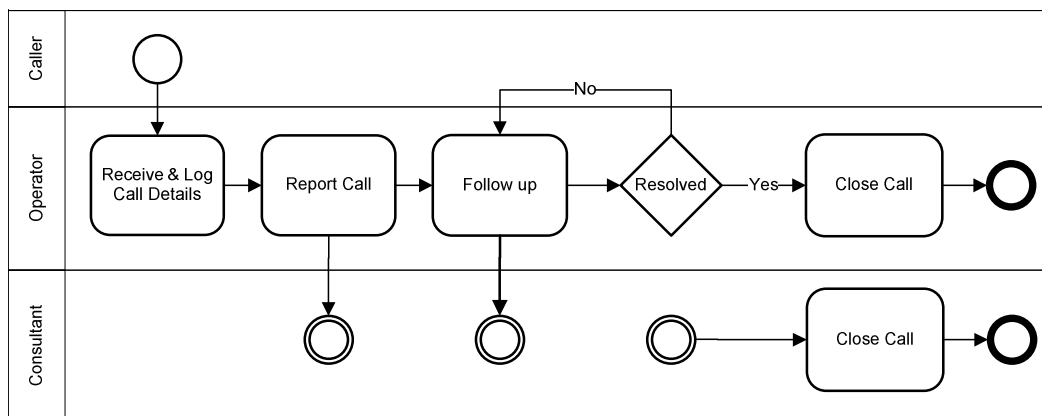


Figure 6 Improved basic call flow

5. LITERATURE REVIEW

The age-old objective of finance and corporate executives to combine the range of perspectives on forward looking activities within a company that will enhance internal alignment and agility, enable increases in financial returns and improves the strategic position is termed Integrated Business Planning (Toor and Dhir, [2]). According to Oliver Wight, the originator of the Integrated Business Planning (IBP) model (Gregory, [3]), IBP is merely an advanced version of the known concept Sales and Operations Planning (S&OP).

As depicted in Figure 7, the evolution of S&OP to IBP origins in the 1980's with companies seeking a solution to balance planning for demand and supply. Originally S&OP was intended to serve as a primary business planning process that will drive the enterprise (Riverlogic, [5]). At this stage in time companies were at ease with having an annual plan that controlled inventory, production and distribution from the viewpoint of demand. Since then S&OP grew into a more operational or better termed as a "supply chain centric" process (Riverlogic, [5]). This is due to the adoption of S&OP by supply chain groups, as a platform that enables the translation of several distinctive plans into a common plan to balance supply and demand (Riverlogic, [5]). Nowadays, the drivers of change: globalization, technology, the empowered customer, organizational consolidation and government policies and regulation, forces businesses to a more agile planning approach (Langley *et al.*, [6]). The agility within the known S&OP planning process is however limited (Riverlogic, [5]).

Other drawbacks for S&OP are that it is not explicitly aligned with the company strategy and has a rather weak link to financial planning (Riverlogic, [5]). IBP differentiates from S&OP in this point, as it integrates business processes from a true strategic viewpoint (Oliver Wight, [7]).

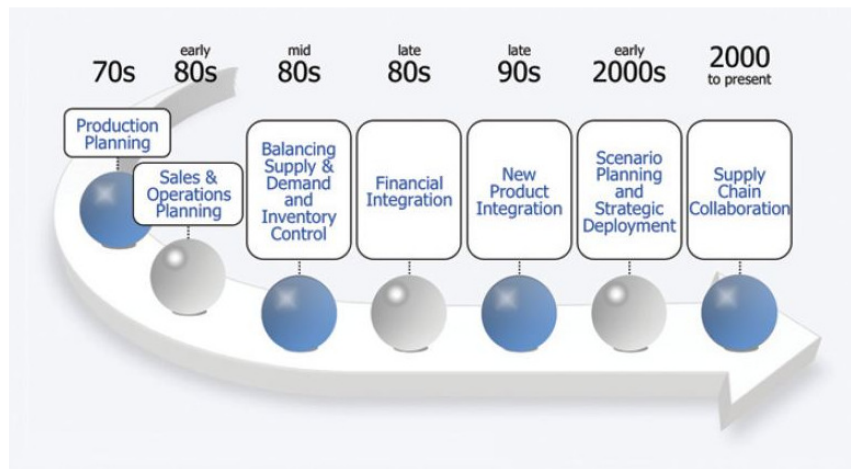


Figure 7 Decades of evolution: S&OP to IBP [4]

Oliver Wight [4] elucidates the main objective of IBP to be the development of an integrated volumetric and financial plan for success that seizes the form of a single set of numbers. This is followed by the internal alignment of the entire organisation against the plan (Oliver Wight, [4]). Gregory [3] explains that it includes the monthly alignment of strategic and tactical plans and efficient allocation of critical resources.

The benefit of an IBP is that it provides a single model which the leadership team can utilize to evaluate alternatives based on the true economic impact of each (Toor and Dhir, [2]). Thus corporate executives, business unit heads and planning managers are facilitated to make influential decisions at the present by the realistic view of where the business plans to be (Oliver Wight, [4]).

One may question the fit of an IBP model to an organisation. Both McGuffog [8] and Ketchin and Spiteri [9] expresses that it is crucial for a business to make use of IBP to effectively realize objectives and to ensure the business's long-term feasibility. Oliver Wight [4] argues that an IBP model's suitability is not based on the size or level of planning sophistication of a company. It is rather a matter of designing the process correct for a company (Oliver Wight, [4]). From their experience in implementing IBP models, Oliver Wight [4] found that the challenge arises in the overcoming of functional boundaries within a company.

Thus far IBP has been extensively utilized in the effective integration and modelling of a number of planning efforts. Some of the applications Toor and Dhir [2] refer to includes: customer profitability, capital expenditure, market demand curves and decision support. However the majority of the literature on IBP is based on supply chains and manufacturing organisations. For this reason the identified IBP best practices below will be adapted, where applicable, in the development phase of the IBP tool for Advance Call to suite the service environment.

The first best practice approach to IBP, to consider is that of Gartner. In a webinar, Gartner [10] guides the audience in how to incorporate the financial aspect to planning with the S&OP plan (see Figure 8). The best practice consists of considering the financial impact of supply chain what-if's and developing the base supply plan and base financial plan in a collaborative manner.

Figure 9 depicts the second IBP approach under consideration. The Steelwedge IBP platform is cloud-based, allows design and automation for a collaborative planning process and agile enough to adapt to changing business realities (Steelwedge Software Inc, [11]). The illustration of the model clearly indicates the interaction, interdependencies and interrelationships of each function within the planning process of a company.

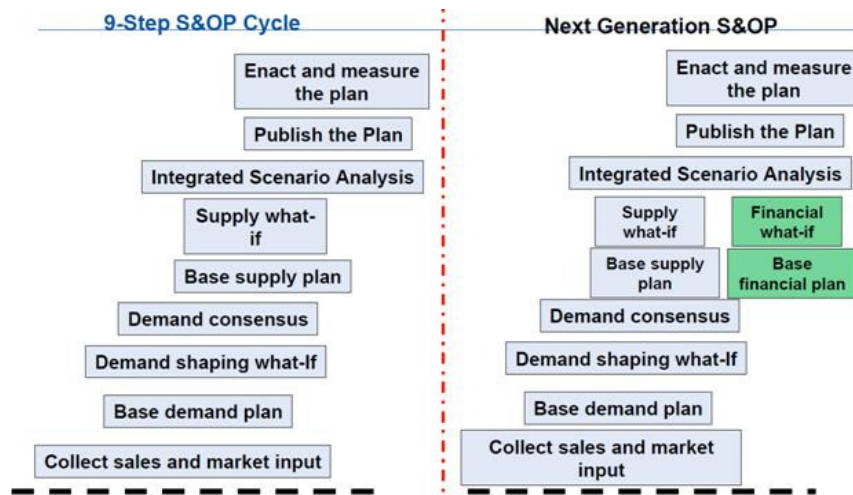


Figure 8 S&OP versus IBP [3]

Other IBP models to consider are that of the known software Enterprise Optimizer (see Figure 10) and Hitachi Consulting (see Figure 11). The former clearly emphasize the importance of the financial aspect to IBP with the positioning in the centre, while the latter view the financial aspect as a separate component in the IBP process.

In the article “Face the same way” Gregory [3] advocates that the intended function of IBP is to provide a process for commonsense decision making. Ortiz *et al.* [14] emphasize the importance of utilizing the best practice: tools in a company. Tools are not only incorporated to support, construct and facilitate the application of concepts, but also used in the management of various models (Ortiz *et al.*, [14]). Combining the data mining need of Advance Call with both the statements of Gregory and Ortiz *et al.* above, a tool based on an IBP model would be a justified solution.

Rowntree [15] identified that the incorporation of information technology (IT) and an IBP model enables scenario modelling that serves as an aid to effective decision making. Gaps can be identified in the comparison of both long- and short-term operational plans to financial forecasts, followed by the assessment of scenarios in order to close the identified gaps and ensure that goals are met (Rowntree, [15]). Most of the shelf software solutions specialize in industries such as agriculture, forestry, fishing, healthcare, manufacturing and transportation (Microsoft Pinpoint, [13]). For this reason the focus of the project is on developing a customized IBP tool for Advance Call.

According to Business Modelling Associates [16], the distributor of the known software Enterprise Optimizer, an IBP tool considers the interacting and interrelating factors between business units, by incorporating activity based costing (ABC), constraint-oriented process modelling and comprehensive financial modelling. Toor and Dhir [2] describe this process as cost-benefit analysis. The opportunity cost, together with the risks quantified in the initial and ongoing expenses versus the expected return is considered to predict the outcome of a planned action (Toor and Dhir, [2]). Ketchin and Spiteri [9] agree to the importance of the financial aspect to IBP due to the fact that finance has end-to-end view of the organisation which enables them to effectively audit the integrity of a plan. Other advanced planning techniques to be incorporated in IBP include driver-based planning, rapid planning cycles and rolling-quarters time frames (Toor and Dhir, [2]).

The hierarchy of call centre decisions, as identified by Avramidis and L’Ecuyer [17], and loosely adapted, is that of strategic, tactical, scheduling and daily control. This agrees with the loosely adapted hierarchy of components of IBP which can be seen in Figure 12. The best practices to be included in the IBP tool, for each of the components, follows.

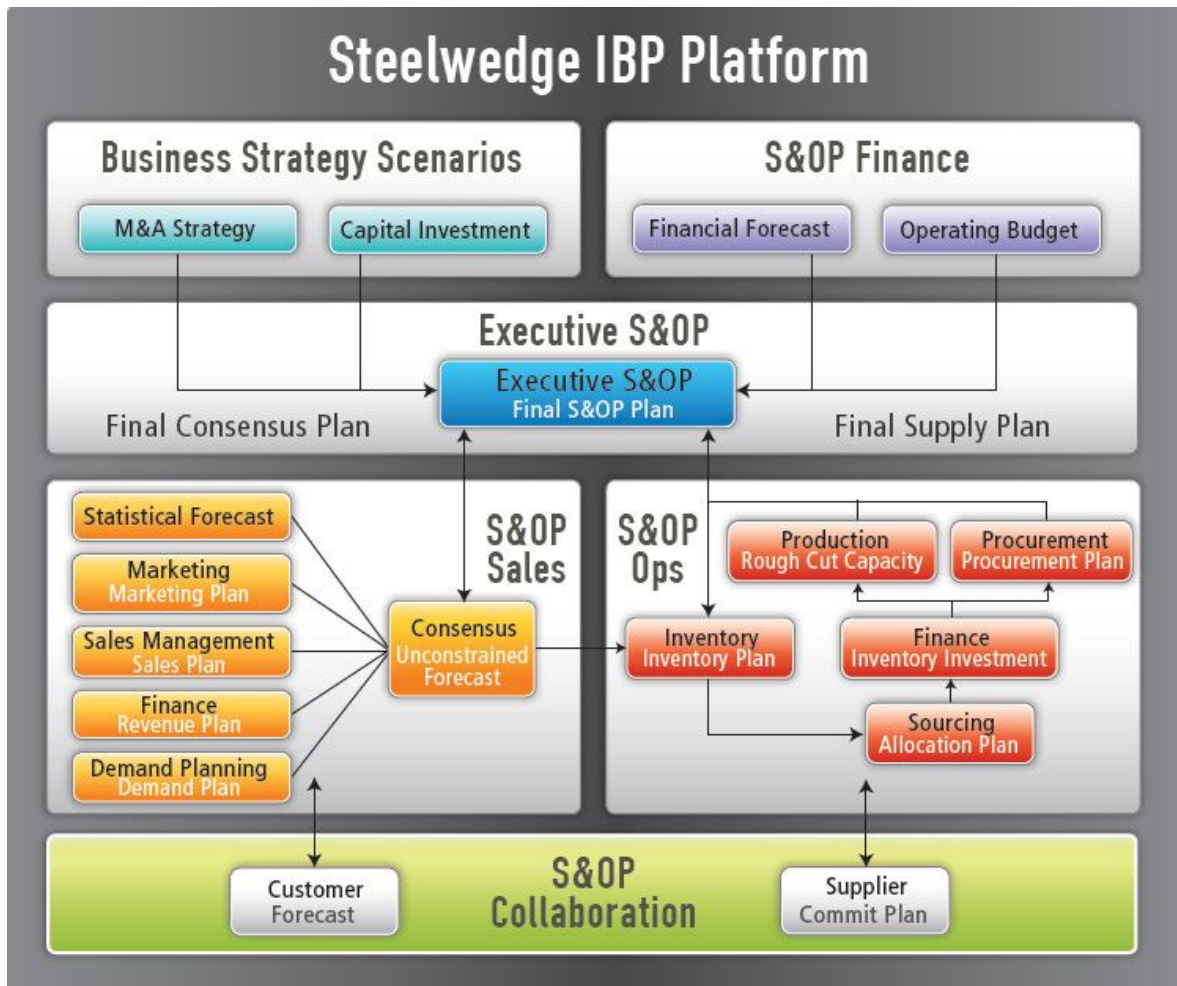


Figure 9 Steelwedge IBP Platform [11]



Figure 10 IBP model [13]

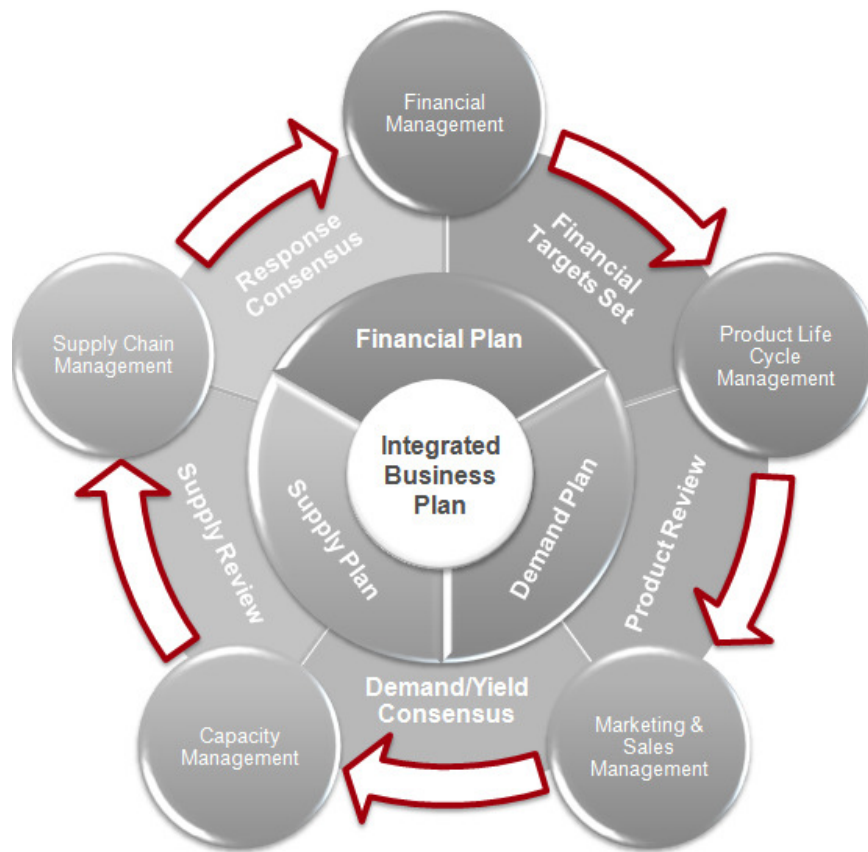


Figure 11 IBP Model [12]

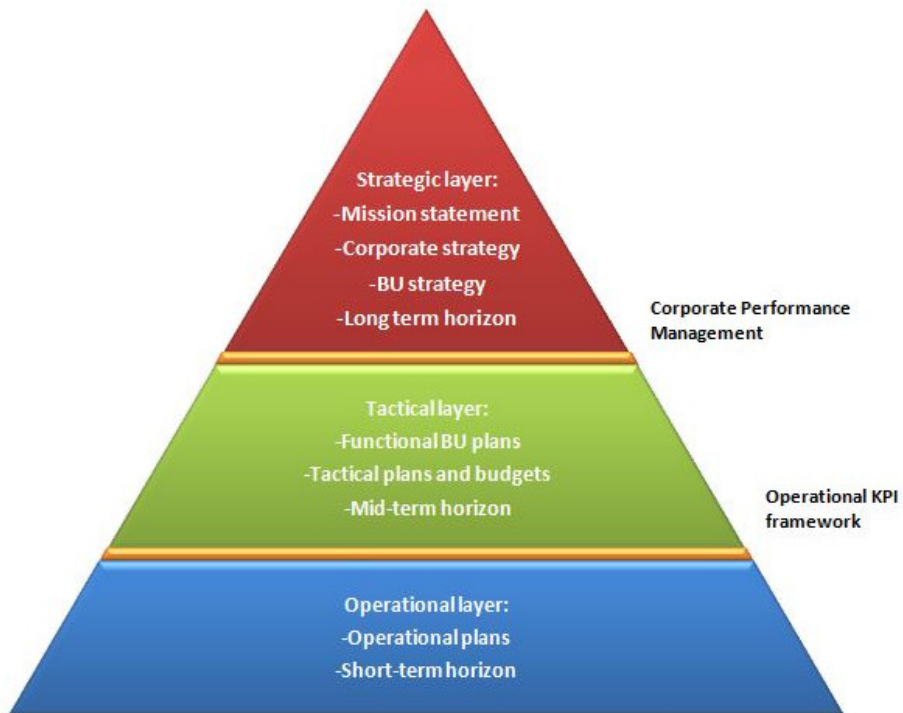


Figure 12 IBP hierarchy

O'Regan and Ghobadian [19] describe strategic planning as the process where a company adjusts its strengths relative to the competitors using the most efficient and effective approach. This consists of a dynamic plan portraying how the company will overcome internal weaknesses and conquer external threats in order to capitalize on environmental opportunities (Schraeder, [20]). Both Phillips [21] and Carter [22] emphasize that it is of utmost importance to the sustainability of a company to view strategic planning as a continuous process and not a product. Strategic planning typically follows a one to three year time horizon cycle (Bachrodt and Smyth, [23]). Russel [24] expresses that starting with the overall view, followed by the details is a more practical approach to planning. Schraeder [20] followed the above approach in the compilation of the steps to follow in strategic planning: development or evaluation of mission statement; Strengths Weaknesses Opportunities Threats (SWOT) analysis; thematic analysis of issues identified through SWOT; identify and prioritize issues to be developed into objectives and the development of timelines and resource requirements. Bachrodt and Smyth [23] however argue that an impact analysis must be conducted before the timelines and resource requirements are developed. Reasoning that the impact analysis will verify the creditability of the strategy developed through market testing and financial modelling (Bachrodt and Smyth, [23]). As Advance Call strives towards service excellence, a KPI that needs to be considered in an impact analysis would be service quality. A good scale to measure the trade-off between service utilisation and quality is illustrated in Figure 13 (Haywood-Farmer and Nollet,[25]). A combined version of both Schraeder and Bachrodt and Smyth is depicted in Figure 14. To conclude strategic planning, the IBP tool must make provision for each step of the above described best practice process.

