Innovation Lab DSS for Large Supermarket Chain (LSC)

Contents

1. Executive Summary

The Innovation Lab Decision Support System developed for Large Supermarket chain (LSC) represents a modeling effort designed to help decision-making in managing and helping within the company. Using Stella Architect, this dynamic simulation model captures the lifecycle of the project from the proposals through its completion, integrating key operational and financial dimensions. The model is an essential tool that LSC's management uses to simulate different market situations, resource availability, and strategic priority scenarios that might vary over time. It provides a solid foundation for strategic planning and operational modifications by enabling precise forecasting of project results, resource utilization, and financial consequences. With the help of this documentation of our model, we aim to provide a comprehensive guide for DSS analysts who are familiar with the workings of the systems and Stella architecture dynamics but are new to this specific model. It includes the model's structure, components, logic, and user interface along with the guidelines for modifications, maintenance, and troubleshooting. This ensures that the model is an asset for LSC's ongoing strategic initiatives.

2. Introduction

The purpose of the documentation is to get a detailed understanding of the Innovation Lab Decision Support System created for LSC. This system offers insights into the possible financial and operational effects of different strategic decisions, assisting in the assessment and management of innovation initiatives throughout the organization's operations. The decision support system's design, organization, functional elements, functionality, and user interface are all covered in this documentation. It is meant for DSS analysts who are responsible for expanding, changing, or maintaining the model; it makes sure they can utilize and adjust the system efficiently even if they do not have a detailed understanding of how it was built beforehand.

3. Model Overview

The Stella model's main goal is to offer a dynamic tool that can replicate an innovation project's whole lifespan inside LSC, from the project's original concept to its conclusion or termination. The model considers a variety of aspects, including shifts in staff availability, financial constraints, and strategic goals. This helps predict obstacles and pinpoint possibilities in the process of innovation. The model with the help of each quarter tends to show the forecast for the next 5 years.

4. Model Structure

The model structure comprises of main components. These main components are Stocks, Flows, Convertors, and Information flows.

- **Stocks:** Stocks represent accumulations or quantities of resources, materials, or other measurable elements within a system. They are essentially storage components that hold a quantity that changes over time. So, it stores the projects that are proposed in each quarter, approved by awaiting initiation, which are currently being executed and successfully concluded projects.
- **Flows:** Flows are the representation of the movement of the projects between stocks. This can be inflows or outflows. Inflows are the ones that increase the stock and outflows are the ones that decrease it. The main characteristic of the flow is they can dictate how the projects move between the different stocks and they do the same in the LSC model as well.
- **Convertors:** Converters are influencers who influence the flow and sometimes other converters as well. They can represent policies that can modify system behavior but do not get accumulate over time. Convertors in the LSC model are used to adjust the behavior of flow based on the current state.
- **Information Flows:** Information flows are just lines that carry the information from a stock, convertor, and flow to one another.

With the help of these parameters, the model simulates the process of project proposal generation.

5. Assumptions:

- The budget allocated for the year has been distributed evenly through the four quarters of the year. This budget will increase every year based on the fixed percentage.
- Similarly, the staff allocated for the year needs to be distributed evenly throughout the four quarters. The staff number will increase every year at a fixed percentage rate.
- Projects move linearly in a flow, so thus they go from proposal to approval, followed by ongoing, and finally to completion.
- All the projects have an equal cost and duration.

6. Values and Calculations:

In this section, there are some initial values provided to the DSS analysts, and various equations used to do the projections for profit and calculate it.

- **Proposed Projects:**
  Stock:
  i. The proposed projects are influenced by proposed rate.
  ii. ProposedTrigger * CompletedProjects is added to the number. (projects/quarter)
  (Completed projects are implemented in more than 1 BU at a rate of 2/100 projects)

  Flow:

  i. ProposedRate = (Initial_proposing_rate*business_units)*quarterly growth*seasonal

  Converter:

i. Initial proposing rate = 2.5 projects (average project that are proposed per business unit).
ii. Business units = 6 units
iii. Projects_per_buisness_unit = (Initial proposing rate * business units)
iv. Growth rate = 0.015 per quarter (1.5% projected growth per quarter)
v. Seasonal = seasonal[(TIME-1) MOD 4 + 1]

6.1 Budget:

The innovation lab will be funded with a budget of 12,500,000 Australian dollars, which is planned to grow at a 3% annual rate.

