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Departamento de Economía, Administración y Mercadología
Especialidad en Gestión de la Cadena de Suministro

ANALYZING THE IMPACT OF EXCESS INVENTORY OF CALIFORNIA GLAM TO CONTROL THE INVENTORIES OF DISTRIBUTORS BY INTEGRATING PRODUCT AND DISTRIBUTOR SEGMENTATION CONCEPT IN THE SUPPLY CHAIN

TRABAJO RECEPCIONAL que para obtener el GRADO de
ESPECIALISTA EN GESTIÓN DE LA CADENA DE SUMINISTRO

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Index of contents

Introduction

Chapter 1 - Problem, objectives and intervention methodology

1.1 Description of the scenario: company, area of the company, process

1.2 Description of the context of the company and the industry

1.3 Perceived problem and foundation. Problem and its cause

1.4 Validation of project conditions and change: time required, sponsorship, willingness to change, type of problem to address

1.5 Delimitation of the area (s) to be intervened

1.6 Purposes of the intervention and / or consultancy and its relevance

Chapter 2 - Conceptual or reference framework

Chapter 3 - Process of intervention

Chapter 4 – Exhibition of Findings

Chapter 5 - Conclusions and recommendations

References and sources of information

Annexes

Chapter 1

Problem, objectives and intervention methodology

Introduction

The main purpose of this Degree Obtaining Work (DOW) is to document the methodology, objectives, application process and results analysis of an organizational intervention for the supply chain of a new born beauty and cosmetics company California Glam which is emerging as a key player in Beauty and Cosmetic space in Mexico.

1.1. Description of the scenario: company, area of the company, process

California Glam is a beauty and cosmetics company entered into the Mexican market since January 2018. They offer multi-action hair products offering high quality ingredients & performance for hair. Their Epic PPD FREE Italian professional hair color is made with 3 certified organic active ingredients. GlossX hair color line is made with Certified Organic Coconut Oil & our breakthrough ingredient GlossX. Both color lines offer the best color technology in a PPD Free and traditional PPD color formulations. Both hair color lines offer incredible performance, coverage & shine.

California Glam just started their operations and their primary business is by importing the key product variants from their supplier from Italy. They are highly conscious about their quality of the product. Their key business strategy is to expand their distributors network and want to be a good supplier for these distributors who are into the hair and cosmetics space.

1.2. Description of the context of the company and the industry

California glam tried to have this product imported from ITALY and craft in Mexico. The key decision to be dependent on a Supplier out of Mexico was to not compromise on the quality of the product. California Glam's key intention was to get this product value to the Mexico market for its prestige along with an outstanding quality. The import quality standard of the active components of Gloss X (Natural Cocoa, Keratin etc.) has 35% of Quality Quotient difference in Mexico and Italy. This is the reason that California Glam wanted to keep the active and key product imported from Italy and not sourcing the operations locally.

Composed of 97 splendid reflections nuanced through to a unique formulation called Gloss X that guarantees a deep penetration of the color molecules for a uniform application from the root to the tip, its component of Organic Coconut Oil is rich in Lauric Acid which Brightens and prevents the wear of the capillary structure.

1.3. Perceived problem and foundation. Problem and its cause

Initial discussions with the key stakeholders of California glam we have come to know that they do not have any ERP system or an ordered supply chain management process. The company does not want to invest on any ERP system now however there are other problems related to their product variants inventory. Further discussing with them we have come to know that they have irregular demand pattern of the products and for few product variants they have overstock and few product variants they have stock outs. Now they were really trying to churn the inventory in a way so that they can balance the product variants in a way to have a smooth flow of their supply always to the distributor. Company was looking out in a random way to solve their inventory problem.

The buying conditions from the supplier are not so flexible which puts California Glam to place orders with quantity restrictions and they order the product variants without any demand strategy and piles up inventory for few product variants which leads to excess inventory and affects the cash flow of the company. In addition to the discussions we also found that the distributor demand was irregular and California Glam did not had a fixed strategy to find a way to optimize inventory.

In addition to the above, company is struggling to build their distributor network to expand religiously in Mexico and increase the sales to rise revenue and cut down operating expenses.

1.4. Validation of project conditions and change: time required, sponsorship, willingness to change, type of problem to address.