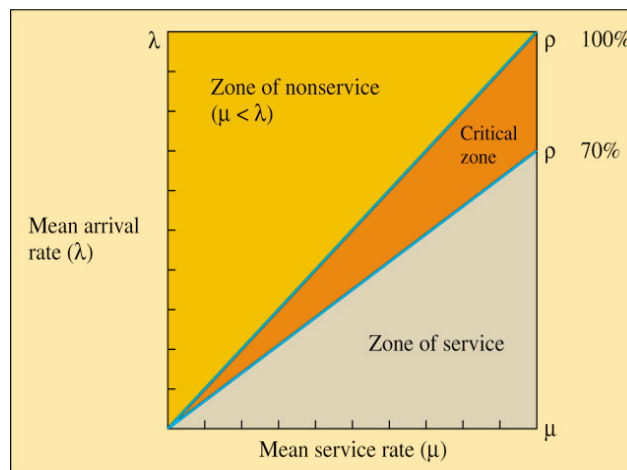


Figure 13 Relationship between service quality and utilization [25]

Strategic planning enables the linking of the long-range strategic goals set with mid-range (tactical) and operational plans (Dincer *et al.*, [26]). The Oliver Wight IBP model [4] addresses five main review components to be considered in a mid-range period: product management, demand, supply, integrated reconciliation and business management. Product management review refers to the understanding of to what extent product changes or key initiatives planned will impact the business and whether or not it is in line with the objectives set. The demand review component aligns plans with changes in the market and enables the forecasting capability of an organisation. In a service industry context, supply review considers elements such as the quality levels of the service supplied. All the changes identified in the above review areas are addressed and resolved in the integrated reconciliation component. Integrated reconciliation is a continuous process with the goal to manage the gap between the updated view of future business performance and the strategy. In order to reach the goal the interaction between the key business levers and forces must be understood. Oliver Wight [4] recommends the utilisation scenarios modelling to reach the comprehensiveness. The fifth component is based on real management information. Business management reviews the key performance indicators and analyse the trends in operational and financial performance to highlight the gaps. Furthermore the reconciliations made are approved and the forward plan is revised before returning to step one, product management. Thus the IBP tool must contain tactical planning components that will assist a company in the above described monthly review process.

Following tactical planning is the short-term planning component: scheduling. The main obstacle in a service environment is that of the inability to build inventory (Wirtz and Lee, [27]). When not operating with appointments, the complexity increases in the managing of supply to fit demand. The most common result is idle capacity. In most cases companies strives to increase their capacity utilisation rate through implementing an optimized schedule. However in the case of a company differentiating itself from its competitors on a service quality level or short waiting times, idle capacity often takes on a higher percentage (Wirtz and Lee, [27]). The trade-offs between an optimized, efficient schedule and the service quality level must be considered.

The fourth component in the hierarchy of call centre decisions is concerned with how the system reacts to the current situation (Avramidis and L'Ecuyer, [17]). Daily control includes issues such as releasing operators for training if the load is less than planned (Avramidis and L'Ecuyer, [17]). The modelling of various scenarios will assist in the daily operational decisions to be made.

In the call centre environment a large amount of the decisions must be made while facing a compilation of complexities and uncertainties (Fama and Mehrotra, [28]). Considering that the decisions are being made in the dynamic planning environment of a business (McGuffog, [8]), static modelling alternatives such as spreadsheet based models would not meet the required accuracy and complexity capabilities. As means of a more suitable approach, Avramidis and L'Ecuyer [17] identified two types of modelling: analytic and simulation models. Bouzada [29] recognizes that a simulation model would provide the most accurate decision support with the statement: "it is better to have a rough solution for a very realistic model than an exact solution for a model with several approximations". Bouzada [29] further expresses that this approach serve as a best practice when utilized in planning and the management of operations while facing potential scenarios.

A variety of simulation software packages were considered for the construction of an IBP tool. These include: Arena, Simio, Stella, iThink, Powersim, Vensim and AnyLogic. After comparing the advantages, disadvantages and cost of each of the above options, AnyLogic was selected as the simulation software package to use. AnyLogic is compatible with standard software such as Microsoft Excel and is also accessible to students through the Department of Industrial and Systems Engineering. The software provides the user with the capability of either simulating using one or a combination of the following methodologies: agent based, discrete event or system dynamics (SD) simulation.

From a practical point of view the XJ Technology Company [30] defines agent based modelling as an essentially decentralized, individual-centric approach to model design. In the model agents would represent whatever entity (For example: people, projects, assets or products) the modeller assigns to them. Each respective group of agents' behaviours are allocated, placed in an environment and connections between them established. The agent based model is based on the individually simulated behaviour patterns of the agents, which in turn affect the interactions between the agents, with the objective to determine the global or system-level behaviour.

According to the XJ Technology Company [30] discrete event modelling is utilized in the case where a natural sequence of operations which is performed on entities of certain types (Such as customers, documents and phone calls) can be identified. The simulation methodology is process-centric in such a sense that it is used to approximate continuous real-world processes with non-continuous events defined.

The SD approach is the methodology utilized in cases where the goal of the model would be to understand the structure and behaviour of the system under consideration. It comprises of the high-level aggregation of objects being modelled, rather than individual unit interaction. Thus the objects lose their individual properties, history or dynamics as it is being modelled in quantities. SD makes use of two primary modelling elements: stocks and rates. Rates continually extract and replenish the process's inventory quantities represented by stocks (XJ Technology Company, [30]). In his book "*Business Dynamics: Systems Thinking and Modelling for a Complex World*", Sterman [30] describes system dynamics as:

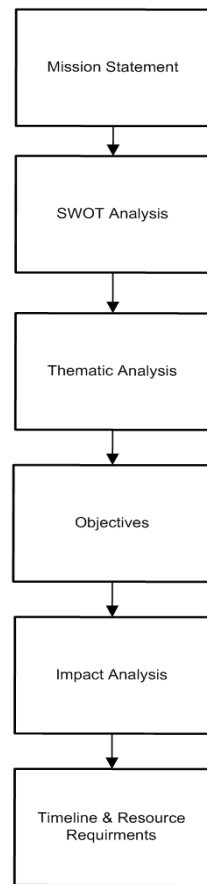


Figure 14 Steps of Strategic Planning

“...a perspective and set of conceptual tools that enable us to understand the structure and dynamics of complex systems. System dynamics is also a rigorous modelling method that enables us to build formal computer simulations of complex systems and use them to design more effective policies and organizations. Together, these tools allow us to create management flight simulators - micro worlds where space and time can be compressed and slowed so we can experience the long-term side effects of decisions, speed learning, develop our understanding of complex systems, and design structures and strategies for greater success.”

As the objective for the IBP tool for Advance Call can be translated to the imitating of high-level interdependencies within the company, the SD simulation methodology would be most suitable approach to make use of. It is however important to acknowledge that the tool will be developed as a means to assist Advance Call in planning activities. Computer simulations are to a great extent instructive in explore alternatives, but human judgement remains an essential element (McGuffog, [8]).

6. FRAMEWORK AND DATA ANALYSIS

6.1. Framework Development

A framework was developed as a means to combine the conclusions drawn from both the user requirements and the literature review into a proposed model for the Advance Call Integrated Business Planning (IBP) tool.

The proposed framework for an IBP tool for Advance Call is depicted in Figure 15. The model is based on a top-down view to planning and can be divided into three main planning tiers. These tiers include: strategic planning followed by tactical planning and at the bottom tier, operational planning.

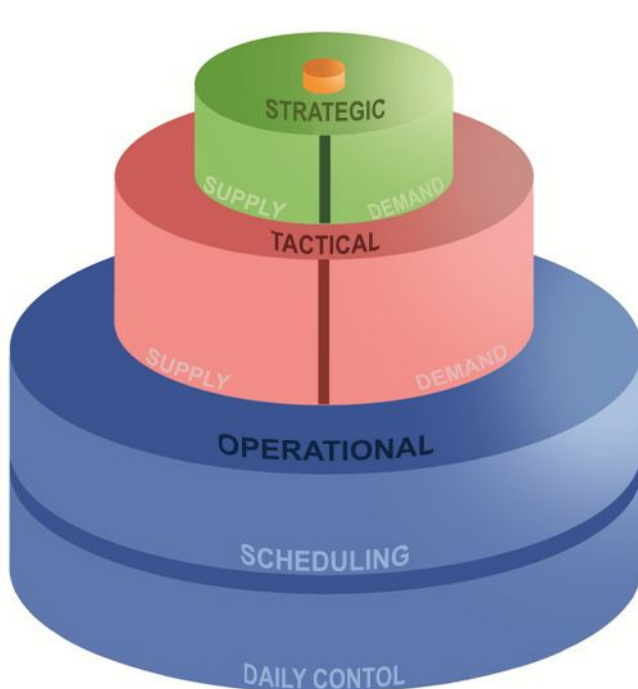


Figure 15 Proposed Framework

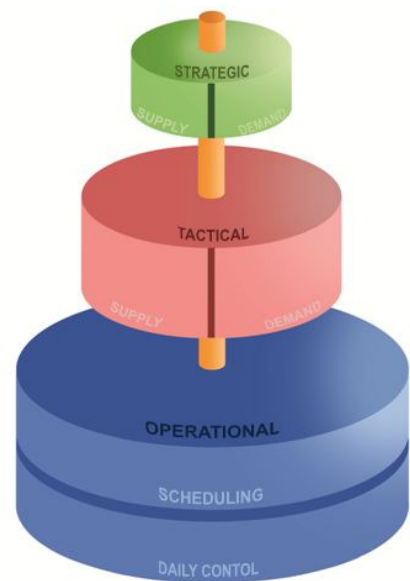


Figure 16 Financial Component

For strategic planning an overall view of the company is needed, planning takes place on high-level and long-term goals are set. For this reason strategic planning is positioned at the top. The model assists by simulating the high-level effect an alternative has on the key performance indicators (KPI's) and other capacity and financial indicators of the company. Alternatives may include current product profitability analysis or product development options.

Proceeding downwards, the strategic goals set are put into more practical short-term goals in the tactical planning process. Thus the short-term effect an alternative has on the KPI's and other capacity and financial indicators will be simulated.

In the operational layer operations are aligned on the lowest level in order to ensure goals will be met. This will include the development of an improved schedule which will consider short-term variances in call volumes.

Together with the incorporation of strategic viewpoints, a key point to IBP is the financial component of the business which is integrated in all planning processes. For this reason the financial component in the proposed framework forms the centre of all planning activities. As illustrated in Figure 16, all planning activities will include the financial component applicable to the specific level. Activity based costing (ABC) will be utilized as a means to model the financial component.

The detailed aspects to each layer of the model, for which the tool needs to make provision, will be addressed in the conceptual design phase. The reason being, more company specific data is needed in order to develop the most accurate customized model to assist in the required steps in their current planning processes. However, from the models considered in the literature review, it can be concluded that the suggested subcomponents to the strategic and tactical planning tier should consist of supply and demand (see Figure 15). The supply subcomponents will consider all elements relating to the service that is supplied. This will include elements such as capacity levels, customer satisfaction levels, average queuing times and call duration times. The demand subcomponents will consist of demand management and forecasting. The two subcomponents are positioned next to one another to illustrate that it will interact in a collaborative manner.

For the operational tier the components can be separated into two consecutive subcomponents: scheduling and daily control (see Figure 15). Scheduling intends to develop an improved schedule, aligned with the required forecasted needs of the demand subcomponent in tactical planning. At the bottom, the daily control subcomponent aims to give assistance on to daily matters through the use of scenario modelling.

The framework will be used as a guide in completing the data analysis process and is expanded into more detail in the conceptual and final design phase of the project.

6.2. Data Analysis

Data analysis was conducted with the purpose of identifying the data requirements of the tool, available data and the data still to be gathered. The discussion is structured according to the developed framework in section 6.2.1. For each tier of the framework the current method of planning and its data flow will be analysed.

Data was collected from existing Advance Call documents, discussions with the Operations Manager and an interview with the CEO (see Appendix C: Interview) of Advance Call.

6.2.1. Strategic Planning

6.2.1.1. Current Approach: Strategic

Today, with more than a decade's experience, Advance Call can make accurate estimations of the feasibility of company activities. The present method to strategic planning can best be described as an educated guess. This method of planning is sufficient at the moment, yet it would be sensible to follow the best practice approach of capturing the profound knowledge into a system to ensure future use.

Advance Call differentiates themselves from other call centre service providers in that they prefer call centre projects that require a unique solution. Other project characteristics Advance Call considers are that it must have an annuity type income as well as related characteristics to existing products. The latter is required due to the reason that it will minimize development costs and ease the integrated implementation of the solution (as Advance Call already has the required resources).

6.2.1.2. Data Flow: Strategic

Figure 17 depicts the data flow for the strategic planning component of the developed framework. Starting on the left, the strategic planning tier will need to attend queries such as: product profitability analysis and product development activities. In product profitability analysis two scenarios are being investigated. The first is to determine the profitability of a specific call centre to Advance Call. Secondly, what is the end effect that it has on the whole business of Advance Call?

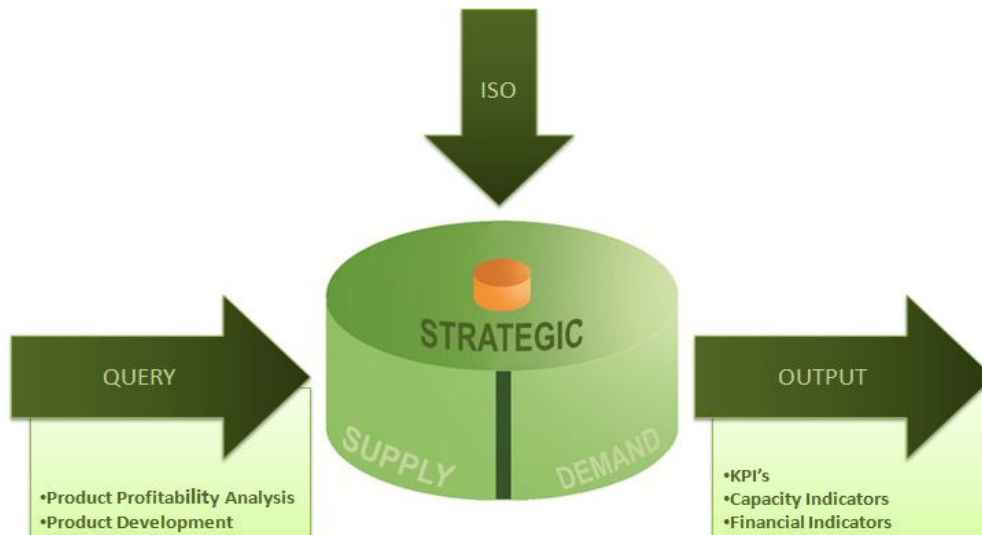


Figure 17 Strategic Tier Data Flow

For product development options, the model needs to assist in balancing supply and demand. From the demand side the service requirements need to be captured; where after the supply side will determine if the current capacity can support such service requirements or if capacity should be added. To assist the planning team in this balancing act, the financial effects of alternatives will be calculated. For example: the opportunity cost will be calculated to display the financial effect the added capacity for a specific product under development would have on Advance Call. Together with the financial component, the effect of added capacity on the service level will be calculated. With these outputs the decision team will be able to make a scientific-based decision on whether or not the alternative should be selected.

From the scenarios mentioned above it becomes evident that the strategic component will simulate the high-level effect an alternative has on the KPI's and other capacity and financial indicators. Before the indicators will be identified it is important to consider Advance Call's management philosophy (The top arrow in Figure 17).

a) Management Philosophy

As previously mentioned, Advance Call utilizes the quality management system (QMS) ISO 9001:2008 to ensure service excellence. Thus the ISO 9001:2008 standards set specifically for Advance Call is utilized to measure the company's service performance. The structuring and operating of Advance Call is based on the ISO 9001:2008 framework. The main sections to the framework includes: General, Management Responsibility, Resource Management, Product or Service Realisations and Measurement, Analysis and Improvement. Appendix D: Scope of QMS illustrates the scope of the QMS and the interaction between processes in terms of the ISO 9001:2008 Standard. To confirm the management philosophy of Advance Call, the vision and mission statements are included below.

Advance Call's vision

"To comply with the tender specification for all call centres hosted:

- Repair and Maintenance Call Centre (RAMP)
- Day To Day Maintenance Call Centre
- SEDA SMME Payment Assistance Hotline (SPAH)

- Dolomite Call Centre
To be available 24/7, 365 days per annum as an inbound and outbound call centre to all our clients.”

Advance Call’s mission

“To deliver a quality service through empowering our employees and to facilitate and monitor customer feedback to continually comply with tender specifications. Advance Call employees deliver excellent customer service, giving the company its personality and shaping its culture through innovation. Advance Call’s employees are its greatest asset. We believe in treating our people with respect, looking after their welfare and allowing them the freedom to be themselves and flourish.”

b) Indicators

In considering the above mentioned QMS, the ISO 9001:2008 standards set for Advance Call are identified as the KPI’s. However, the focus point of the QMS is the Facilities and Infrastructure Maintenance call centres. For this reason, the identified KPI’s and the associated benchmarks set out in Table 1 are applicable to RAMP, Day To Day and Dolomite. The SPAH call centre’s performance is measured in terms of the average call closing time. Thus the amount of time needed to resolve the call and close it.

KPI	Benchmark
Average queuing time	≤ 30 seconds
Average call duration	≤ 2:00 minutes
Customer Satisfaction	≥ 85%

Table 1 KPI’s and benchmarks

The capacity indicators that will be displayed to assist in the planning process are: human resources, and infrastructure in terms of office space and equipment. The output needs to indicate the Rand and unit values of the capacity to be added. In terms of the financial indicator: the net operating profit or loss per activity under consideration will be displayed.

In order to simulate the high-level effect different alternatives would have on the above mentioned indicators both historical operational and financial data will be needed.

c) Historical Data: Operational

At the present all incoming and outgoing activities of the call centre are being captured into a Microsoft Excel document (see Appendix E: Operational Data). The duration, source and operator can be traced for each fax, SMS, email, inbound and outbound call. Table 2 provides specific data elements that are available and will be needed in the development of the IBP tool. A short discussion on how each will be used is also provided.

Data Element	Utilisation
Customer’s satisfaction level (per month)	In strategic planning the average monthly customer satisfaction level would be used to determine the relationship between the service quality level and the volume calls attended.
Call duration time	This will be used in combination with the average call logging time to determine the total time operators are busy. The idle capacity can also be calculated.
Number of calls arriving per unit time	Determine the total volume of arriving calls. It will also be used in simulating how many operators would be required if call volumes increased or decreased by, for instance: 10/hour or 100/hour.
Waiting time	Create a model which is an accurate representation of actual operations.
Source of call	To determine the volume of calls each call centre is respectively responsible for.

Table 2 Data elements: Strategic planning

d) Historical Financial Data

The financial figures needed are provided on the company’s Income and Balance sheets Appendix F: Income and Cost Elements contains all income and cost elements that need to be considered. For the purpose of determining the effects a call centre has on the whole of Advance Call and product development queries, the classification of cost element as fixed, variable or mixed is also included in Appendix F: Income and Cost Elements. Specifically for product profitability analysis, the financial component will be integrated into strategic planning by means of ABC.