The annual funds will be equally split between the four quarters for innovative projects The budget is different from the full-time personnel expenses.

Converters:

- Initial Budget= 12500000 Australian dollars/year
- Yearly raise = 3% per year
- Yearly raised budget =

```
initial_y_bg

ELSE IF TIME <= 8 THEN

  initial_y_bg*(1+0.03)

ELSE IF TIME <= 12 THEN

  initial_y_bg*(1+0.03)^2

ELSE IF TIME <= 16 THEN

  initial_y_bg*(1+0.03)^3

ELSE IF TIME <= 20 THEN

  initial_y_bg*(1+0.03)^4

ELSE

  0
```

- Budget Per Quarter = Yearly raised budget / 4
  - Budget is evenly distributed over the 4 quarters
- Budget per project = 150k
- Budget constraint = budget_per_quarter / budget_per_project
  - This allows us to determine how many projects can be completed in a quarter with the allotted money.

6.2 Full-Time Staff:

The innovation lab will have 420 employees in the first year. The predicted growth rate for full-time staff is 5.5% each year. For the benefit of this decision analysis, the staff available each year will be evenly allocated among the four quarters.

Converters:

- Initial Y Staff = 420 people per year
- Yearly raise = 5.5% per year
- Rised Yearly Staff =

```
IF TIME <= 4 THEN
  initial_y_staff
ELSE IF TIME <= 8 THEN
  initial_y_staff*(1+0.055)
ELSE IF TIME <= 12 THEN
  initial_y_staff*(1+0.055)^2
ELSE IF TIME <= 16 THEN
  initial_y_staff*(1+0.055)^3
ELSE IF TIME <= 20 THEN
  initial_y_staff*(1+0.055)^4
ELSE
  0
```

- Staff per Quarter = Rised Yearly Staff / 4
- Staff per project = 3.5
- Unavailable Staff = on_going_projects*staff_per_project
- Available Staff = staff_per_quarter-unavailable_staff

The average cost of completing a project (from approval to completion) is around $150,000 Australian dollars. Each project will receive an average of 3.5 full-time people.

- Budget Per Project = 150,000 Australian dollars/project
- Staff Per Project= 3.5 people/project

- Using the budget and full-time staff numbers, we determine the minimal number of projects that can be granted for the quarter.
-
- Projects Per Quarter = MIN(bud_constraint, resource_constraint)
- Budget constraint= budget_per_quarter/budget_per_project
- Staff constraint = available_staff/staff_per_project

This will allow us to compare the ProjectsPerQuarter with the number of ProposedProjects and approve the project while staying within the limitations.

Approval Rate = MIN(approved_rate_per_qu,proposed_project)

- **Approved Projects:**

  Stock:

  i. Approved projects depend on the flow of projects through the approval rate.

  Flow:

  i. approval rate = MIN(approved_rate_per_qu,proposed_project)

  Converter:

- **Ongoing Projects:**

  Stock:

  i. On going projects depend on the flow of projects through progress rate.

Flow:

i. On going rate = Approved_projects - (Approved_projects*cancelling_rate)

Converter:

i. Cancellation percent = 1%
ii. Cancelling rate = cancellation_percent/100

- **Completed Projects:**

Stock:

i. Completed projects depend on the flow of projects through the completion rate

Flow:

i. Completion rate = (on_going_projects - (on_going_projects*suspended_rate))

Converter:

i. project replication = completion_rate*0.02
ii. new project proposals = completion_rate*0.01
iii. suspended rate = sunspension_percent/100
iv. suspension percent = 5%

6.3 Profit:

Converters:

- Cost of Projects = (completed_projects*budget_per_project)
- BudgetRemaining= CapitalBudgetPerQuarter-ApprovedProjectsBudget
- annual Staff Salary=AUD 100,000
- Salary of staff per quarter = annual_staff_salary/4
- Duration of Project = 1.5 quarters
- Total Cost of Staff = staff_per_project*completed_projects*salary_of_staff_per_quarter*duration_of_project
- Total Cost = cost_of_staff+cost_of_projects
- Revenue per project = 850000 AUD
- Total Revenue = completed_projects*rev_per_project
- Profit = total_revenue-total_cost