The outcomes of discussion with key stakeholders were directed to make them aware about a better inventory management plan. A sense of urgency was made to the stakeholders because of the accumulated stock in their warehouse. The tentative time required to manage or resolve inventory problems would take from 20 days to maximum of 35 days to have an initial stability in the supply chain. Focus of the discussion was to aware the organization to optimize the inventory and build a better supply chain.

Stakeholders were positive towards applying the supply chain improvements as it is going to benefit them with less investment.

1.5. Delimitation of the area (s) to be intervened

The objective was to diagnose and identify the improvements that can optimize the supply chain of California Glam, adhering to find a way to forecast better and find ways to reduce the inventory using reorder functions while maintaining predefined service level as the form of stock availability. We got a holistic view of the supply chain but our focus is only on Inventory Management.

1.6. Purposes of the intervention and / or consultancy and its relevance

The diagnosis made by studying the current California Glam are mainly to improve the supply chain by analyzing the impact of excess inventory and help with a strategy that can help California Glam to reorder products by reducing excess inventory and enable cost savings. Also, to help with an annual demand pattern to support their needs meticulously without any supply disruption. There have been few complexities noted as per the initial supply chain diagnosis is the complexity of product variations leaving an unpredictable instance to find the right demand pattern not ending up with over inventory and losses.

The plan to start the intervention by segmenting the top products and distributors based on ABC Analysis and find the reorder points based on demand using some exponential smoothening concepts. Methodology will be based on inventory management techniques, in which the areas of focus will be on Reorder Point, Reorder Level, Maximum and Minimum Level and Average Level for the fast-moving products based on replenishment time and consumption.

Based on the information obtained, the current problem statements of the company California Glam, Mexico operation are as below:

Problem statement

- Segment the products and distributors based on demand
- To analyze the impact of excess inventory to control the inventories of distributors

Planned analysis as a part of this study is highly significant and rich with diversity in terms of conception, actualization, optimization and overall efficiency.

The intervention was carried out by the authors of this work together with the work team of the company California Glam.

Chapter 2

Conceptual or reference framework

This part of the paper specifies about the literature reviewed while analyzing the subjected case. The section commences with the overview of the approach and framework used, followed by description of data collection and analysis.


2.1. Diagnosis. Logical Framework Matrix. The problem and its causes.

Before we discuss in detail about our intervention, we want to connect to the reference supply chain decision frameworks, key drivers which would help us streamline the supply chain value in the right way.

In literature, many definitions of supply chain management are proposed Cooper et al defined it as "a key management, integrated business processes from original suppliers to ultimate user, that provides products, associates services, and information that creates additional value for customers and other stakeholders." More recently, the Council of Supply Chain Management (Bian, 2017)

In this study, the approach corresponds to these ideas of a case study, with high inventory value being the contemporary phenomenon in the case company, on which the researcher conducted investigation and decided on the ways to reduce inventory, planed implementation and illustrated the expected results. In this study, the approach supports combination of qualitative and elements of numerical calculations.

Supply Chain Decision Framework
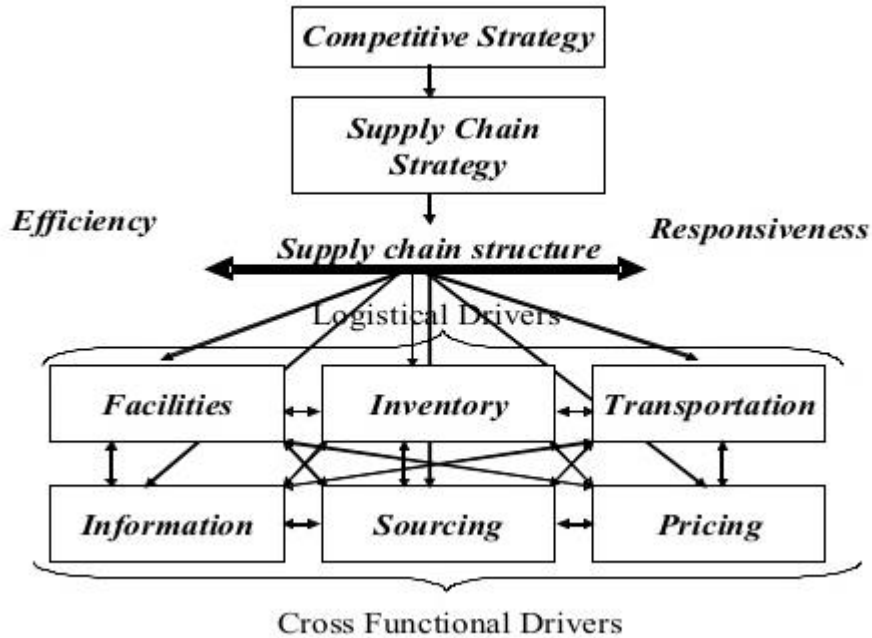
Source: Chopda and Meidl(Pearson Prentice Hall Edition)
Figure 1: Supply Chain Decision Framework