Activity Based Costing (ABC)

The ABC process starts with identifying and defining the activities, activity cost pools, activity measures and the cost objects. An ABC model (see Figure 18) is utilized for this. The term activities refer to the respective cost accounts on the Income sheet. As illustrated in Figure 18, four activities can be traced directly to a specific cost object. The activities that cannot be directly traced to a cost object are assigned to cost objects by means of first-stage and second-stage allocation methods through activity pools. The chosen activity pools are: Other and Service Provided (see Figure 18).

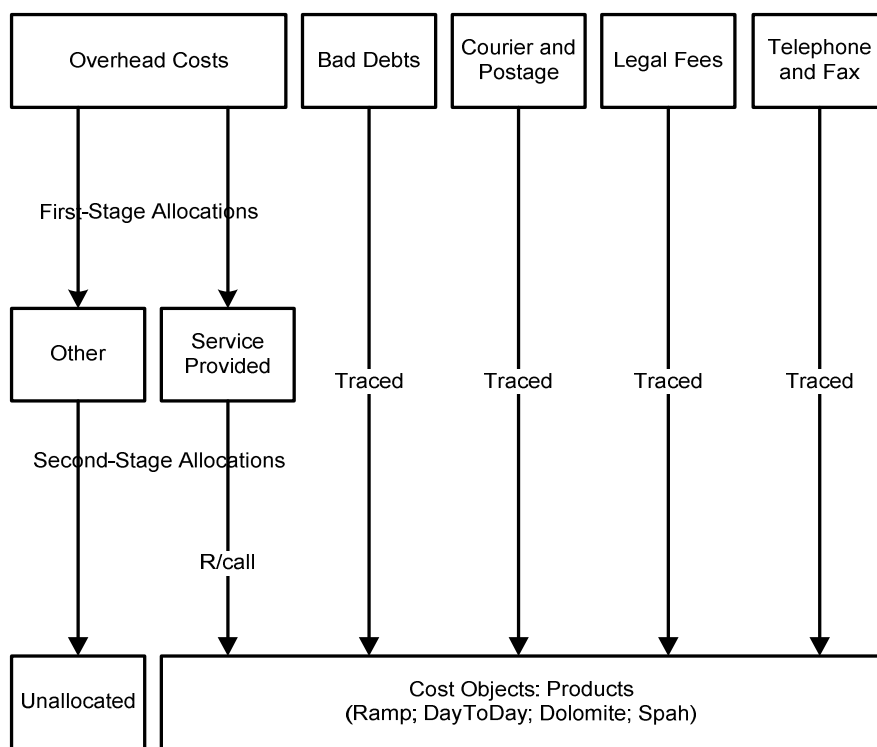


Figure 18 Advance Call ABC model

The first-stage allocation method assigns the Rand values of activities to specific activity pools. The allocation process is repeated for the minimum, average and maximum values the activity can take, due to simulation purposes.

After the first-stage allocation is completed, activity rates are calculated. This includes dividing the activity cost pool value for each activity by the volume of calls (activity measure) attended throughout the time period. Appendix G: Financial Data Template exhibits the activity distribution, first-stage allocation and activity rates for activities of Advance Call.

The second-stage allocations will be made per cost object. This will be done through multiplying the total volume of calls per call centre (cost object) with the activity rate of the activity pool. These allocated costs will be used together with the activities that can be directly traced and the income for the respective cost object, to determine if the product is profitable or not.

6.2.2. Tactical Planning

6.2.2.1. Current Approach: Tactical

Tactical planning takes place on a monthly basis. Short-term goals are set to minimize average call duration time, increase customer satisfaction levels and specific employee development milestones. An example of current short-term goals set is displayed in Table 3. In terms of the human resource planning, at the moment Advance Call does not have a problem to find new operators within reasonable time period when operator capacity is needed.

	Short-term Goal
Average queuing time	≤ 30 seconds
Average call duration	≤ 2:00 minutes
Customer Satisfaction	≥ 85%
Monitoring of Processes:	
Full-time staff	90%
Part-time staff	80%
Call centre downtime	zero

Table 3 Short-term goals example

6.2.2.2. Data Flow: Tactical

The data flow envisaged for the tactical planning component is depicted Figure 19. As the top arrow indicates, the tactical tier put strategic goals into more practical short-term goals. This agrees with the current practice of Advance Call to use tactical goals to achieve desired performance (see Table 3). A typical query that will be raised in the tactical tier is that of to balance the demanded capacity with the capacity that can be supplied. Historical operational data will be used to identify trends in the demand in order to forecast the peak quarters and months per annum. The output will be used in a collaborative process of compiling an aggregated short-term capacity plan and financial budget. Thus it will be used in human resource planning (when new operators should be hired and trained), planning to rent additional office space and equipment purchases.

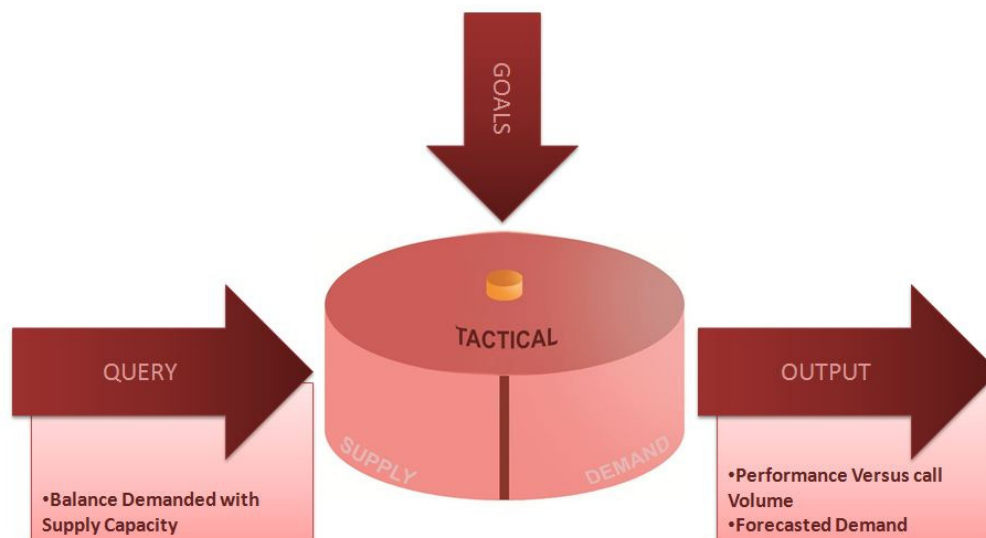


Figure 19 Tactical Tier Data Flow

The operational data elements that will be utilized in the tactical planning tier are summarized in Table 4.

Data Element	Utilisation
Actual KPI's (per month)	In tactical planning the monthly customer satisfaction level will be used to track the company's performance in order to set short-term objectives.
Historical KPI's (per month)	Investigate the service quality versus the call volume during a specific time period to identify trends.
Number of calls arriving per unit time	Identify trends in total volume of arriving calls.
Time and date a call arrives	For tactical planning estimates will be needed, based on historical data, to determine whether or not the call centre will have the required capacity in the peak times of the year.
Source of call	Determine the volume of calls each call centre is respectively responsible for.
Strategic planning calculations	Volume of call an operator can attend in a shift

Table 4 Data elements: Tactical planning

6.2.3. Operational Planning

6.2.3.1. Current Approach: Operational

Operational planning comes to pass through an intuitional approach. Advance Call provides a 24-hour, 7 days a week and 365 days a year call centre service to all its clients. At the moment Advance Call attends an average of 30 000 calls per month. Eight full-time operators and one part-time (after hours) operator follow a set schedule (see Appendix H: Schedule). Together with the operators, the quality and operations manager also attends calls as needed. At the moment it is unclear how much idle capacity exists within the system.

Advance Call specifically questioned the possibility of whether or not a more optimized schedule exists. The suggestion were made to investigate what effect the variation in call volumes throughout a day, day of the week and time of year will have on the operator's work schedule. Questions to be asked include: what should the work hours be on Saturday's, Sunday's and Public holidays?

In terms of daily control, at the moment operators regulate their own work to ensure calls are attended, logged and follow ups are done.

6.2.3.2. Data Flow: Scheduling

The data flow for the scheduling component of operational planning is depicted in Figure 20. The input to the scheduling component would consist of special requests (the questions raised by Advance Call as mentioned above) for the improved work schedule to be developed. The short-term goals set in terms of the operator hiring, training or layoffs will be incorporated in the development of an improved schedule. Historical data will be utilized to determine how the model will include the variation of call volumes thought out the day, day of the week and time of the year. The output to the scheduling component is an improved work schedule.

6.2.3.3. Data Flow: Daily Control

The aim of the daily control tier is to provide guidance in typical day-to-day what-if scenarios. Specific questions were compiled by the Operations Manager of Advance Call. It includes: how many people can be absent for a full day, half a day or a specific day of the week? What is the percentage capacity available per operator? Thus, what is the workload percentage that can be allocated to an operator?

The majority of the above questions will be answerable from the calculations in the preceding tiers. However, the daily control tier will display the results on a lower level that can be used in operational planning.

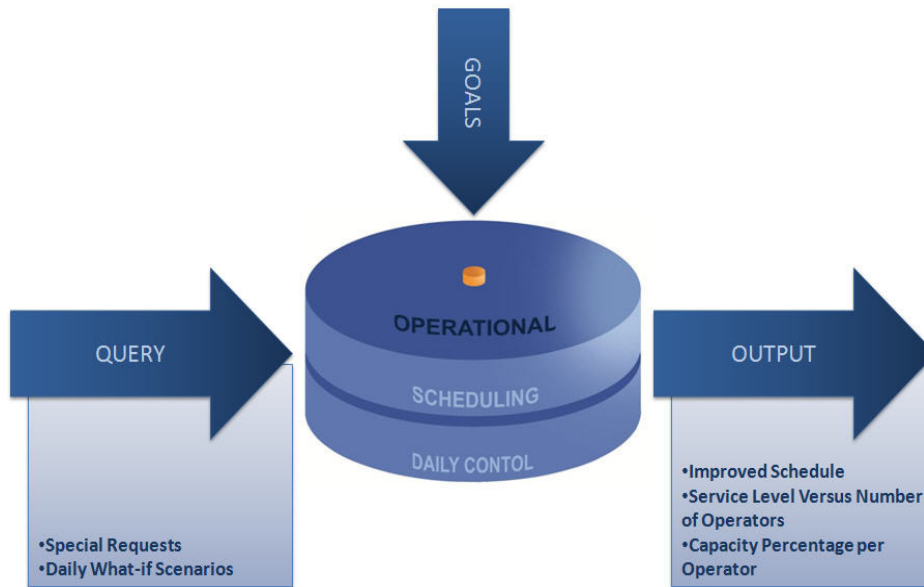


Figure 20 Operational Tier Data Flow

The data flow to the daily control tier is similar to that of the scheduling (see Figure 20). The input to the layer will consist of specific queries raised (such as the above mentioned). Both the tactical goals set and the optimized schedule developed will be utilized in simulating the results. Both the operational and financial data elements which will be needed can be gathered from preceding tiers. For the output, the service level versus the number of operators will be displayed. The capacity percentage per operator will play a role as this will influence the above indicators.

7. CONCEPTUAL DESIGN

Phase four, the conceptual design, entails the logical design of the customized integrated business planning (IBP) tool for Advance Call. The purpose of the section is to capture all requirements in a conceptual solution before the actual model is built.

The concept can be summarized as a system dynamics (SD) simulation model developed in the AnyLogic simulation software environment which operates in conjunction with Microsoft Excel files. The structure of this proposed design is depicted in Figure 21. As portrayed, the main interface will enable navigation to the various model components. A more detailed discussion on each logical design component follows.

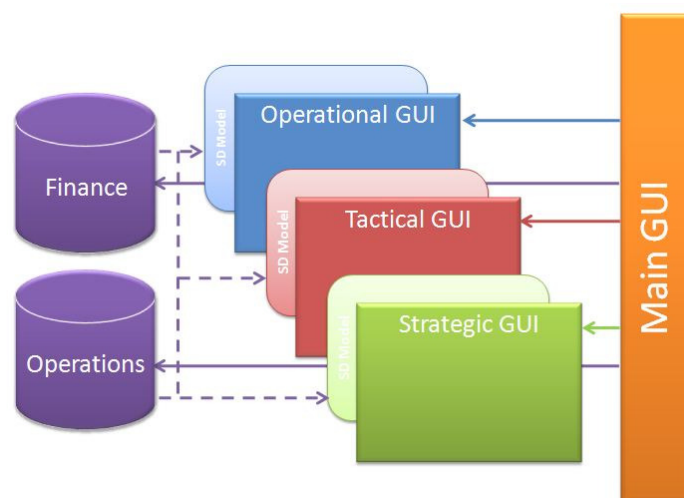


Figure 21 Conceptual Design

7.1. User Interfaces

In order to promote accessibility and maintenance of the IBP tool the main user interface will provide access to all model components. This includes navigation to the interactive graphic user interfaces (GUI's) of each of the respective models and all data templates mentioned in section 7.3

With the dual purpose of communicating requirements set with Advance Call, and steering the design process of the IBP tool towards achieving its objectives, draft versions of the tiers' GUI screens were drawn. The rationale behind these drafts was to specify the output elements identified in section 6.1 in more detail to specifically determine the preferred format of the output elements. An example of a draft screen shot is attached in Appendix I: Screen Draft . It is important to notice that this is only a draft version to communicate the concept of user interaction with the simulation. The final screen design will however depend on the options and capabilities of AnyLogic presentations functionalities.

7.2. Conceptual System Dynamics Model

The conceptual SD model developed for Advance Call is depicted in Figure 22. For the purpose of maintaining the technical feasibility level of the IBP tool design, this conceptual SD model will be adjusted according to each framework tier requirements. For this reason the construction will extensively make use of variables and parameters in order to account for possible value alterations.

The key process (Figure 22 point {1}) of the call centre is scoped and modelled in the following manner: calls arrive and accumulate in a queue from where it is either being attended to by an operator or abandoned by the caller. An abandoned call exits the system, whereas an attended call is logged before departure. Once the call is logged the operator reports the call to a specific third party and informs the second party.

The model comprises of the two primary SD building blocks: stocks and flows, alongside several other elements such as auxiliary variables and delays. Stocks can be defined as: "the memory of the history of changing flows within the system" (Meadows, [32]). Thus flows are the elements which causes the dynamics (iThink, [33]).

Arrivals, Queue, Calls Abandoned, Calls Being Logged and Calls Reported are respectively depicted by stock components (point {2}) to observe how each of these elements accumulates over time. The rates (point {3}) cause the changes in the above mentioned stock levels and for this reason each are depicted by a flow component. Consecutive flows are delayed (point {4}) for a time value in order to imitate the sequence of the process. For instance, the rate at which logged calls departure is in essence the attendance rate of calls delayed by the call duration of calls.

The supporting stock and flow processes (point {5}), the Queuing Time Non-Conformities (NC's) and Call Duration NC's, are modelled to explore how the soft variable, Customer Satisfaction, behaves to changes in other system elements. In order to determine what elements influence the Advance Call Customer Satisfaction measure, the customer satisfaction survey questions and non-conformity reports (NCR's) were inspected. It was concluded that Customer Satisfaction can be divided into six main elements which could be incorporated in the SD model. A more detailed discussion follows in section 7.3.

The remaining KPI's, Average Queuing Time (point {6}) and Average Call Duration time, are modelled by means of auxiliary variables. Auxiliary variables are incorporated for the purpose of clarifying the model structure (Kirkwood, [34]). Capacity indicators (point {7}) are represented by Infrastructure Utilisation and Utilisation Factor (in terms of operators). Infrastructure refers to equipment and office space used by operators. The Profit stock and flow process, point {8}, integrates the financial component into the model.

As previously mentioned, the SD simulation methodology is used to imitate high level interdependencies between key system elements. For this reason assumptions were made to ease the high level modelling process while maintaining the required level of accuracy of the model. These assumptions include:

- Abandoned Calls exit the system.
To ease the data mining process calls abandoned are treated as calls which are no longer in the system and as new calls when re-entering the system. This assumption is justified by the inconsiderably small amount of calls abandoned each month.
- Fixed outgoing activity and cost.

On the recommendation of the Operations Manager of Advance Call it was decided to treat the outgoing call activity accordingly to the specific service solution of each call centre. Thus variation is not considered in this part of the process.

- Not explicitly considering the follow-up part of a call process.
 Due to the new system Advance Call introduced in terms of follow-ups on calls, the time spent by operators on this part of the process is largely reduced. However a parameter is built in to account for the natural capacity of operators during a normal operating day.

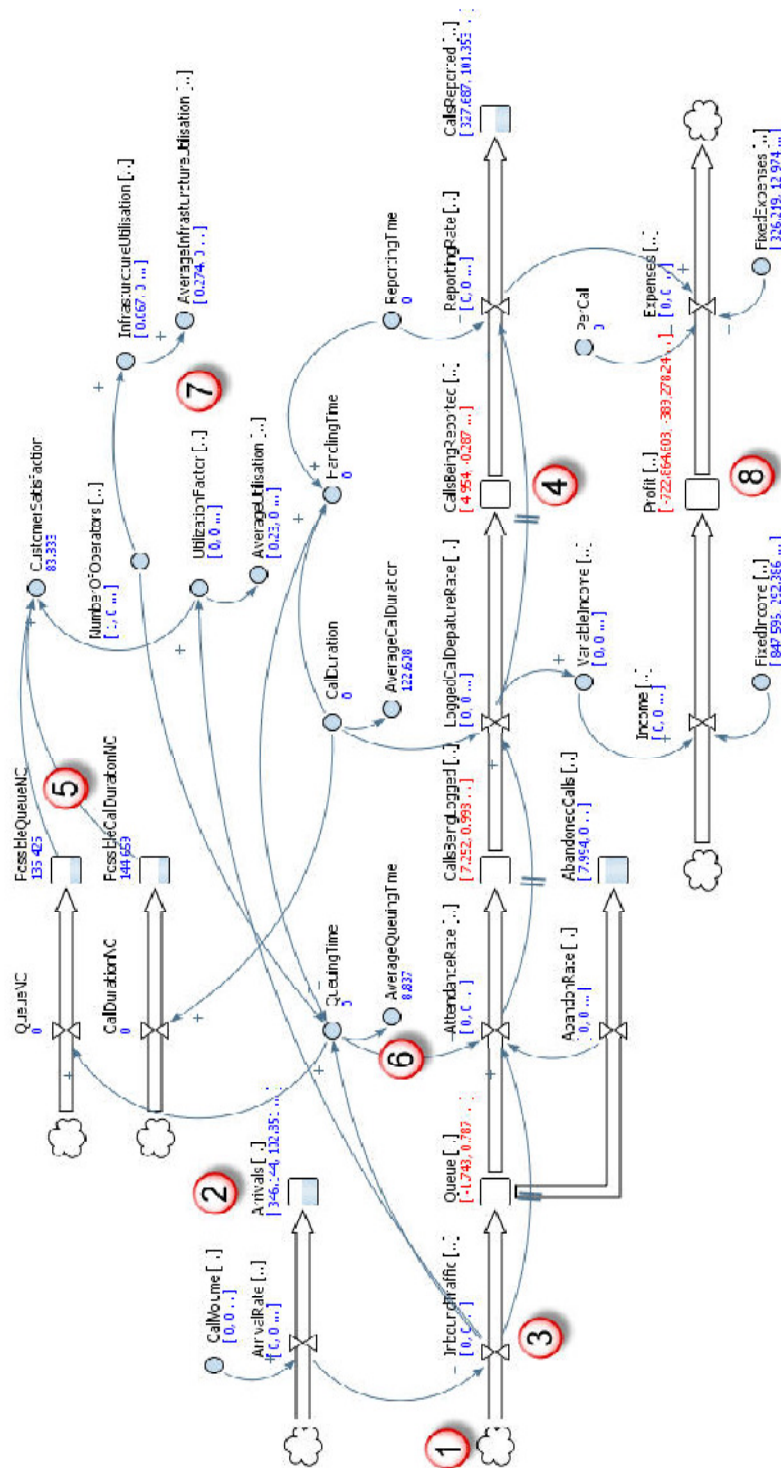


Figure 22 Conceptual SD design

7.3. Operational and Financial Data

Opposed to the traditional scenario of having too little data on a process, Advance Call records all activities of the call centre. The focus point thus shifts from having to obtain data, to one of needing to take a sample from the whole. In section 7.3.1 this problem is addressed by describing how the data was prepared. This is followed by the data solution in section 7.3.2.