7. Working of the model.

The main inputs to the model are allocated staff and budget, and projects which are proposed initially. These inputs that we give in the model have several constraints affecting them. They can be described as several projects are affected due to the seasonal effects and projects will be only accepted if they have enough budget and personnel. The maximum number of projects that may be completed in a quarter is determined using a quarterly budget and the staff available. The projects that were not approved or those that had more value than the budget have been kept in the lost project's portfolio. Similarly, the projects that were approved but canceled and ongoing projects that were suspended have been kept in the canceled projects and suspended projects portfolio. The total income from the projects per quarter has been determined using the number of completed projects each quarter. On the other hand, authorized projects and quarterly employee pay were used to determine the overall cost of the projects each quarter. The profit/loss that the LSC Innovation Lab will record each quarter is further calculated using these total expenses and income.

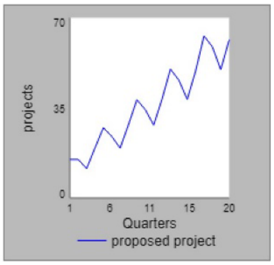
8. Interface and Visualization

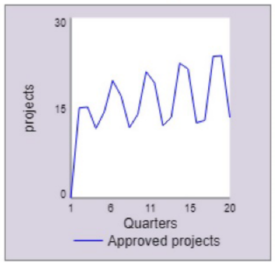
The model provides us with an interface so that the analyst can visualize the flow of projects and all its characteristics. It enables the analysts to explore the different scenarios. These visuals can help the analyst to analyze and make decisions on projects and its profits for the next 5 years, i.e. 20 quarters.

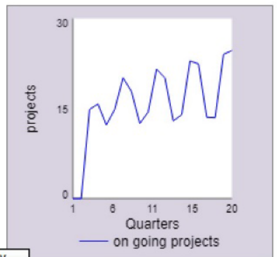
LSC SIMULATION

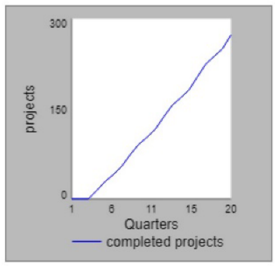
Projects Forecast

run stop









	proposed project	Approved projects	on going projects	completed projects
3	19.5	11.6	15.7	14
4	27.3	14.4	12.2	29
5	23.9	19.6	14.8	40
6	19.4	17	20.1	54
7	28.5	11.7	17.8	73
8	38.2	13.9	12.5	90
9	34.3	21	14.4	[illegible]
10	28.3	19.2	21.5	[illegible]
11	38.5	12	20.1	[illegible]
12	50.1	13.4	12.9	[illegible]
13	45.8	22.4	14	[illegible]
14	38.3	21.5	22.9	[illegible]
15	49.3	12.5	22.4	[illegible]
16	63	12.9	13.5	[illegible]
17	58.7	23.6	13.5	[illegible]
18	49.9	23.7	24	[illegible]
19	61.5	13.4	24.6	[illegible]

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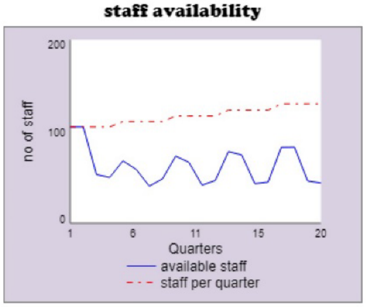
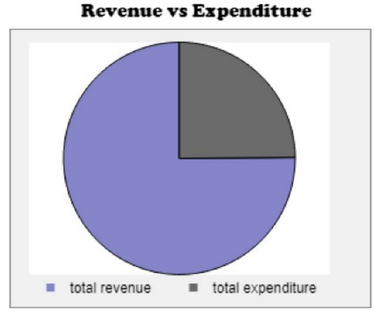
LSC SIMULATION

staff availability

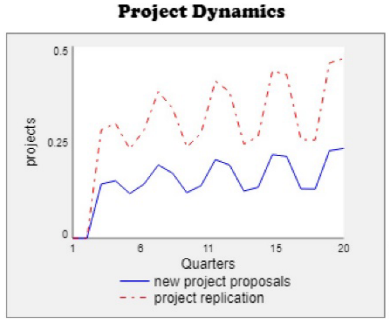


run stop

Revenue vs Expenditure



Project Dynamics



You can change Values here

Percentage of approved projects cancelled before starting 1

You can change Values here

percent of ongoing projects suspended before completion 5

This Graph shows New project proposals and replication of completed projects in different business units over time