Supply chain robustness is achieved or influenced by the decisions we make. To take better decisions for our supply chain we should look for the drivers which can be managed meticulously. Each of these drivers can be developed and managed to emphasize **responsiveness** or **efficiency** depending on changing business requirements.

As deeply we investigate a supply chain works, we find about the demands it faces and the capabilities it needs to be successful. We have to optimize or tweak the supply chain drivers for supply chain capability

The five drivers provide a useful framework for thinking about supply chain capabilities. Decisions made about how each driver operates will determine the blend of responsiveness and efficiency a supply chain is capable of achieving. The five drivers are illustrated in the diagram below:
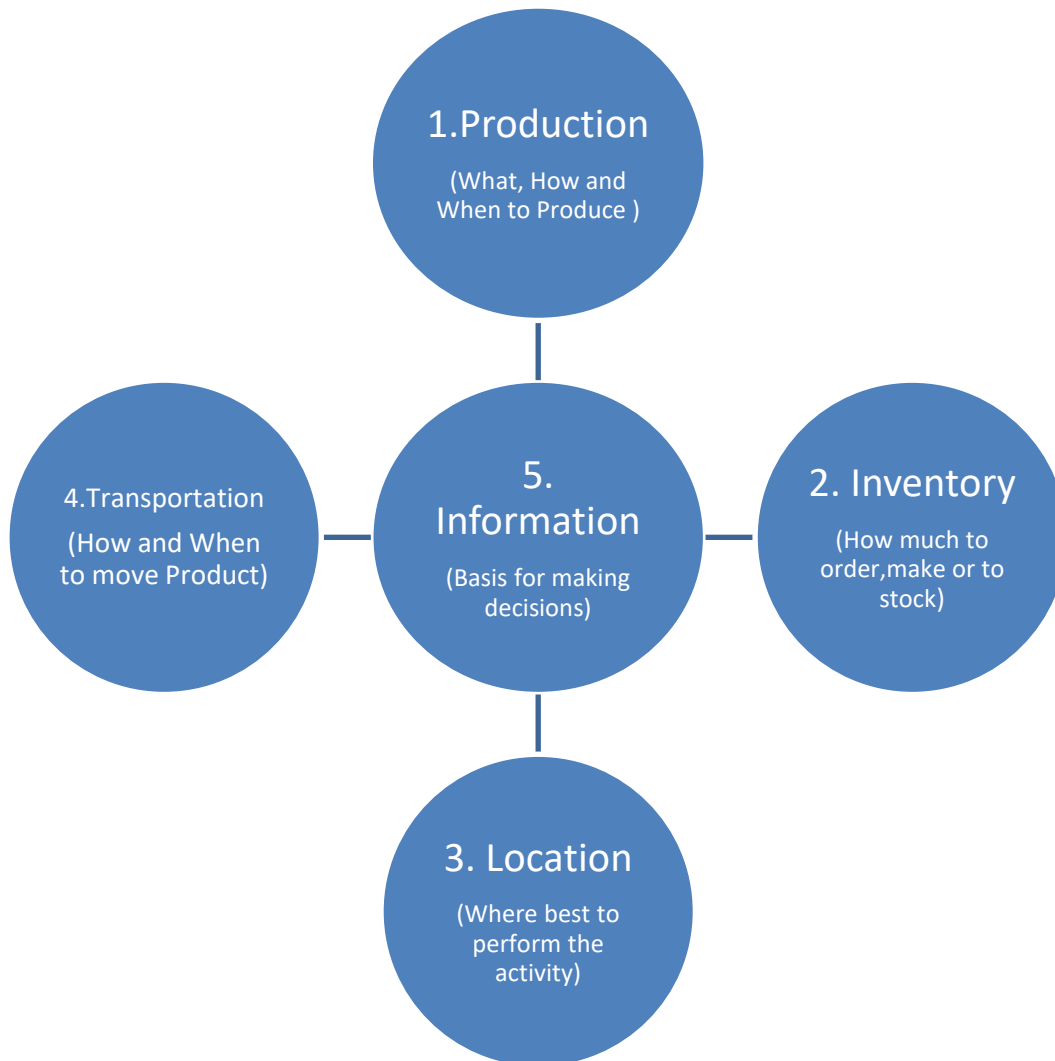
Source: Self Prepared for California Glam Intervention
Figure 2: Supply Chain Drivers help drive decisions