7.3.1. Data Preparation

Operational data was gathered over the period January 2011 to June 2012 in order to supply the following SD model elements (as depicted in Figure 21) of data: Call Volume, Queuing Time, Call Duration and Customer Satisfaction. A summary of each follows.

Call Volume and Model Time Units

As a starting point in determining the distribution of the arrival volume of calls at the call centre, high-level graphs were created and inspected. Data were sorted and graphed to establish the call volume distribution per year (Figure 23) and per day (see Figure 24), per hour (see Figure 25) and per week over a month's period. This process was repeated for the total incoming call volume of the call centre and for each of the four respective call centres: RAMP (FAIM), Day To Day, Dolomite and SPAH.

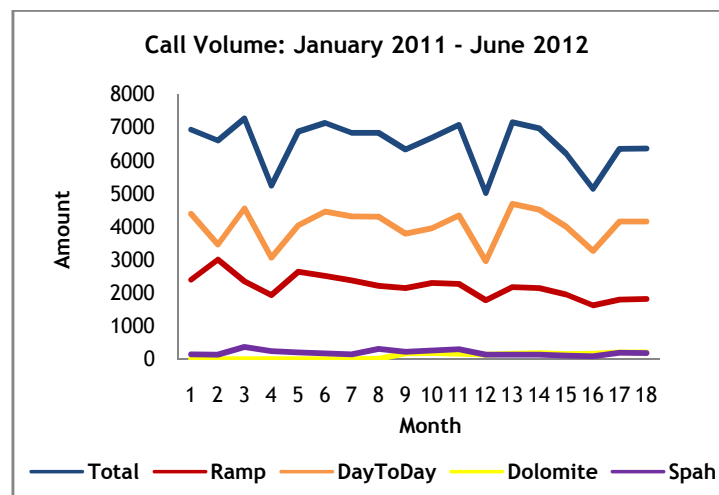


Figure 23 Per year distribution

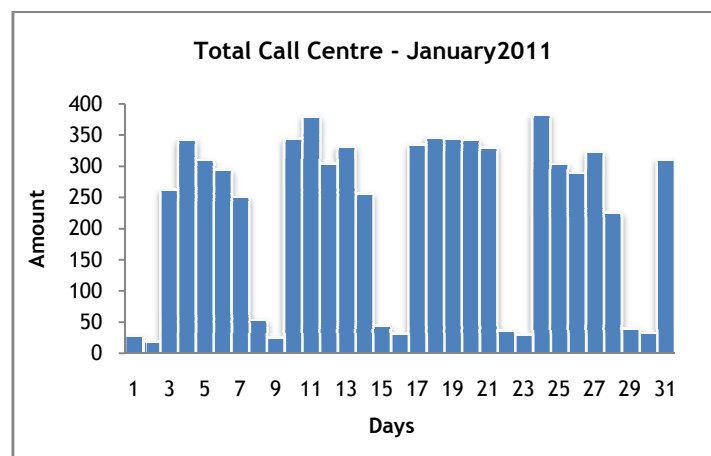


Figure 24 Per day distribution

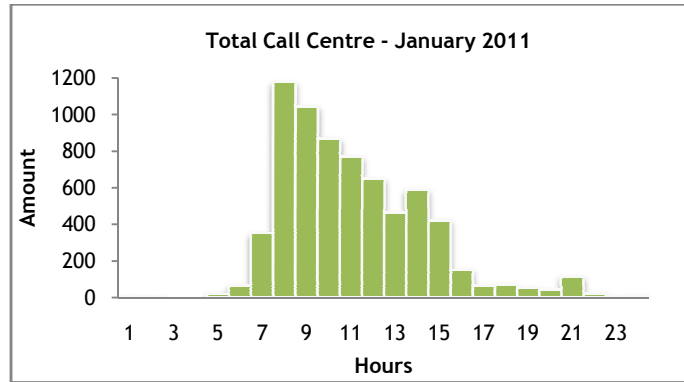


Figure 25 Per hour distribution

Figure 23 illustrates that the call volume distribution is relative constant over a period of a year, with some variation during April and December. In comparing each month’s respective per day (Figure 24) and per hour (Figure 25) graphs the conclusion can be drawn that the call distribution per weekday and per hour remains constant. It only varies in volume. In the case of exceptions, assignable causes were identified, for example: public holidays. The distribution between weeks in a month was found to be inconsiderably small.

From the above observation the model time units and Call Volume input format was determined for each tier’s SD model (see Table 5). With regards to the software limit on model time units, weeks were chosen for both the strategic and tactical tier. The time steps however differ with 4 and 0.001 weeks respectively. For practical simulation reasons a larger time step was chosen for the strategic tier. The smaller time steps for the tactical and operational model was selected based on the following theoretical reason: when utilizing delays the fixed time step (Δt) for a SD model should be at least a tenth of shortest delay time in the model. The reason being: to observe actual effects of the delay. Considering this together with the model run time length, data mining activities and the current operator schedule, the operational tier SD model is developed to run in hours. This hourly input to the model in terms of call volume is for a specific weekday and month.

Tier	Model Time Unit	Time Step (Δt)
Strategic	week	4
Tactical	Week	0.001
Operational	Hour	0.001

Table 5 Model Time Units

The next step was to determine the statistical distribution of arrivals within the selected model time unit. The Input Analyzer tool of the known simulation software Arena was utilized to investigate the best distribution fit. Both the results for a week (see Figure 26) and hour (see Figure 27) were as expected, that of a Poisson distribution.

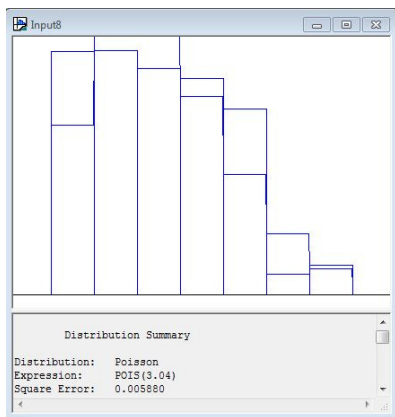


Figure 26 Week Distribution

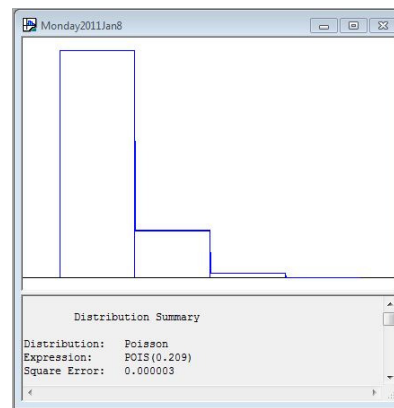


Figure 27 Hour Distribution

Changes in the volume of abandoned calls were found to be directly proportional to arrivals. Thus it can be modelled as a fixed rate of the total arriving call volume.

Queuing Time

The calculation of queuing time for a specific instance is based on the Queuing Theory. However before the theory was utilized it was first insured that the prerequisites were met.

In the previous section it was found that the incoming call distribution of Advance Call indeed follows a Poisson distribution. As expected, the inter arrival times between calls successfully tested to follow an exponential distribution. It can be assumed that the service rate also follows a Poisson distribution and thus Queuing Theory can be utilized.

The following derived M/M/1/GD/∞/∞ Queuing Theory model formulas were used:

For $\rho \geq 1$ no steady state exists. For $\rho < 1$,

$$\rho = \frac{\lambda}{s\mu}$$

$$W_q = \frac{\lambda}{\mu(\mu - \lambda)}$$

where,

s	Number of operators
ρ	Traffic intensity
W_q	Queuing Time
μ	Service rate
λ	Arrival rate

Call Duration

In combing conclusions from data analysis and process observation no particular relationship could be identified between system elements and the call duration of a call. For this reason the historical operational data is used to simulate call durations. By means of the Arena Input Analyzer tool the Beta distribution was identified as the best distribution fit to call durations. The parameters for the call duration Beta distribution are fixed. Thus recalculation of each month is not needed.

Customer Satisfaction

As previously mentioned it was concluded that the Customer Satisfaction KPI can be divided into six main components. Table 6 lists the elements, together with the specific system actor it concerns. These six elements were identified from the customer satisfaction survey questions. The allocation of questions per element is depicted in Appendix L: Customer Satisfaction Survey Questions.

According to Advance Call's prescribed Quality Management System (QMS), the Customer Satisfaction KPI is calculated each month based on the number of non-conformities (NC) received. For example, if no NC's are received, Customer Satisfaction takes on the value of 100%. NC's are either received direct by system actors or unveiled during the Customer Satisfaction Survey.

A period of eighteen months was investigated in order to identify trends between Customer Satisfaction levels and system elements. The majority of the months however maintained a 100% Customer Satisfaction level which complicated the quantifying process due to the minimal data available. From the NC's available the following assumptions were made concerning the quantification of each Customer Satisfaction element.

Both Queuing Time and Call Duration will be dependent on the respective system elements exceeding the KPI goals set. Historical data indicated that the probability of receiving a NC for the above elements is exceptionally low. These elements are however still considered due to the expected influence on the customer satisfaction levels, when call volumes increase, while the operator capacity remains constant.

Attitude and Accuracy seems to decrease only when the operators is under extreme pressure. For this reason

a critical level of twice the utilisation factor was allocated to these elements.

The NC's based on operators following an incorrect procedure, and on customers not being fully informed on the service that are provided, was received a short time after the launching of system changes. The negative influence these elements have on the Customer Satisfaction level decreases over time. Table 6 depicts a summary of the stated assumptions.

Customer Satisfaction				
System Actor	Element	NC Probability	Dependent Element	Critical Level
Operators	Queuing Time	0.01	Queuing Time	> 30
	Call Duration	0.01	Call Duration	> 120
	Attitude	1	Utilisation Factor	2
	Accuracy	1	Utilisation Factor	2
Company	Knowledge	0.5	Product Development	time
Customer	Process	0.5	Product Development	time

Table 6 Customer Satisfaction

The data preparation for the financial elements was discussed in section 6.2

7.3.2. Data Solution

As stated above, MS Excel files will be utilized as input to the model. The rationale behind the use of MS Excel files is based on the high compatibility status of MS Excel with not only the AnyLogic software, but also the Advance Call information system. AnyLogic provides specific MS Excel build-in functions to simplify data flow transactions, whereas the Advance Call information system provides an export option direct to MS Excel.

In accordance with the above described conceptual SD model, three separate input templates are needed. This use of numerous spreadsheets is justified by the software space limitation. The separate spreadsheets include the financial data template and two operational data templates: the Operator Schedule and Call Volume data. Each of these will be discussed below.

Financial Data Template

The Financial Data template (Appendix G: Financial Data Template) is developed to account for the need to adjust income or cost elements in the future to more accurate values.

Operator Schedule Template

Appendix J: Operator Schedule Template contains the operator schedule template designed for both operator hours distributed per weekday and per week.

Call Volume Template

The Call Volume template is developed to receive each month's incoming call data, make calculations and sort this data into the format to be used by the simulation model. Appendix K: Call Volume Template Figure 40 displays one of the various controls that are build-in to all the templates. This is to ensure accuracy throughout not only for the initial data mining process, but also for future use. Figure 41 contains a screenshot of the sorted data in the correct format.

8. FINAL DESIGN

By using the framework developed in section 6.1 as means of a guide the physical design process followed that of a top-down approach. This section will provide a summary of both the system dynamics (SD) model and the accompanying dashboard designed for each level in the framework. Extensive examples will be utilized to communicate the functionality of each tier. The section is concluded with the design of the main user interface and the testing and validating of the IBP tool.

8.1. Strategic Model

8.1.1. System Dynamics model: Strategic

The first variation on the conceptual SD design in section 7 is that of the strategic tier (see Figure 28). Components, parameter values (see Figure 28 point {1}) and model time units were adjusted to fit that of a three year horizon. Various functions and parameters were added to meet the required functionalities of the tier. For instance, the parameters in point {2} assist in altering call volumes. The Opportunity Cost (point {3}) auxiliary variable was added to attend Product Development queries. In terms of capacity, the proposed amount of operator hours to be used is calculated continuously. This affects the number of infrastructure units to be added or released. Proposed refers to an improved solution to the current operator schedule.

The model is also built to accommodate the separate behaviours of each of the respective call centres: FAIM, Day To Day, Dolomite and SPAH, simultaneously. An example of the individual call centre's behaviour after time elapsed can be seen in Figure 32.

8.1.2. Dashboard: Strategic

Adhering to the requirements set in section 6, the strategic tier attends Product Development queries and conducts Profitability Analysis's. In order to run these respective queries user input is required. This is captured by means of navigating the user to the first page: the Setup page (see Figure 29).

While considering the user input page, it is important to note that each window was designed to decrease the probability for inaccurate input, while increasing the user friendliness within software constraints.

The simple Profitability Analysis query below will guide the proceeding explanation.

Profitability Analysis Example:

What was the profitability status of each of the call centre's over the period 1 January 2011 to 31 December 2011?

The model start and end dates are set on the first page (point {1}). The type of query to be run is selected at point {2}. For a Profitability Analysis the call centres to be included in the simulation run must be selected at point {3}. The de-selection of a call centre will simulate operations as if no calls were to be received from the specific call centre. Traced incomes and expenses are also not considered. By means of a button (point {4}) the user is navigated to the query which has been set up. In this case the Profitability Analysis' dashboard depicted in Figure 30.

On the dashboard at point {1} the call volume for the selected call centres, as well as a total, is displayed per four weeks. The profit or loss before tax for the period is illustrated by means of the bar chart in point {2}. Associated indicator results are depicted respectively in point {3} KPI's, point {4} number of operator hours per week and utilization of both operators and infrastructure point {5}.

A similar start up process is followed to run a Product Development query. The input for the example below can be seen at point {5} on (see Figure 29). The output for the query is illustrated on the Product Development dashboard in Figure 31.

Product Development Example:

What will be the effect on the financial, capacity and key performance indicators if another call centre is added? The call volume anticipated for the new call centre is that of 110% of the current FAIM call centre.

On the dashboard the expected growth of profit over time is displayed at point {1}. The income and expenses distribution associated with the new call centre can be seen at point {2}. Point {3} depicts the related opportunity cost. It is important to note that these values are calculated with the input data provided. In the case of running both an operator query and a new call centre query, the modified number of operator hours on the setup page will be taken into account. For instance, if the number of operator hours per week are

increased (operator query), the number of additional operator hours to procure would decrease. Point {4} illustrates the comparison between the current capacity (blue bar) and the proposed capacity (green bar) for operators and infrastructure respectively. Point {5} graphically shows the number of infrastructure units to additionally acquire or sell and also the associated cost.

The other functionalities of the Product Development section are set out in Table 7 together with their purposes and expected results.

Query	Options	Functionality	Purpose
Call Volume (Figure 31 point {6})	NA	Adjustments to the call volume of a specific call centre can be modeled by inserting a percentage in the edit boxes provided. The percentage is added to the current call volume and for this reason decreases can be captured by adding a negative before the number.	To forecast the effect of a modified call volume on the KPI's, financial and capacity indicators of the call centre.
Average Queuing Time (Figure 31 point {7})	Constant Operators	Calculate the proposed total call volume the call centre can attend with the average queuing time entered and the current operator schedule.	Determine the capacity of the call centre if the variation in queuing time is not considered.
	Constant Call Volume	The proposed operator hours per week are calculated by means of the current call volume load for the average queuing time provided.	Determine an improved number of operator hours needed.
Average Call Duration Time (Figure 31 point {8})	Constant Operators	Calculate the proposed total call volume the call centre can attend with the average call duration entered and the current operator schedule.	Determine the capacity of the call centre if the variation in call duration is not considered.
	Constant Call Volume	The proposed operator hours per week are calculated by means of the current call volume load for the average call duration provided.	Determine an improved number of operator hours needed.
Operators (Figure 31 point {9})	Constant Queuing Time	The proposed call volume the call centre can attend with the changed operator hours.	Determine the capacity of the call centre if the current operator schedule was to change.
	Constant Call Volume	The expected average queuing time will be calculated by means of the current call volume load and the changed operator hours.	The effect on the KPI's of a changes operator schedule.

Table 7 Product Development Functionalities

From the above examples one would notice that both the Profitability Analysis and Product Development queries are run simultaneously for the input provided on the setup page. Point {6} enables the user to navigate between the two query types while the model is running. The user can also access the SD model by selecting the "[Origin]" option. On this page the user can both inspect, additional to the developed dashboard, all the model elements values and change parameter values. On Figure 32 point {1} displays the value of Attendance Rate over time and point {2} the opportunity to modify the parameter value of equipment cost per.