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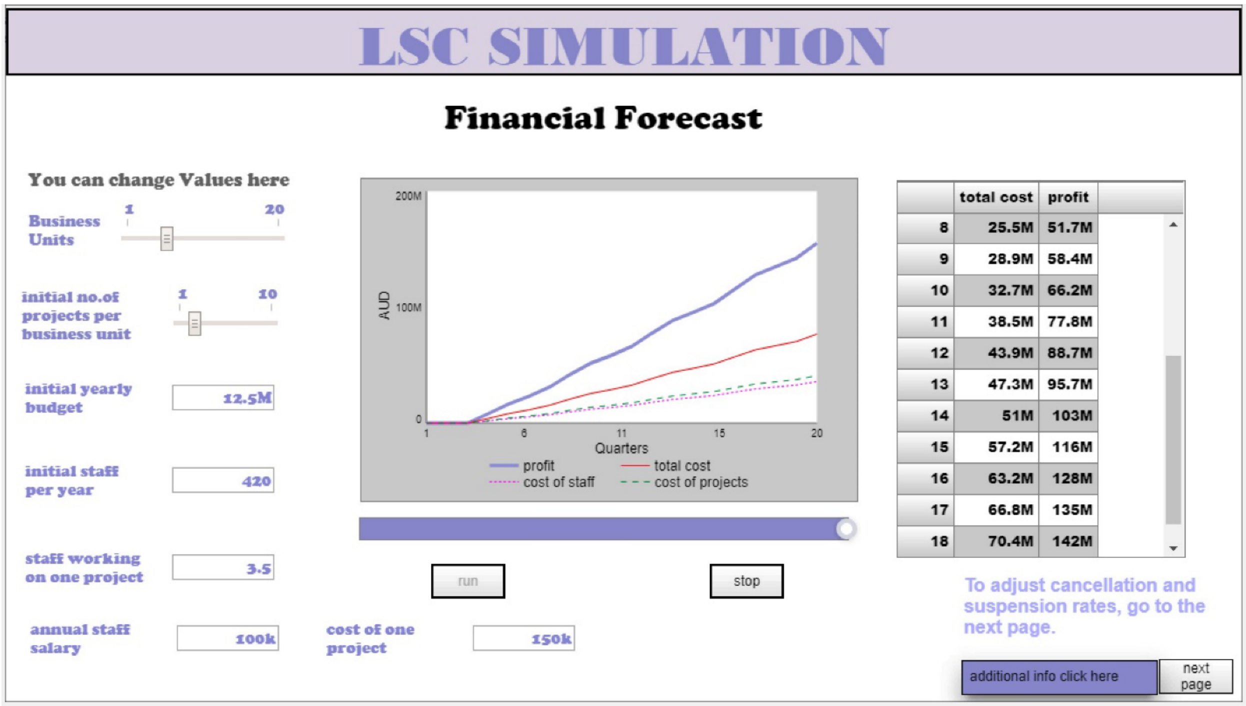

9. Conclusion:

A powerful tool for managing the lifecycle of innovation projects, the Innovation Lab Decision Support System created for LSC closely complies with strategic objectives to maximize resource utilization and improve decision-making. This approach allows scenario-based planning to anticipate the results of strategic decisions, in addition to assisting in the identification and resolution of resource bottlenecks before they affect project timelines. Because of its adaptability, it will continue to be useful as LSC's demands change, which makes it a priceless tool for building a robust innovation pipeline and enhancing the business's overall financial performance. LSC may continue to have a competitive advantage in the grocery sector by updating and modifying the model often to account for shifting internal dynamics and external market situations.

10. References:

Tutorials. (n.d.). Www.iseesystems.com.

https://www.iseesystems.com/resources/tutorials/