2.2.1. State of the question: terms, theoretical approaches, methodologies and studies related to the problem.

Theoretical Concepts

In this intervention we have taken the below mentioned references and concepts to analyze and come up with better inventory management plan.
ABC Analysis

An inventory management technique that is used to categorize a large number of products into predefined categories. Inventory review system or policy is assigned to different categories based on ABC categorization or classification.

The reason for selecting ABC analysis was to find those products which are high runners and can matter to California glam to help in decision making or for a valuable analysis

Continuous review system

It is also known as fixed point reorder system. A replenishment order is placed at a specific stock level. Inventory management A key element of logistics and supply chain management. (Zhang, 2017)

Inventory Management

Inventory management decides on when to order, how much to order and how much stock to maintain. (Zhang, 2017)

Inventory review system Knows also as inventory review policy or inventory control system, is a way of tracking inventories. Periodic and continuous reviews are the two main methods.

Holt's Liner Method

(Martinez, 2018) recommended to use exponential smoothening when we want to adjust our forecasts with limited amount of data and we don't have any trend and variable demand. Also, Exponential smoothening techniques allow us to smoothen our forecast with single (alpha), double (Alpha & Beta) and triple variables.

A technique for smoothing time series data using the exponential function. It is easily applied procedure for making some determination based on prior assumption. In our case we have used last six months sales data for analysis of time-series data.

The raw data sequence is n represented by $\{X_t\}$ beginning at time t=0, and the output of the exponential smoothing algorithm is written as $\{S_t\}$ it regarded as a best estimate of what the next value of 'X' will be. When the sequence of observations begins at time (t).

The simplest form of exponential smoothing is given by the formula: where α is the smoothing factor, and $0 < \alpha < 1$. In other words, the smoothed statistic s(t) a simple weighted average of the current observation x(t) and the previous smoothed statistic s(t−1).

$$s_0 = x_0$$
$$s_t = \alpha x_t + (1 - \alpha)s_{t-1}, \ t > 0$$

Holt's linear method is also known as exponential smoothening. The reason we selected method was to analyze better because we had limited data the of California Glam only for last six months as the company is new. Exponential smoothening gives us the flexibility to adjust the dynamic variables which could be single, double and triple. We call them as smoothening factors alpha, beta.

We have selected double smoothening method to have a variable control on to adjust our alpha and beta values based on forecasting suppose we want to readjust our forecast based on error percentage by checking actual versus forecasted values for the forecasted period.

Unlike other forecasting method why Holt's linear method suits us for our intervention is because it gives more weight or preference in forecast to the most recent data and also we don't have too much data(only six months) , other forecasting methods like weighted model or average weighted model follows a modular approach as in giving equal weights to all the intervals and we can land up into more error rates on our forecast if we have less or limited data.

The concepts discussed above helps us in exploring the current inventory management of California Glam and find ways to control the inventories for distributors.

2.2.2. Development of concepts and theoretical / practical approaches that define the problem.

(Cervantes, 2019) suggested to use the supply chain canvas to draw the objective function and to analyze the end to end California functions using a canvas which was very useful us to summarize our work streams and was fruitful.