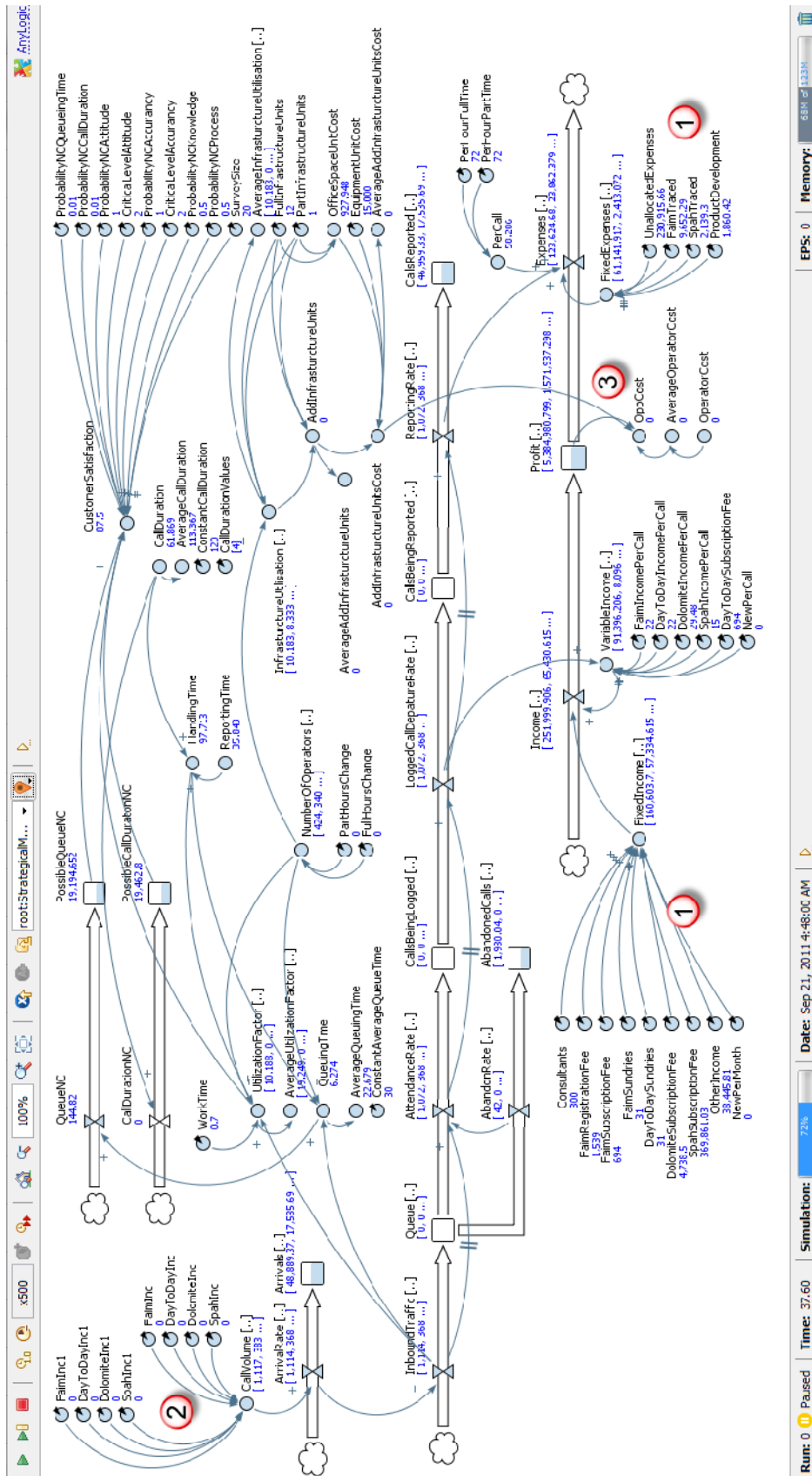


Figure 28 Strategic SD model

AnyLogic Strategic Planning

Setup

Start Time (1) Year: 2011, Month: 0

End Time (2) Year: 2011, Month: 12

Functionality (3) Profitability Analysis, Product Development

Profitability Analysis (4) Faim, DayToDay, Dolomite, Spah

Product Development (5)

Call/Volume	Faim	DayToDay	Dolomite	Spah	Income
	0.0	0.0	0.0	0.0	50.0
	calls per month	calls per month	calls per month	calls per month	R per call
	110.0	0.0	0.0	0.0	1000.0
	% per month	% per month	% per month	% per month	R per month

Average Queuing Time (6) Average Queuing Time (seconds): 30

Operators Constant, Call Volume Constant

Average Call Duration (7) Average Call Duration (seconds): 120

Operators Constant, Call Volume Constant

Operators (8)

Full Time Hours (per week): 0

Part Time Hours (per week): 0

Queuing Time Constant, Call Volume Constant

Run (9)

Run: 0 Paused | Time: 0.00 | Simulation: 4% | Date: Jan 1, 2011 12:00:00 AM | EPS: 0 | Memory: 83M of 21M

Figure 29 Strategic Setup

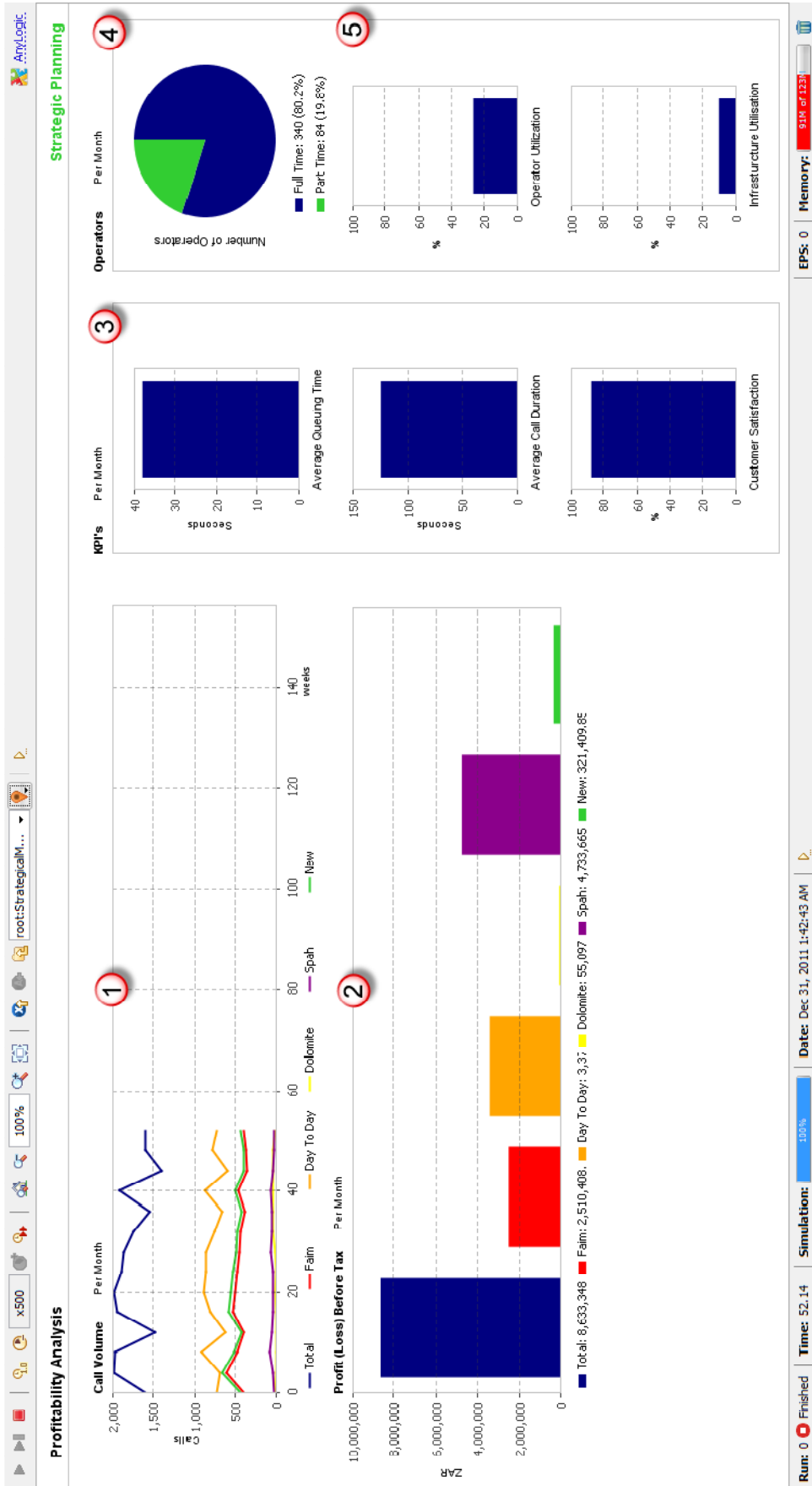


Figure 30 Profitability Analysis Dashboard

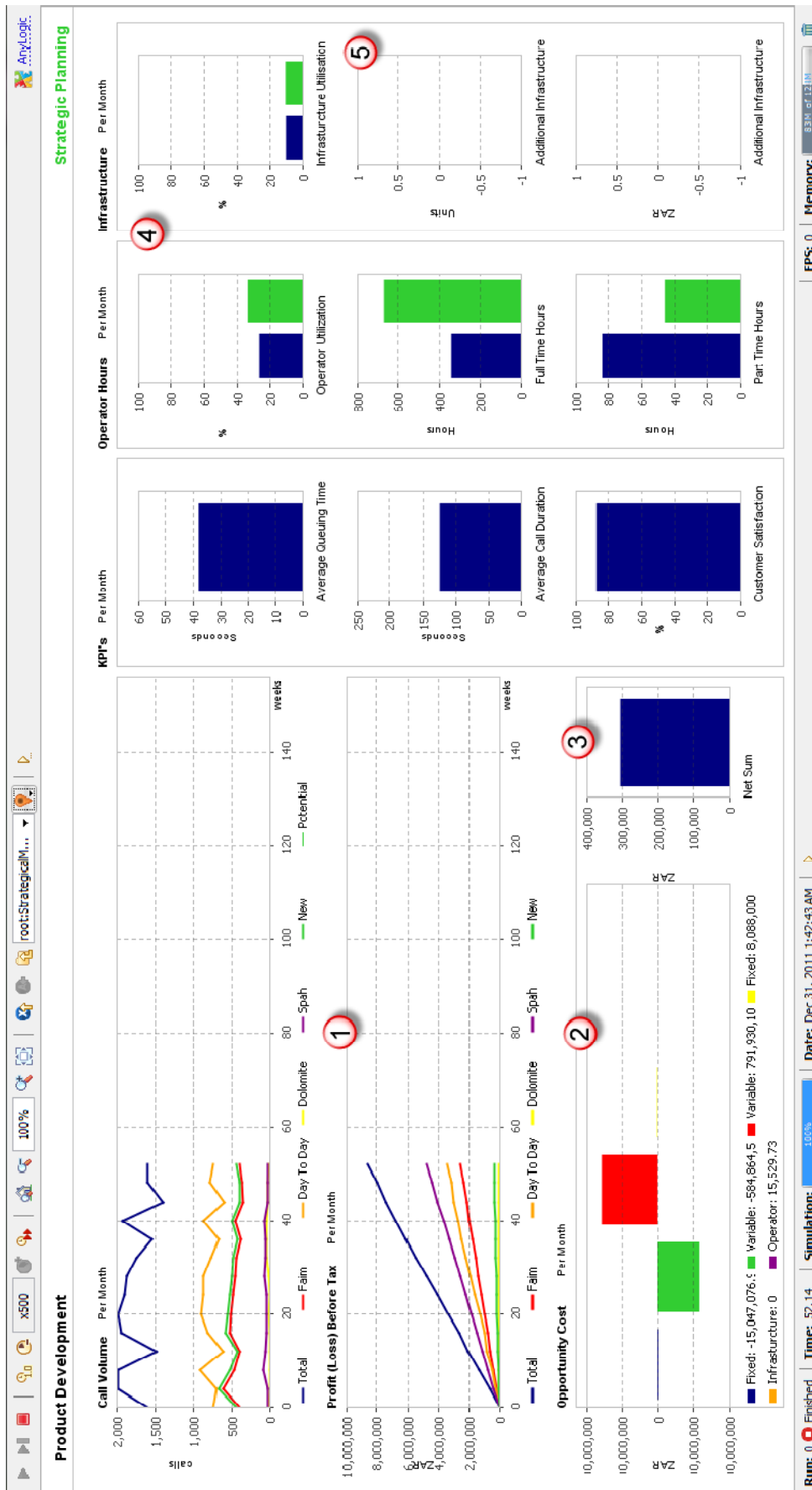


Figure 31 Product Development dashboard

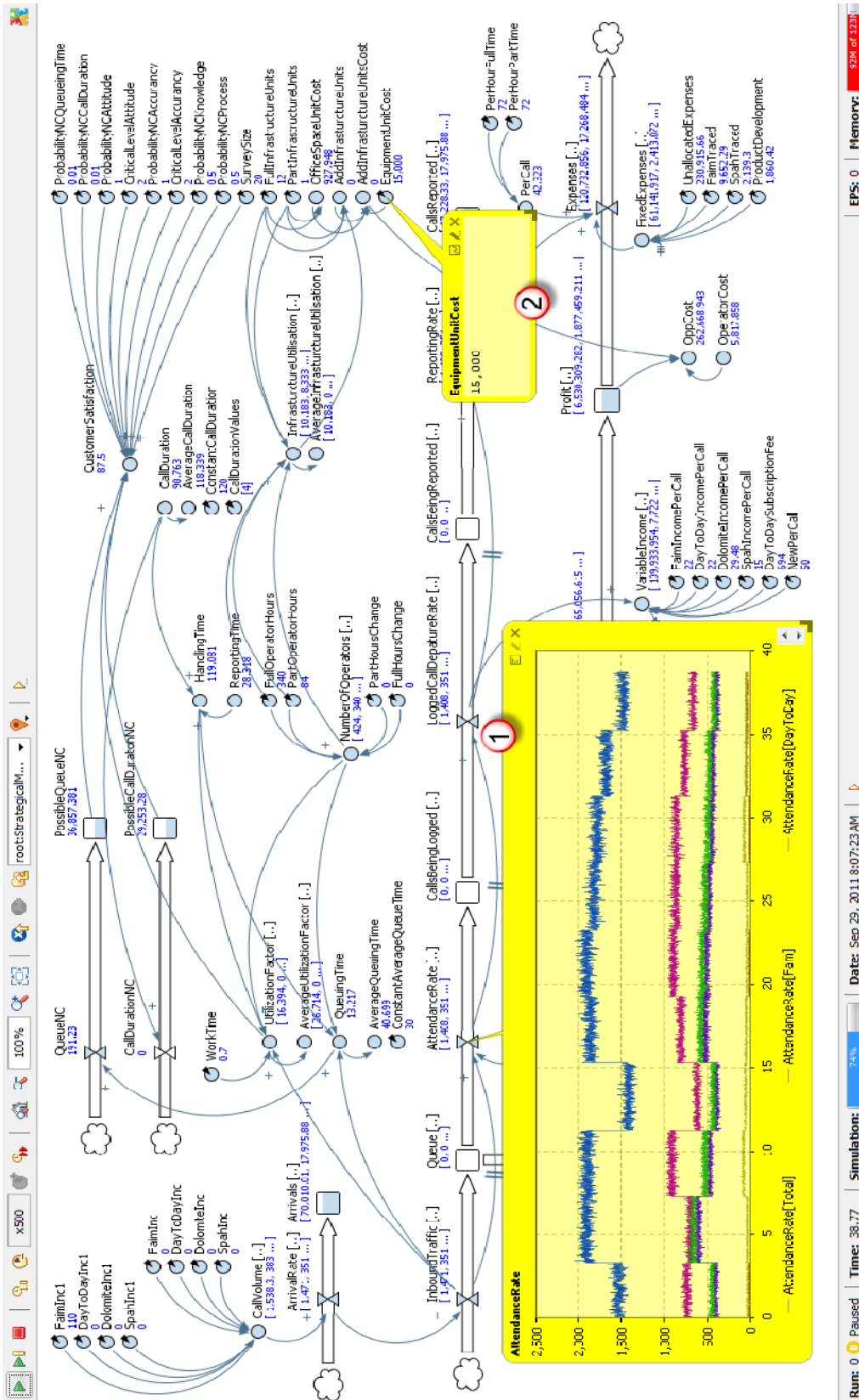


Figure 32 Simulation in run

8.2. Tactical Model

8.2.1. System Dynamics Model: Tactical

The second variation on the conceptual SD model is depicted in Appendix M: System Dynamics Model Figure 42. The tactical model is developed to attend queries stretching over the time horizon of one month up to a year. The diagram takes on a similar format to the strategic model with a diminutive alteration of added KPI goal parameters. The purpose of these parameters is to be used in improved solution calculations as well as the comparison of results on the output page.

8.2.2. Dashboard: Tactical

In accordance with the framework developed in section 6 the goals set in a tier must be carried on to the subsequent tiers. However, with the solution comprising of three respective SD models this data flow needs to be captured manually. For this reason the tactical setup page design takes the form as depicted in Figure 34. Point {1} illustrates this procedure were the input (the Product Development goals set in section 8.1) is put into the tactical model. The time period for the model run is however adjusted to that of a typical tactical planning horizon: 1 January 2011 to 31 March 2011.

When running the query, the user is navigated to the Supply & Demand Balancing window depicted in Figure 34. The tactical dashboard displays output in smaller time steps which enable more detailed inspections of variation within the specific period. For example, at point {1} the operator hours per week are depicted over time. Point {2} indicates the comparison of current capacity to proposed capacity over time.

In order to align the tactical with the strategic tier the added input functionalities described in Table 8 are needed.

Query	Functionality	Purpose
Call Volume (Figure 33 point {2})	Adjustments to the call volume of a specific call centre can be modeled by inserting a percentage in the edit boxes provided. In the case of wanting to de-select a call centre for the simulation run -100% can be used as input.	To forecast the balancing required on a modified call volume (demand) with current and proposed supply options.
Operators (Figure 33 point {4})	Adjusted operator hours per week can be put in. This option is preferred to the alternative of editing the master operator schedule in the MS Excel file.	Determine the capacity of the call centre if the current operator schedule was to change.
Goals (Figure 33 point {3})	The KPI's goals input.	Firstly this is required for the comparison of results against KPI goals (Figure 34 point {3}). Secondly the average queuing time goal is utilized in determining an improved capacity.

Table 8 Tactical input options

Tactical Planning

Setup

Start Time

Year:
 Month:

End Time

Year:
 Month:

Parameters

Call Volume

Fairn: %
 DayToDay: %
 Doornite: %
 Spath: %

Newr Call Centre

Fairn: %
 DayToDay: %
 Doornite: %
 Spath: %
 Income: R per call
 R per month

Operator Hours

Full Time Hours: per week
 Part Time Hours: per week

Goals

Average Queuing: seconds
 Average Call Duration: seconds
 Customer Satisfaction: %

Run: 0 Paused | **Time: 0.00** | **Simulation: 0.0%** | **Date: Jan 1, 2011 12:00:00 AM** | **Memory: 55M / 4.33G**

Figure 33 Tactical Setup

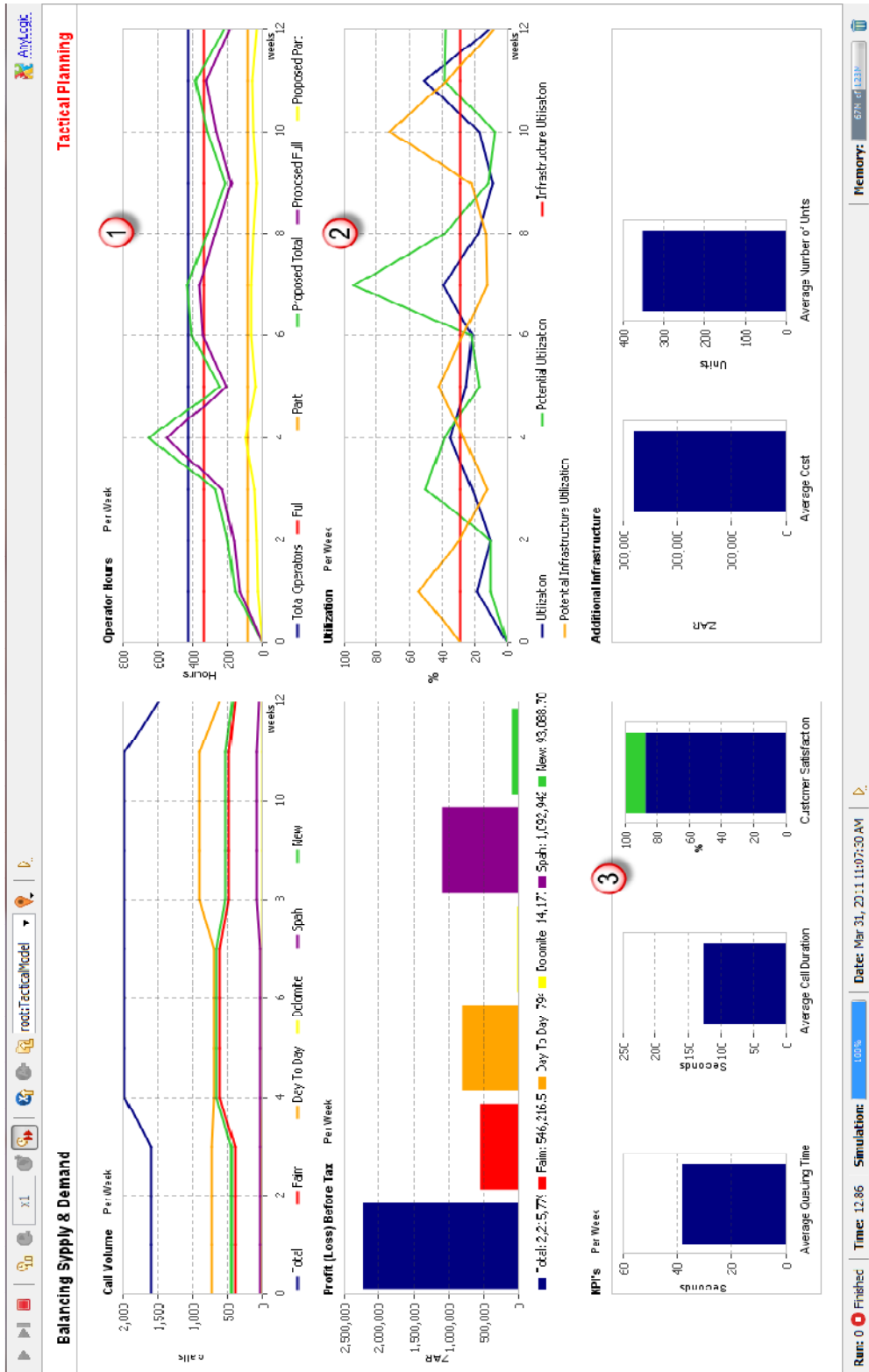


Figure 34 Tactical dashboard

8.3. Operational Model

8.3.1. System Dynamics Model: Operational

The SD model customized from the conceptual SD model for the operational tier can be seen in Figure 43. The model is designed, according to the operational tier requirements set in section 6, for the time period scope of one day. However, it can be run for any amount of consecutive days to the expense of actual run time.