About California Glam	Key Activities	Value Proposition	Problems Analyzed	Frameworks Used and How
Beauty and Cosmetics Company Single Supplier is from Italy Hair Gloss X products	Selling the Gloss X Products Using Distributor Network for Selling Products Supply Suppliments along with Main Products	Natural Hair Products 0% Chemical Components 97 Color Streams (Hair Dyes)	Irregular Demand of Products Variable Sales Excess Inventory No Systems No Established Supply Chain Process Adequate Supply Chain	Value Stream Mapping Segment the Products Use ABC Better Forecast using Holts Linear Demand Make a Inventory Management Plan
	Key Resources Distributor Network		Scope of Problem Explore Inventory Determine Inventory to Control based on Distributor Demand	

Solution and Strategy	Results and Recommendation
Inventory Exploration of all 97 products ABC analysis using last 6 months of Sales Data Targeted Top 23 Products for Analysis Identify Reorder Point , Minumum , Maximum and Optimized Inventory for Top Products Implement Traffic Light for better Decision Making	Inventory Management Plan for California Glam 74% Excess Inventory 26% Inventory is Only Needed for Full Fledged Operations Renegotiate Strategy for Ordering B and C Items using EOQ **Recommendations** 3PL, VMI, Stock Inventory Based on Annual Consumption and Forecast Look for Multiple Suppiers

Figure 3. Supply Chain Canvas
Source: Self Prepared for California Glam Intervention

Intervention has been focused on the two parts.

First part focuses on the flow of California Glams current Inventory. Here we would try to understand their products variable demand by distributors.

Second part will focus more towards analyzing the impact of excess inventory of California Glam and explore more to control inventory limits for the top products based on their Sales Data.

At Tactical Level

As per the study by us for California Glam is to find tactically the good way to find relationship between the key products and predictions which are on high demand and follow segmentation approach to do forecasting.

For California Glam, product-segmentation activities are critical to tailoring supply chain operations to contribute the most value. Segmentation activities are based on many factors and criteria. Finding the coefficients of fast-moving products based on historic sales data and use an ABC model to set priorities for managing the inventory to keep which items and which not.

2.2.3. Characterization of the analytical, technological or innovation tools considered in the work

Value Stream Mapping Way – It is a lean way of visualizing the work processes and look for any delays or wastes in the entire supply chain. Analyzing all the elements of each processing units and improve based on situation or scenarios. The scenarios could be based on the key drivers and find opportunities of improvements of procure.
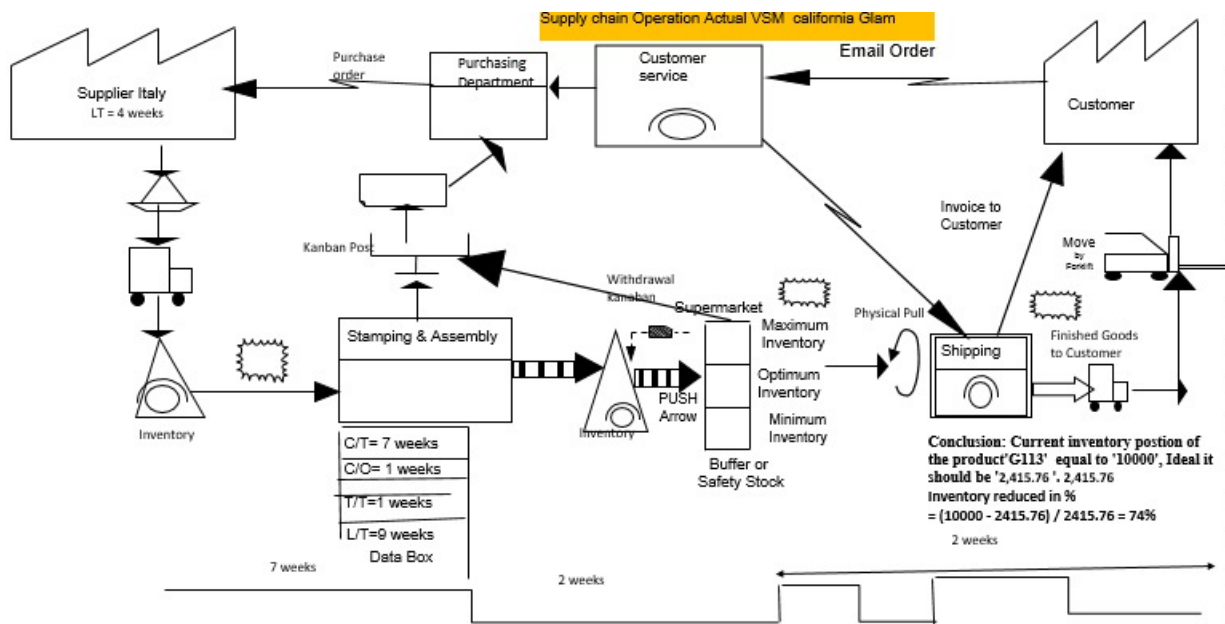
Figure 3. Actual Value Stream Mapping for California Glam
Source: Self Prepared for California Glam Intervention

2.2.4. Identification, description and quantification of initial metrics

The initial intervention using a value stream mapping to understand the current process of California Glam We find the total the lead time of 11 weeks, also if we study deeply about the order time internal processing is 3 weeks. All these facts direct us to convince that there could be serious improvement in terms of reducing the lead time, make an inventory management plan.