All system elements were adjusted to represent their behaviour per day. For instance, the financial data not included in the ABC was transformed into per hour contributions.

The aim of the Daily Control component in the operational tier is to answer to specific what-if's regarding operator density. For this reason the auxiliary variable Capacity per Operator (see Figure 43 point {1}) were added. Used together with the Operator Utilisation and Operator Hour results issues regarding Daily Control and Scheduling can be assist.

8.3.2. Dashboard: Operational

The Setup page for the operational model is similar to that of the tactical model (see Appendix N: Operational Setup Page). As an example the previously mentioned New Call Centre query will again be used in illustrating functionalities. The output for the time period of one day, 3 January 2011 24:00 to 4 January 2011 24:00, is depicted in Figure 35. As can be seen from Figure 35 a similar dashboard to the tactical tier is utilized, with the difference in time units. Point {1} indicates the specific weekday. This is an important indicator to the user due to the reason that call volume varies together with the operator schedule per weekday. Point {2} reveals the added auxiliary variable: Capacity per Operator mentioned in section 8.3.1.

The operational model framework component: Scheduling is accounted for by including the actual schedule operator hours compared to an improved number of operator hours per hour of a specific day. This output can assist decision makers in considering all variances when compiling an improved operator schedule.

The financial element was added to indicate the effect decisions at the bottom level have on the overall finances of the company.

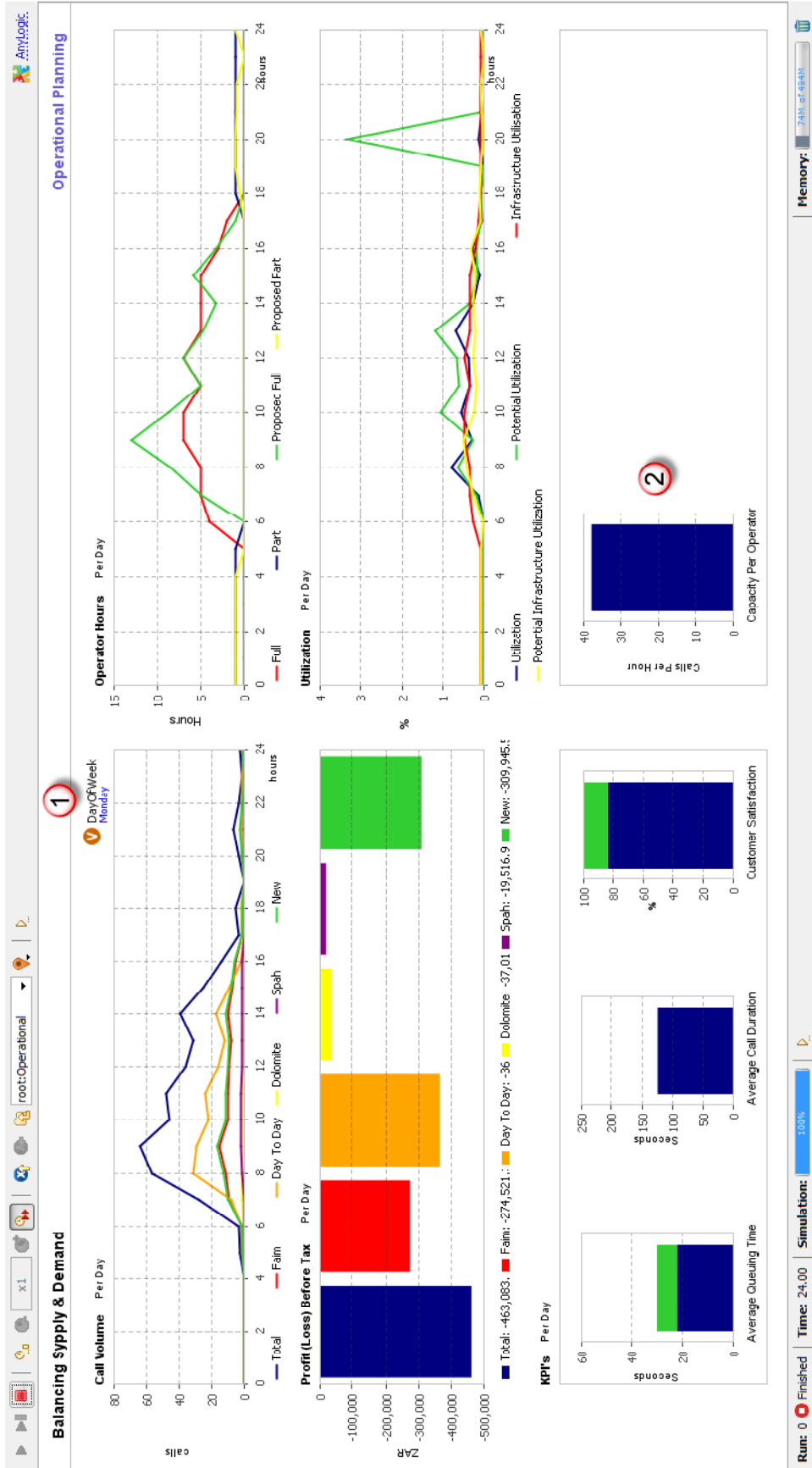


Figure 35 Operational dashboard

8.4. Main GUI

As mentioned in section 7, a main interface will be developed to package the various model components to the user. Figure 36 depicts the home page of the IBP tool. From this page the user can navigate to a specific planning tier by means of an on-click action at options points {1}, {2} or {3}.

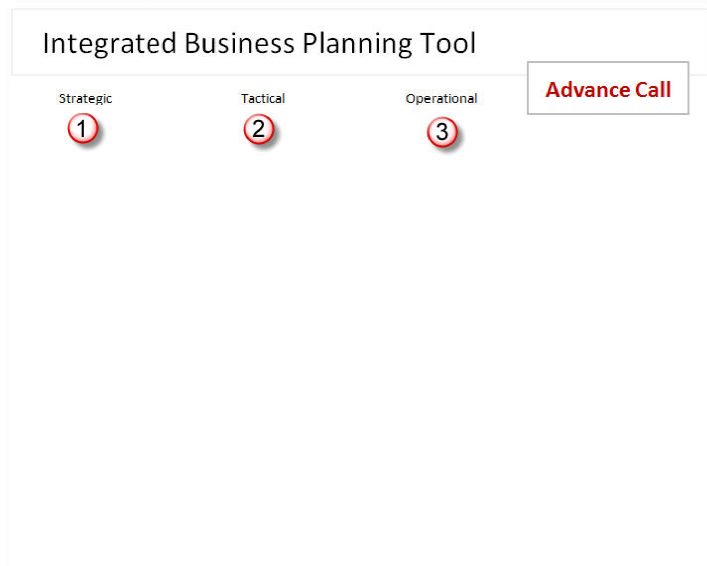


Figure 36 Home page

For instance, if the user selects option {1}: Strategic in Figure 36 the following options depicted in Figure 37 would be displayed. Point {1} indicates the option to open via a hyperlink the strategic planning model. Point {2} indicates the various associated strategic data spreadsheets which can be accessed. By clicking on the block at point {3} the user will be navigate to the home page. Both the Tactical and Operational pages take on the same form as the Strategic page.

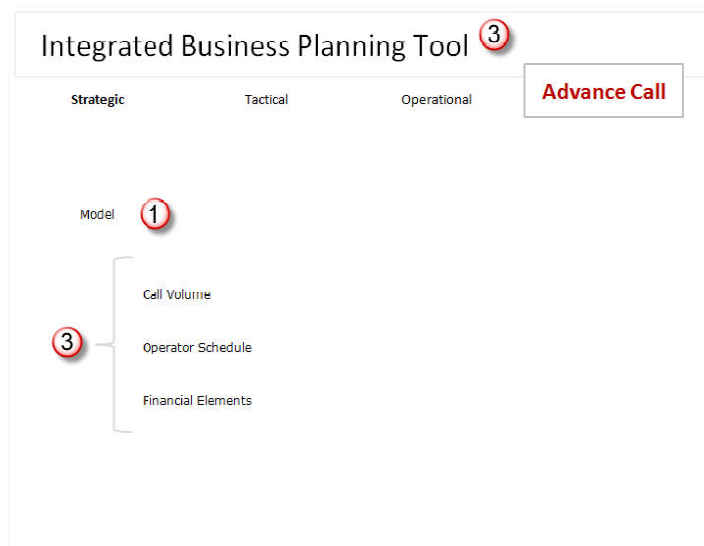


Figure 37 Strategic page

8.5. Test and Validation

Queuing Time and in essence the KPI Average Queuing Time, serve as the main test element for the model. The reason being that: Queuing Time is the only element for which the historical data distribution cannot be

directly applied. Thus it is contrasting to the case of Call Duration and Reporting Time which takes up arbitrary values. Influences on the Queuing Time of calls such as the Arrival Rate, Service Rate and Number of Operators in the system all determine the behaviour of this element.

Table 9 sets out three consecutive test runs conducted with each of the models. Relative small error percentages were found. In the case of the operational model, the larger error percentages may be due to the extensive use of averages. Results were modelled assuming that operators spend 75% of a work hour on actual work.

Model	Time Period	Actual [seconds]	Simulated [seconds]	Error [%]
Strategic	2011/08	28.91	28.345	1.95
			26.729	7.54
			27.215	5.86
Tactical	2012/05	30.05	31.089	3.46
			31.625	5.24
			31.369	4.34
Operational	2011/02/15	7.27	8.142	11.99
			8.125	11.76
			8.282	13.92

Table 9 Average Queuing Time Test

In Appendix O: Financial Component Testing depicts the spreadsheet utilized in the testing of the financial component. Small error percentages were the result, with New being the exception. This larger error percentage is caused by the variation of the cost per call which is not accounted for in the test sheet.

On this note it is important to remember that simulation models and specifically this IBP model are developed to assist decision-makers in making a decision. The results of the model cannot be taken as an exact estimation.

The examples utilized in the above sections 8.1 to 8.4 confirm the overall structure and functionalities of each tier to be in accordance with the requirements set. As time pass finer calibrations can be made to increase the level of accurate representation of reality.

9. CONCLUSION

To conclude, from the examples above it is evident that the customized integrated business planning (IBP) tool indeed unlocks the value within the enormous amounts of data captured by Advance Call. The tool provides assistance for each of the planning horizons by a separate system dynamics (SD) model for the strategic, tactical and operational tier of planning. These simulation models accurately represent the actual high-level interdependencies between call centre system elements such as call volume variation, queuing time, call duration, customer satisfaction, operators and financial indicators over a specific time horizon.

The explained examples illustrate how the model requirements were put into functionalities of the final solution. It is however recommended that as the company becomes more familiar with the structure of the tool, they can combine queries and thus utilize it in planning more complex scenarios.

Technical recommendations for the future include developing additional interfaces to the tool with the purpose of storing the results of a simulation run. Secondly, an export format may be considered. At the moment an installed version of the AnyLogic software is a requirement for running the simulation models on a computer. However, by eliminating the input data structure the models may be exported as Java Applets. This format does not require the software to be installed on the computer.

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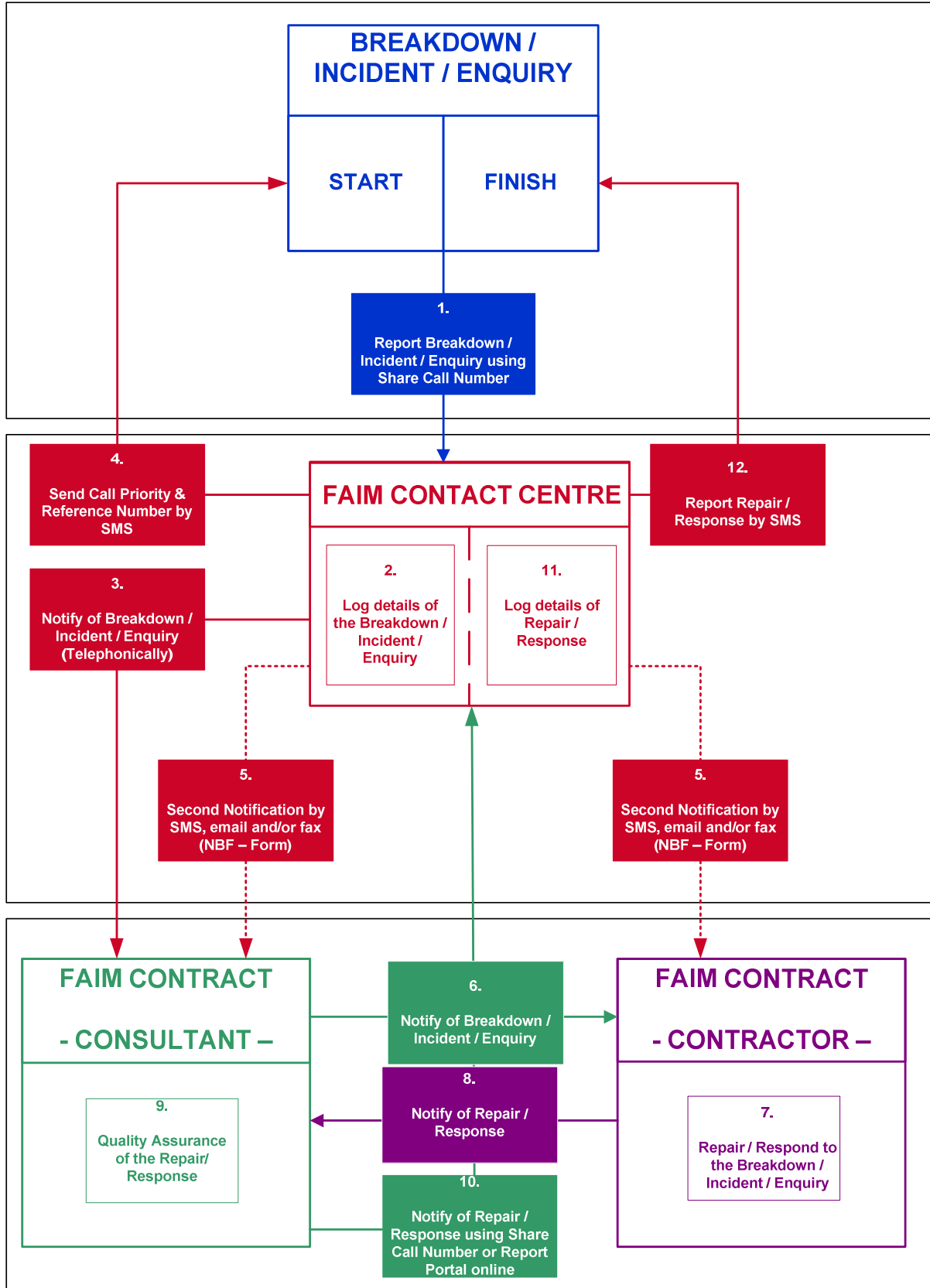
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APPENDICES

Appendix A: Acronyms

Acronym	Meaning
ABC	Activity based costing
CPI	Consumer Priced Index
FAIM	Facilities and Infrastructure Maintenance Call Centre
GUI	Graphic User Interface
IBP	Integrated Business Planning
IT	Information Technology
KPI	Key Performance Indicator
NC	Non-conformity
NCR	Non-conformity Report
QMS	Quality Management System
RAMP	Repair and Maintenance Call Centre
S&OP	Sales and Operations Planning
SD	System Dynamics
SPAH	SEDA SMME Payment Assistance Hotline
SMME	Small, Medium and Micro sized Enterprise
SWOT	Strengths Weaknesses Opportunities Threats

**FAIM (Facilities And Infrastructure Maintenance)
CONTACT CENTRE**
BREAKDOWN LOGGING AND TRACKING PROCESS



Appendix C: Interview

INTERVIEW

Interviewer: Natalie Joubert
 Interviewee: Philippus Fouché, CEO of Advance Call (Pty) Ltd

AIM OF INTERVIEW

- Get more insight into the current planning approaches.
- Gather outstanding financial data.

BACKGROUND TO INTERVIEW

- Developed proposed model for IBP tool
- Goal of the tool: Simulate frequently asked questions during a planning exercise.
- Description:
 - Start at the top with an overall view of the company in strategic planning. Set long-term goals.
 - Move downwards to tactical planning to put long-term goals into short-term goals.
 - Align operations with short-term goals set.
 - Financial component in the middle – Key concept of IBP to integrate finance on each level.
 - Strategic Planning component: Focussed on product development related quarries.
 - Model will be able to simulate the effect a specific product (call centre) have on the company (on KPI's); e.g. Call volumes versus service levels
 - Feasibility of product.
 - Tactical planning component: Set short-term goals.
 - Supply: Track performance in relation to targets set.
 - Demand: Use historical data to identify trends e.g. capacity versus demand
 - Operational planning component:
 - Schedule: Time of day, day of week, week of month, month of year.
 - Daily control: Scenario's (will be incorporated above)

INTERVIEW QUESTIONS

The current approach to strategic planning can be described as a "gut feeling" approach.

1. What tools or techniques do you make use of in strategic planning?

Extrapolate estimations of the call volumes and the income per call centre. For instance, Advance Call knows that the Day-to-Day call centre call volume requires 50% of the daily capacity. Then in the case of obtaining another contract for the same amount of calls, an additional 50% capacity will be needed.

2. How would you judge a product or tender feasibility? e.g., IRR, NPV

The project must have the following characteristics:

- Annuity income
- Have the same characteristics as existing products to ease the implementation (Advance Call already has the experience, minimize development costs)
- Must require a unique solution.

For the financial modelling ABC will be used. Goal: Earnings & costs allocate to specific call centre. The following questions are related to the provided income sheet.

1. Turnover = Income – variable expenses?

Turnover = Income

2. Income elements

	Turnover Element	
	Yes	No
Cost per call	x	
Monthly Sundries	x	
Monthly subscription	x	
Once off registration	x	

Increase due to the Consumer Price Index (CPI) adjustment.

3. Variable expenses:

No specific variable expenses that can be easily allocated to a call centre.

Identify & Allocate percentages

4. Other income & expenses related to call centre

Distribution indicated on data analysis of Income sheet.

5. Expenses variable, fixed or mixture of both

Type of cost indicated on data analysis of Income sheet.

Appendix D: Scope of QMS

ISSUES CONSIDERED	QMS CRITERIA / ISO 9001:2000 SECTIONS	QMS DOCUMENTS DESCRIBING SYSTEMS & CONTROLS
<p>Company profile, vision, mission & organisation</p> <p>General company policies and objectives</p> <p>Scope of the quality system and exclusions</p> <p>Control of documents</p> <p>Control of records</p>	<p>Part 1 GENERAL (ISO 9001:2008 SECTION 4)</p>	<p>Quality Manual Document</p> <p>Procedures:</p> <p>Control of Documents</p> <p>Control of Records</p> <p>Forms - records</p>
<p>Policy statement</p> <p>Specific objectives</p> <p>Quality planning</p> <p>Internal & external communications and information</p> <p>Review of the total quality system</p>	<p>Part 2 MANAGEMENT RESPONSIBILITY (ISO 9001:2008 SECTION 5)</p>	<p>Quality Manual Document</p> <p>Procedures:</p> <p>Quality Planning</p> <p>Internal Communication</p> <p>Management Review of the Data capturing forms and checklists - records</p>
<p>Policy statement</p> <p>Human resources</p> <p>Infrastructure</p> <p>Work environment</p>	<p>Part 3 RESOURCE MANAGEMENT (ISO 9001:2008 SECTION 6)</p>	<p>Quality Manual Document</p> <p>Procedures:</p> <p>Human Resources</p> <p>Infrastructure</p> <p>Work Environment</p> <p>Emergency Action Plan</p> <p>Data capturing forms and checklists - records</p>
<p>Policy statement</p> <p>Client-related processes</p> <p>Procurement/Purchasing</p> <p>Provision of services and deliverables</p> <p>Control of monitoring and measuring devices</p>	<p>Part 4 PRODUCT/SERVICE REALISATION (ISO 9001:2008 SECTION 7)</p>	<p>Quality Manual Document</p> <p>Procedures:</p> <p>Process Manual in General</p> <p>Customer Related Processes</p> <p>RAMP Breakdown, Logging and Tracking</p> <p>RAMP Reporting</p> <p>RAMP Contract Registration & Monthly Invoicing</p> <p>RAMP Penalty & Payment Reduction</p> <p>Purchasing</p> <p>Work Instructions and Standards</p> <p>Data capturing forms and checklists - records</p>
<p>Policy statement</p> <p>Monitoring and Measurement of:</p> <ul style="list-style-type: none"> • Client satisfaction • Systems (internal audits) • Process quality • Products/Deliverables quality <p>Identification and control of Nonconformity</p> <p>Analysis of data</p> <p>Continual improvement</p> <p>Corrective action</p> <p>Preventive action</p>	<p>Part 5 MEASUREMENT, ANALYSIS AND IMPROVEMENT (ISO 9001:2008 SECTION 8)</p>	<p>Quality Manual Document</p> <p>Procedures:</p> <p>RAMP Customer Satisfaction</p> <p>Internal Quality Audit</p> <p>Monitoring of Processes</p> <p>Analysis of Data</p> <p>Control of NC Products, Corrective Action, Preventive Action</p> <p>Work Instructions and Standards</p> <p>Data capturing forms and checklists - records</p>

Appendix E: Operational Data

Call Date	Event	Queue Name	Caller ID	Wait Time	Call Time	Hold Time
01-01-2011 00:52:03	COMPLETEAGENT	default-faim_after_hours	824491675	00:00:08	00:01:23	00:00:00
01-01-2011 01:00:23	COMPLETEAGENT	default-faim_after_hours	824491675	00:00:10	00:00:30	00:00:00
01-01-2011 08:07:50	COMPLETECALLER	default-faim_after_hours	Day_2_Day-	00:00:13	00:00:33	00:00:00
01-01-2011 08:10:59	COMPLETEAGENT	default-faim_after_hours	Day_2_Day-	00:00:10	00:01:37	00:00:00
01-01-2011 08:46:26	COMPLETEAGENT	default-faim_day_to_day	Day_2_Day-	00:00:06	00:00:21	00:00:00
01-01-2011 08:48:25	COMPLETEAGENT	default-faim_day_to_day	CorrectionalServices-	00:00:35	00:03:21	00:00:00
01-01-2011 09:52:12	COMPLETECALLER	default-faim_day_to_day	CorrectionalServices-	00:00:06	00:00:55	00:00:00
01-01-2011 10:39:56	COMPLETEAGENT	default-faim_day_to_day	RAMP_SAPS-	00:00:08	00:02:06	00:00:00
01-01-2011 10:42:31	COMPLETEAGENT	default-faim_day_to_day	CorrectionalServices-	00:01:00	00:00:45	00:00:00
01-01-2011 11:12:27	COMPLETEAGENT	default-faim_day_to_day	Ramp_Border_Control-	00:00:04	00:01:30	00:00:00
01-01-2011 11:36:29	COMPLETECALLER	default-faim_day_to_day	CorrectionalServices-	00:00:04	00:00:56	00:00:00
01-01-2011 12:40:35	COMPLETEAGENT	default-faim_day_to_day	Day_2_Day-	00:00:04	00:01:59	00:00:00
01-01-2011 13:20:56	COMPLETECALLER	default-faim_day_to_day	RAMP_SAPS-	00:00:10	00:04:46	00:00:00
01-01-2011 13:31:08	COMPLETEAGENT	default-faim_day_to_day	Day_2_Day-	00:00:02	00:00:02	00:00:00
01-01-2011 13:31:32	ABANDON	default-faim_day_to_day	Day_2_Day-	00:02:25	00:00:00	00:00:00
01-01-2011 13:42:30	COMPLETEAGENT	default-faim_day_to_day	Day_2_Day-	00:00:03	00:02:30	00:00:00
01-01-2011 14:17:41	COMPLETECALLER	default-faim_lift	RAMP_Occupied_Lifts-	00:00:06	00:01:53	00:00:00
01-01-2011 14:29:18	COMPLETEAGENT	default-faim_lift	RAMP_Occupied_Lifts-	00:01:27	00:00:25	00:00:00
01-01-2011 14:33:49	COMPLETEAGENT	default-faim_lift	RAMP_Lifts-	00:00:05	00:00:42	00:00:00
01-01-2011 14:38:42	COMPLETEAGENT	default-faim_day_to_day	CorrectionalServices-	00:00:05	00:01:24	00:00:00
01-01-2011 16:23:39	COMPLETEAGENT	default-faim_day_to_day	Day_2_Day-	00:00:08	00:04:56	00:00:00
01-01-2011 16:32:16	COMPLETEAGENT	default-faim_day_to_day	Day_2_Day-	00:01:24	00:04:01	00:00:00
01-01-2011 16:36:55	COMPLETEAGENT	default-faim_day_to_day	Day_2_Day-	00:02:51	00:01:11	00:00:00
01-01-2011 16:51:32	COMPLETEAGENT	default-faim_day_to_day	RAMP_SAPS-	00:00:04	00:00:56	00:00:00
01-01-2011 17:02:07	ABANDON	default-faim_day_to_day	Ramp_Border_Control-	00:00:03	00:00:00	00:00:00
01-01-2011 19:47:31	COMPLETECALLER	default-faim_after_hours	Day_2_Day-	00:00:14	00:01:51	00:00:00
01-01-2011 21:01:55	COMPLETECALLER	default-faim_after_hours	Day_2_Day-	00:00:13	00:00:22	00:00:00
01-01-2011 21:02:50	COMPLETECALLER	default-faim_after_hours	Ramp_Labour-	00:00:09	00:00:12	00:00:00

Appendix F: Income and Cost Elements

	Fixed	Variable	Mixed
TURNOVER			
RAMP Call Centre*			
SPAH Call Centre			
Day to Day Call Centre			
OTHER INCOME			
Rent Income			
Rent equipment			
Telephone Income			
ICT Services			
Sub-consulting services			
Bad debts recovered			
Interest received			
EXPENSES			
Audit/Accounting fees	x		
Advertising and promotions	x		
Bank Charges	x		
Bad debts		x	
Cleaning			x
Compensations Commissioner			x
Computer Expenses			x
Consumables	x		
Courier and postage		x	
Directors remuneration	x		
Depreciation			x
Donations	x		
Electricity & Water			x
Entertainment Expenses	x		
General Expenses - Gifts	x		
Insurance			x
Legal fees		x	
Motor vehicle hire	x		
Printing & Stationery			x
Quality Assurance		x	
Rent premises			x
Rent equipment	x		
Repairs and Maintenance			x
Salaries & Wages			x
SDL			x
UIF			x
Security	x		
Sub consultants		x	
Subscriptions	x		
Staff Training		x	
Telephone & Fax			x
Telephone general	x		

*It is important to note from the table above that the RAMP and Dolomite earnings are grouped together as one. The table below differentiate between the components of the earnings per call centre.

Call Centre	Once off registration fee	Monthly subscription fee	Monthly sundries	Cost per call
RAMP	x	x	x	x
Day To Day		x (increase per amount of calls)	x	x
Dolomite		x		x
SPAH		x		x

Appendix G: Financial Data Template

Expense	Activity Cost Pools		Direct Allocation		Traced		First Stage Allocation			Other			Activity Rate				
	Service Provided		Other		Service Provided			Minimum			Maximum			Average			
	[%]	[%]	[%]	[%]	Cost Object	Minimum [R]	Average [R]	Maximum [R]	Minimum [R]	Average [R]	Maximum [R]	Minimum [R]	Average [R]	Maximum [R]	Minimum [R]	Average [R]	Maximum [R]
Audit/Accounting fees	0	100	#N/A	#N/A	#N/A	0	0	0	2987.98	28984.51	8630.46	0.00	0.00	0.00	0.00	0.00	0.00
Advertising and promotions	0	100	#N/A	#N/A	#N/A	0	0	0	0	9280	3361.39	0.00	0.00	0.00	0.00	0.00	0.00
Bank Charges	0	100	#N/A	#N/A	#N/A	0	0	0	642.23	4472	1646.26	0.00	0.00	0.00	0.00	0.00	0.00
Bad debts	#N/A	#N/A	100	Ramp	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Cleaning	50	50	#N/A	#N/A	#N/A	27.41	349.86	942.72	27.41	942.72	349.86	0.00	0.14	0.05	0.00	0.14	0.05
Computer Expenses	66.67	33.33	#N/A	#N/A	#N/A	8164.11	15474.41	41577.41	4081.44	20785.59	7736.04	1.18	6.00	2.23	0.00	6.00	2.23
Consumables	0	100	#N/A	#N/A	#N/A	0	0	0	1181.74	3776	2295.31	0.00	0.00	0.00	0.00	0.00	0.00
Courier and postage	#N/A	#N/A	100	Ramp	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Directors Remuneration	0	100	#N/A	#N/A	#N/A	0	0	0	80000	130000	87333.17	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation	66.67	33.33	#N/A	#N/A	#N/A	7972.51	7972.51	7972.51	3985.66	3985.66	3985.66	1.15	1.15	1.15	0.00	1.15	1.15
Donations	0	100	#N/A	#N/A	#N/A	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Electricity and Water	50	50	#N/A	#N/A	#N/A	0	2626.29	3250.88	0	3250.88	2626.29	0.00	0.47	0.38	0.00	0.47	0.38
Entertainment Expenses	0	100	#N/A	#N/A	#N/A	0	0	0	773.72	8692	2722.74	0.00	0.00	0.00	0.00	0.00	0.00
General Expenses - Gifts	0	100	#N/A	#N/A	#N/A	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Insurance	50	50	#N/A	#N/A	#N/A	151	158.94	194.13	151	194.13	158.94	0.02	0.03	0.02	0.00	0.03	0.02
Legal fees	#N/A	#N/A	100	Ramp	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Motor Vehicle Hire	0	100	#N/A	#N/A	#N/A	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Printing and Stationery	80	20	#N/A	#N/A	#N/A	0	3653.72	11505.6	0	2876.4	913.43	0.00	1.66	0.53	0.00	1.66	0.53
Quality Assurance	100	0	#N/A	#N/A	#N/A	0	1756.67	16630	0	0	0	0.00	2.40	0.25	0.00	2.40	0.25
Rent Premises	50	50	#N/A	#N/A	#N/A	0	12063.33	16518.91	0	16518.91	12063.33	0.00	2.38	1.74	0.00	2.38	1.74
Rent Equipment	50	50	#N/A	#N/A	#N/A	974.5	2598.81	3411.01	974.5	3411.01	2598.81	0.14	0.49	0.37	0.14	0.49	0.37
Repairs and Maintenance	50	50	#N/A	#N/A	#N/A	0	980.56	4358.5	0	4358.5	980.56	0.00	0.63	0.14	0.00	0.63	0.14
Security	0	100	#N/A	#N/A	#N/A	0	0	0	533	1639	968	0.00	0.00	0.00	0.00	0.00	0.00
Sub consultants	#N/A	#N/A	100	PD	0	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Subscriptions	0	100	#N/A	#N/A	#N/A	0	0	0	0	13930	2411.43	0.00	0.00	0.00	0.00	0.00	0.00
Staff Training	100	0	#N/A	#N/A	#N/A	0	3055.42	20733.34	0	0	0	0.00	2.99	0.44	0.00	2.99	0.44
Telephone and Fax	95	0	#N/A	5	Spah	28841.67	40646.69	51619.91	0	0	0	4.16	7.44	5.86	0.00	7.44	5.86
Telephone General	0	100	#N/A	#N/A	#N/A	0	0	0	2342	2342.33	2342.19	0.00	0.00	0.00	0.00	0.00	0.00
Travel and Accommodation	0	100	#N/A	#N/A	#N/A	0	0	0	0	9796	4647.08	0.00	0.00	0.00	0.00	0.00	0.00
Compensations Commissioner	60	40	#N/A	#N/A	#N/A	0	561.47	6737.59	0	4491.72	374.31	0.00	0.97	0.08	0.00	0.97	0.08
Salaries and Wages	60	40	#N/A	#N/A	#N/A	96736.02	121714.23	258737.4	64490.68	172491.6	81142.82	13.95	37.31	17.55	13.95	37.31	17.55
SDL	60	40	#N/A	#N/A	#N/A	1029.88	1531.66	2580.6	686.58	1720.4	1021.1	0.15	0.37	0.22	0.15	0.37	0.22
UJF	60	40	#N/A	#N/A	#N/A	784.16	909.73	1100.4	522.77	733.6	606.48	0.11	0.16	0.13	0.11	0.16	0.13
TOTAL						163380.71	448672.96	230915.66	20.86	64.59	31.14						



ADVANCE CALL FULL TIME STAFF – WORK SCHEDULE

NAME	WORK DAYS	START	FINISH	LUNCH TIME	SMOKE BREAK/GENERAL
IT technician	Monday - Friday	07h00	16h00	13h00 – 14h00	
Adri Visser	Monday - Friday	07h30	16h30	12h00 – 13h00	-8 hours/month
Cindy Maré	Monday - Friday	08h00	13h00		Two full days a month (8-5)
Janine Samuels	Monday - Friday	07h30	16h30	13h00 – 14h00	
Jeanette Cronje	Monday - Friday	06h00	15h00	11h00 – 12h00	
Junitha Alii	Monday - Friday	06h30	15h30	11h30 – 12h30	
Kgathiso Malewa	Monday – Wednesday, Friday	09h00	18h00	14h00 – 14h45	15 min at 11h30
Kgathiso Malewa	Sunday	07h00	16h00	12h00 – 13h00	
Kgomotso Tiale	Monday, Tuesday, Wednesday, Friday	07h00	16h00	13h00 – 14h00	
Kgomotso Tiale	Thursday	09h00	18h00	14h00 – 15h00	
Nicky Berg	Monday - Friday	07h00	15h00	12h00 – 13h00	
Nonhlanhla Mogashwa	Monday – Thursday & Saturday	07h00	16h00	12h30 – 13h30	
Nonhlanhla Mogashwa	Last full week of every month Monday – Saturday (Sunday & Monday off)	07h00	16h00	12h30 – 13h30	
Obakeng Makhutle	Monday - Friday	09h00	18h00	14h00 – 15h00	
Philippus Fouché	Monday, Tuesday, Thursday, Friday	07h30	16h30	13h00 – 14h00	
Queen Masilela	Monday - Friday	06h00	15h00	11h00 – 12h00	
Taryn Barnard	Monday - Friday	07h00	16h00	13h00 – 14h00	

Strategic: FAIM Profitability

Indicators Model

System Dynamics Model

FAIM_Dolomite
FAIM_DayToDay
SPAH

PURPOSE:
Effect, per annum, a specific call centre has on the whole of Advance Call's indicators (past & future).
AND
Investigate growth of call centre.

Customer Satisfaction
Queuing Time
Call Duration Time

Assumption:
Quality, Operations,
IT, PA constant –
Operators vary

Capacity Utilisation
Investment

Variable Income
Fixed Income
Profit
Variable Costs
Fixed Costs

CPI
Call Volume Ratio

KPI's

Time

Capacity

Time

Finance

Time

Time

OnClick – Value display

Human Resources
Equipment
Infrastructure

Appendix J: Operator Schedule Template

	A	B	C
1	1	2	3
2	Start	End	
3	2011	2012.04	
4	Time Slot		Weekday
5	Start	End	Values
6	0	1	1
7	1	2	1
8	2	3	1
9	3	4	1
10	4	5	1
11	5	6	1
12	6	7	1
13	7	8	1
14	8	9	1
15	9	10	1
16	10	11	1
17	11	12	1
18	12	13	1
19	13	14	1
20	14	15	1
21	15	16	1
22	16	17	1
23	17	18	1
24	18	19	1
25	19	20	1
26	20	21	1
27	21	22	1

Figure 38 Operator Schedule Template Hours

	A	B	C	D
1	1	2	3	4
2	Time Slot		Week	
3	Start	End	Full Time	Part Time
4	0	4	340	84
5	4	8	340	84
6	8	12	340	84
7	12	16	340	84
8	16	20	340	84
9	20	24	340	84
10	24	28	340	84
11	28	32	340	84
12	32	36	340	84
13	36	40	340	84
14	40	44	340	84
15	44	48	340	84
16	48	52	340	84
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				

Figure 39 Operator Schedule Template Weeks

Appendix K: Call Volume Template

	A	D	E	F	G	H	I
1							
2							
3				Weekday	MonthStart	MonthEnd	Number
4			1	Monday	2011/01/01	2011/01/31	5
5			2	Tuesday	2011/01/01	2011/01/31	4
6			3	Wednesday	2011/01/01	2011/01/31	4
7			4	Thursday	2011/01/01	2011/01/31	4
8			5	Friday	2011/01/01	2011/01/31	4
9			6	Saturday	2011/01/01	2011/01/31	5
10			7	Sunday	2011/01/01	2011/01/31	5
11	Time Slot			Arrivals			
12				Actual Calls Total			6366
13				Average Calls Total			5966
14				Flaw of Average [%]			6.28
15	WeekDay	Start	End	Ramp	DayToDay	Dolomite	Spah
16	6	0	1	0	0	0	0
17	6	1	2	0	0	0	0
18	6	2	3	0	0	0	0
19	6	3	4	0	0	0	0
20	6	4	5	0	0	0	0
21	6	5	6	0	0	0	0
22	6	6	7	0	0	0	0
23	6	7	8	0	1	0	0
24	6	8	9	2	3	0	0
25	6	9	10	1	1	0	0
26	6	10	11	1	1	0	0
27	6	11	12	1	1	1	0
28	6	12	13	0	1	0	0
29	6	13	14	1	1	1	0
30	6	14	15	1	1	0	0
31	6	15	16	1	1	0	0
32	6	16	17	1	1	1	0
33	6	17	18	1	2	0	0

Figure 40 Sorted Call Volume data

	A	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	S	U	V	W	X	Y	Z	AA
Call Date	Caller ID	Wait Time	Call Time	Hold Time	Position	Day	Date	WeekNr	DayNr	Hour	Minutes	Seconds	Total Minutes	Total Seconds	Call Duration Seconds	Minutes	Seconds	Call Centre	Check	Controls			
1																							
2	01-06-2012 05:07:04	Ramp_Border_Control-	00:00:19	00:02:20	00:00:00	00:00:00	01	2012/06/01	23	5	05	07	04	307	424	140	00	19	Ram	FALSE	RAMP	1792	
3	01-06-2012 06:16:06	RAMP_Lifts-	00:00:04	00:00:15	00:00:00	00:00:00	01	2012/06/01	23	5	06	16	06	376	966	15	00	04	Ram	FALSE	DayToday	4106	
4	01-06-2012 06:42:52	Ramp_Border_Control-	00:00:05	00:02:07	00:00:00	00:00:00	01	2012/06/01	23	5	06	42	52	402	2572	127	00	05	Ram	FALSE	Dolomite	196	
5	01-06-2012 07:08:20	Day_2_Day-	00:00:04	00:02:37	00:00:00	00:00:00	01	2012/06/01	23	5	07	08	20	428	500	157	00	04	Day	FALSE	SPAH	171	
6	01-06-2012 07:13:42	RAMP_Occupied_Lifts-	00:00:05	00:01:05	00:00:00	00:00:00	01	2012/06/01	23	5	07	13	42	433	822	65	00	05	Ram	FALSE	Total	6265	
7	01-06-2012 07:16:09	RAMP_Occupied_Lifts-	00:00:22	00:01:08	00:00:00	00:00:00	01	2012/06/01	23	5	07	16	09	436	969	68	00	22	Ram	FALSE			
8	01-06-2012 07:21:01	RAMP_Occupied_Lifts-	00:00:04	00:02:28	00:00:00	00:00:00	01	2012/06/01	23	5	07	21	01	441	1261	148	00	04	Ram	FALSE			
9	01-06-2012 07:32:10	Day_2_Day-	00:00:04	00:01:13	00:00:00	00:00:00	01	2012/06/01	23	5	07	32	10	452	1930	73	00	04	Day	FALSE			
10	01-06-2012 07:38:38	CorrectionalServices-	00:00:09	00:04:16	00:00:00	00:00:00	01	2012/06/01	23	5	07	38	38	458	2318	256	00	09	Ram	FALSE			
11	01-06-2012 07:38:51	Day_2_Day-	00:00:06	00:01:50	00:00:00	00:00:00	01	2012/06/01	23	5	07	38	51	458	2331	110	00	06	Day	FALSE			
12	01-06-2012 07:43:14	CorrectionalServices-	00:00:24	00:02:57	00:00:00	00:00:00	01	2012/06/01	23	5	07	43	14	463	2594	177	00	24	Ram	FALSE			
13	01-06-2012 07:52:49	Day_2_Day-	00:00:05	00:01:25	00:00:00	00:00:00	01	2012/06/01	23	5	07	52	49	472	3169	85	00	05	Day	FALSE			
14	01-06-2012 07:53:01	CorrectionalServices-	00:00:05	00:00:40	00:00:00	00:00:00	01	2012/06/01	23	5	07	53	01	473	3181	40	00	05	Ram	FALSE			
15	01-06-2012 07:57:35	RAMP_Defence-	00:00:04	00:00:28	00:00:00	00:00:00	01	2012/06/01	23	5	07	57	35	477	3455	28	00	04	Ram	FALSE			
16	01-06-2012 08:01:33	Day_2_Day-	00:00:04	00:01:14	00:00:00	00:00:00	01	2012/06/01	23	5	08	01	33	481	93	74	00	04	Day	FALSE			
17	01-06-2012 08:03:10	Day_2_Day-	00:00:03	00:01:48	00:00:00	00:00:00	01	2012/06/01	23	5	08	03	10	483	190	108	00	03	Day	FALSE			
18	01-06-2012 08:05:17	Day_2_Day-	00:00:25	00:03:17	00:00:00	00:00:00	01	2012/06/01	23	5	08	05	17	485	317	197	00	25	Day	FALSE			
19	01-06-2012 08:09:36	Day_2_Day-	00:00:05	00:02:01	00:00:00	00:00:00	01	2012/06/01	23	5	08	09	36	489	576	121	00	05	Day	FALSE			
20	01-06-2012 08:11:30	SPAH_	00:00:02	00:00:42	00:00:00	00:00:00	01	2012/06/01	23	5	08	11	30	491	690	42	00	02	SPA	FALSE			
21	01-06-2012 08:12:38	Day_2_Day-	00:00:08	00:01:04	00:00:00	00:00:00	01	2012/06/01	23	5	08	12	38	492	758	64	00	08	Day	FALSE			
22	01-06-2012 08:12:45	RAMP_Justice-	00:00:03	00:01:28	00:00:00	00:00:00	01	2012/06/01	23	5	08	12	45	492	765	88	00	03	Ram	FALSE			
23	01-06-2012 08:14:41	CorrectionalServices-	00:00:06	00:01:01	00:00:00	00:00:00	01	2012/06/01	23	5	08	14	41	494	881	61	00	06	Ram	FALSE			
24	01-06-2012 08:18:46	RAMP_Lifts-	00:00:21	00:02:31	00:00:00	00:00:00	01	2012/06/01	23	5	08	18	46	498	1126	151	00	21	Ram	FALSE			
25	01-06-2012 08:20:03	Day_2_Day-	00:00:29	00:02:46	00:00:00	00:00:00	01	2012/06/01	23	5	08	20	03	500	1203	166	00	29	Day	FALSE			
26	01-06-2012 08:21:09	CorrectionalServices-	00:00:32	00:01:26	00:00:00	00:00:00	01	2012/06/01	23	5	08	21	09	501	1269	86	00	32	Ram	FALSE			
27	01-06-2012 08:23:44	SPAH_	00:00:08	00:02:59	00:00:00	00:00:00	01	2012/06/01	23	5	08	23	44	503	1424	239	00	08	SPA	FALSE			
28	01-06-2012 08:25:49	Day_2_Day-	00:00:03	00:01:20	00:00:00	00:00:00	01	2012/06/01	23	5	08	25	49	505	1549	80	00	03	Day	FALSE			
29	01-06-2012 08:27:04	Day_2_Day-	00:00:05	00:01:12	00:00:00	00:00:00	01	2012/06/01	23	5	08	27	04	507	1624	72	00	05	Day	FALSE			
30	01-06-2012 08:30:27	Day_2_Day-	00:00:04	00:00:51	00:00:00	00:00:00	01	2012/06/01	23	5	08	30	27	510	1827	51	00	04	Day	FALSE			
31	01-06-2012 08:34:54	Ramp_Border_Control-	00:00:04	00:02:12	00:00:00	00:00:00	01	2012/06/01	23	5	08	34	54	514	2094	132	00	04	Ram	FALSE			
32	01-06-2012 08:35:48	CorrectionalServices-	00:00:04	00:01:28	00:00:00	00:00:00	01	2012/06/01	23	5	08	35	48	515	2148	88	00	04	Ram	FALSE			

Figure 41 Controls

Appendix L: Customer Satisfaction Survey Questions

Element	Questions
Queue Time	<p>Are you satisfied with the time you wait in the queue when phoning the Contact Centre?</p> <p>How many times do you have to call before you get through to an operator?</p>
Call Duration	<p>Are you satisfied with the speed at which the breakdown, incident or enquiry are being logged?</p>
Attitude	<p>When you spoke to the Contact Centre were they friendly?</p> <p>When you spoke to the Contact Centre were they helpful?</p> <p>Does the Contact Centre return your calls?</p> <p>Can you tell me of a specific incident where you experienced the Contact Centre to be unfriendly and unhelpful?</p>
Accuracy	<p>Do you receive a SMS for every breakdown that you log with the Contact Centre?</p> <p>Do you receive a SMS for every breakdown that was completed and repaired?</p> <p>Has the wrong information ever been sent to you?</p> <p>Does the Contact Centre call you on the same day the breakdown occurs?</p> <p>Do you receive a SMS, Email and or fax in accordance with your preference for every breakdown logged?</p> <p>Is the NBF - Notification of Breakdown Report completed accurately?</p> <p>Is payment certified to the contractor on the basis of the Contact Centre invoice?</p>
Knowledge	<p>Do you think the Contact Centre has the necessary and correct information to address your problems and enquiries?</p> <p>Do you think the Contact Centre personnel are qualified for their task?</p> <p>Do you think the Contact Centre have the necessary knowledge or "know how" to provide you with satisfactory service?</p>
Process	<p>Is there any other information that you would like to receive from the Contact Centre?</p> <p>How often do you require a payment reduction report?</p> <p>Are you satisfied with the functionality of the web-based reporting portal?</p> <p>Would you suggest the Contact Centre to other Consultants?</p> <p>Are you satisfied with the FAIM process that is being followed?</p> <p>Please indicate on a scale of 1 to 4 how satisfied you are with the overall service that the Contact Centre is providing you. A score of 1 indicates total dissatisfaction and 4 indicates total satisfaction?</p> <p>Have we previously conducted a similar interview with you?</p> <p>Would you recommend the Contact Centre to other client departments and consultants?</p> <p>Do you have any further suggestions or comments?</p> <p>Do you know that you can call the Contact Centre 24 hours a day?</p> <p>Do you know that when you report a breakdown that the Contact Centre is supposed to send you a SMS when the problem is fixed?</p> <p>Do you use the Contact Centre to gather information?</p> <p>Are you aware that you must request a payment reduction report from the Contact Centre or generate the report on the reporting portal when you may need them?</p> <p>Are you registered on the Advance Call web-based reporting portal?</p> <p>Are you satisfied with the speed in which Notification of Breakdown Forms-NBF and SMS's are sent?</p> <p>Are you satisfied with the FAIM Payment Reduction and Pending Call reports you receive?</p>

Appendix M: System Dynamics Model

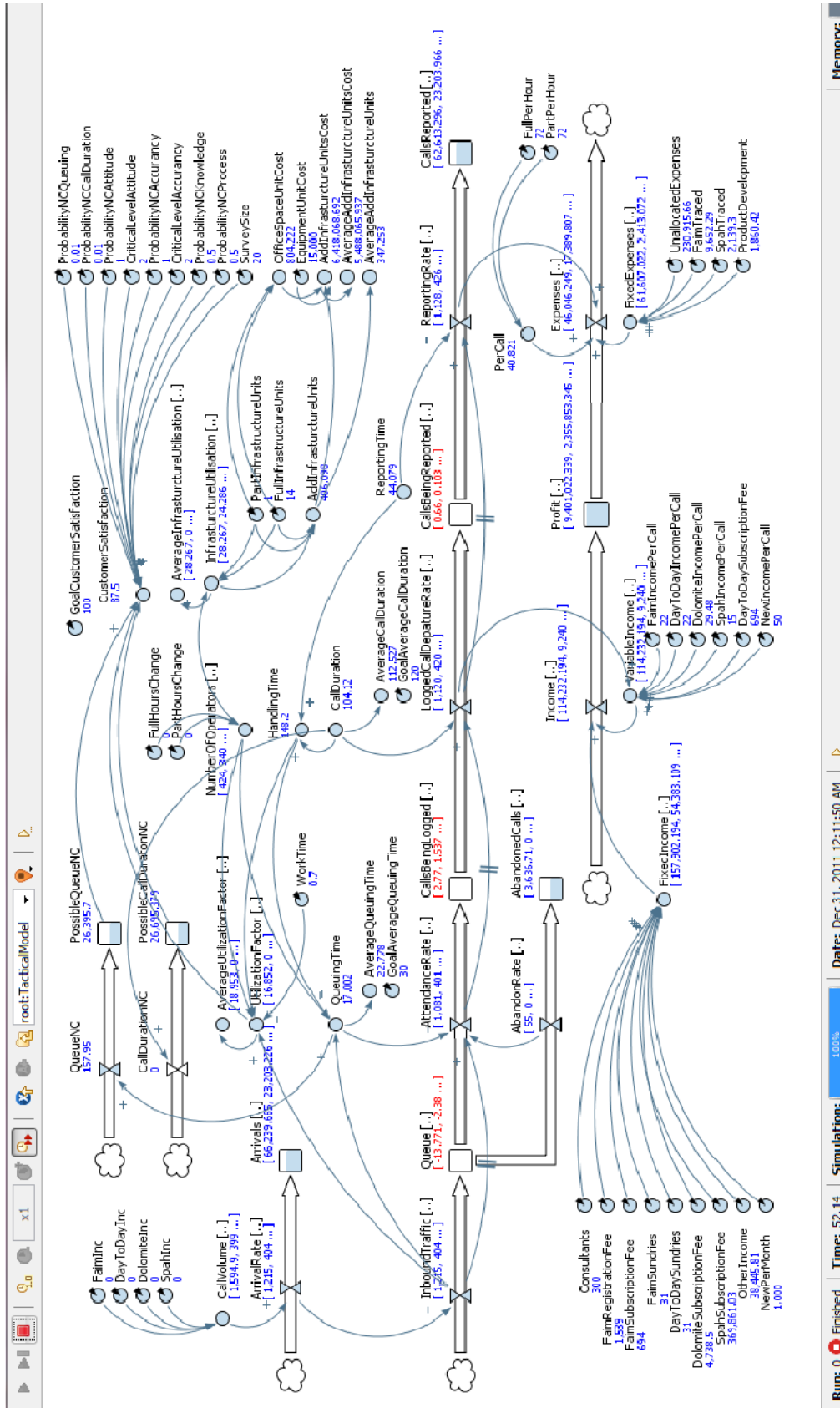


Figure 42 Tactical SD model

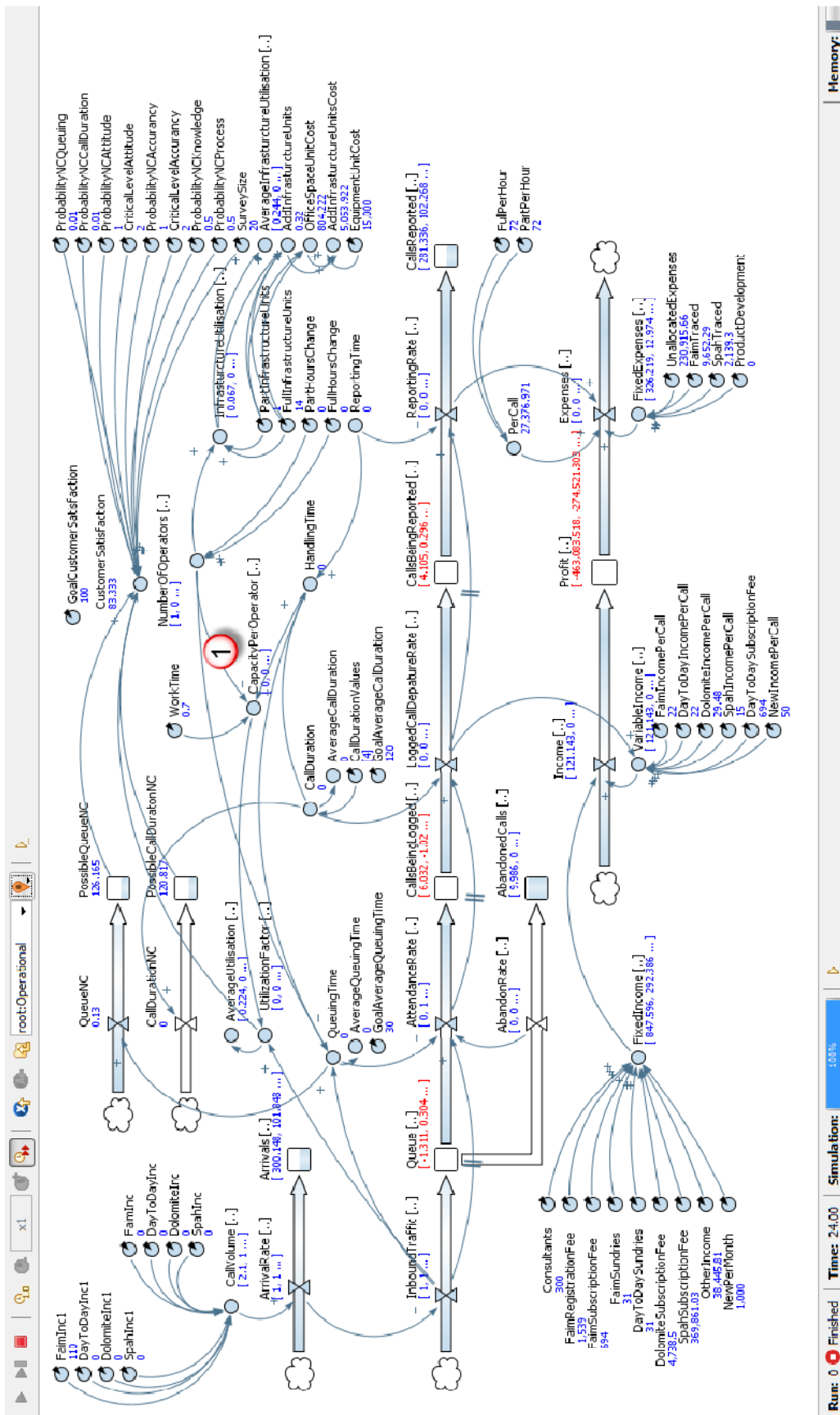


Figure 43 Operational SD model

Appendix N: Operational Setup Page

root:Operational

Operational Planning

setup

Memory: 71M

Start Time

Year	2011
Month	1
Day	3
Hour	0

End Time

Year	2011
Month	1
Day	4
Hour	0

Parameters

Call Volume

Falm	0.0	%
DayToDay	0.0	%
Dolomite	0.0	%
Spah	0.0	%

New Call Centre

Falm	110.0	%
DayToDay	0.0	%
Dolomite	0.0	%
Spah	0.0	%
Income	50.0	R per call
	1000.0	R per month

Operator

Full Time	0.0	operators
Part Time	0.0	operators

Goals

Average Queuing	30.0	seconds
Average Call Duration	120.0	seconds
Customer Satisfaction	100.0	%

Run

Run: 0 Finished

Time: 24.00 Simulation: 100%

Memory: 71M

Appendix O: Financial Component Testing

Tier	Strategic	Start	2011	0	End	2011	12	
Element	Unit	Total	Firm	DayToDay	Dolomite	Spah	New	Unallocated
CallVolume	calls	91748.431	23219.664	46245.176	633.910	2137.730	25511.651	0.000
Actual								
Income	Fixed	160853.700	57334.615	7.750	1184.625	92465.258	250.000	9611.453
	Variable		22.000	121.143	29.480	15.000	50.000	0.000
Expenses	Fixed	61141.918	2413.073	0.000	0.000	514.825	465.105	57728.915
	Variable		31.140	31.140	31.140	31.140	31.140	0.000
Period		52 weeks						
Income	R	15076976.802	3492332.608	4875818.607	80288.167	4840259.340	1288582.550	499795.530
Expenses	R	6036416.505	848540.107	1253234.781	19739.957	94379.812	818618.272	3001503.580
Profit	R	9040560.292	2448692.501	3622583.826	60548.209	4745879.528	469964.278	-2502108.050
Model								
Income	Fixed	160853.700	57334.615	7.750	1184.625	92465.285	250.000	9611.425
Error	%	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Expenses	Fixed	61141.917	2413.072	0.000	0.000	514.825	465.105	57728.915
Error	%	100.000	100.000	0.000	0.000	100.000	100.000	100.000
Period		52 weeks						
Profit	R	8502914.841	2507625.196	3386747.095	56833.497	4733352.430	320465.003	-2502109.480
Error	%	5.947	5.147	6.510	6.135	0.264	31.811	0.000