Exploring the current inventory of California Glam Since January 2019. The study finds that there have been reasonable variations on the sales and demand by the distributiors. Further pondering the same it becomes more difficult for the company like California Glam which just started its operations with so many product variants.

Having a look at the metrics, the key focus as a part of this study was on Inventory Management and Analyzing ways to control it for distributors.

Initial Metrics or driving factors were Inventory, Lead Time and Product Segmentation

Inventory Analysis

First step was to look up the Sales, Consumption and Actual Inventory of California Glam in last 6 months starting January 2019.Eye opening facts were that they had 97 products and variable demand with excess inventory for many products

For a matter of fact for our intervention

Lead Time

Using Value Stream Mapping We found that over all process of California Supply Chain from Placing an Order to its supplier present in Italy and bringing the product to warehouse present in Guadalajara takes 11 weeks.

Product Segmentation

We could try to streamline the products based on distributor demand and look for finding some insights which can help for a better inventory management plan

Chapter 3

Process of Intervention

3.1 Intervention approach and presenting the problem

The process of intervention for California Glam is to find the key inventory management drivers of the supply chain which could have the maximum impact on the flow of operations and help us draw strategies to control the inventories and find inventory boundaries to operate flexibly.

As per the understanding or brief explanation of the problem of California Glam is having excess inventory of few products and stock outs of few products.

Clearly understanding the drivers and possibilities to defined decision-making responsibilities and tactical level.

Having a look at current inventory management of California Glam

Product Code	Product Description	January (Qty)	February (Qty)	March (Qty)	April (Qty)	May (Qty)	June (Qty)	Product Code	Product Description	January (Qty)	February (Qty)	March (Qty)	April (Qty)	May (Qty)	June (Qty)
G1	NEGRO 1	24.00	20.00	24.00	51.00	36.00	24.00	G19	CASTAÑO CLARO NATURAL CENIZO 5.01	6.00	2.00	1.00	8.00	6.00	4.00
G10	RUBIO PLATINADO NATURAL 10	6.00	5.00	6.00	9.00	4.00	7.00	G2	MORENO 2	4.00	1.00	7.00	31.00	9.00	12.00
G100	PERÓXIDO VOL. 7 CALIGLAM (Botella 1000ml)	10.00	2.00	12.00	1.00	39.00	20.00	G20	RUBIO OSCURO NATURAL CENIZO 6.01	12.00	2.00	13.00	39.00	15.00	4.00
G102	PERÓXIDO VOL. 20 CALIGLAM (Botella 1000ml)	36.00	22.00	52.00	11.00	111.00	30.00	G21	RUBIO NATURAL CENIZO 7.01	62.00	20.00	6.00	19.00	25.00	6.00
G103	PERÓXIDO VOL. 30 CALIGLAM (Botella 1000ml)	10.00	70.00	78.00	72.00	77.00	61.00	G22	RUBIO CLARO NAT. CENIZO 8.01	53.00	25.00	34.00	3.00	30.00	5.00
G104	PERÓXIDO VOL. 40 CALIGLAM (Botella 1000ml)	2.00	9.00	39.00	12.00	4.00	47.00	G23	RUBIO CLARISIMO NAT. CENIZO 9.01	24.00	2.00	57.00	3.00	15.00	21.00
G105	TAZON PARA TINTE	2.00	16.00	2.00	3.00	23.00	5.00	G24	RUBIO PLATINADO NAT. CENIZO 10.01	12.00	7.00	56.00	12.00	11.00	33.00
G106	BROCHA PARA TINTE	2.00	24.00	53.00	17.00	43.00	17.00	G25	RUBIO OSCURO MATE 6.7	2.00	3.00	13.00	3.00	9.00	17.00
G107	CAPA 7A CORTE	1.00	5.00	53.00	17.00	13.00	32.00	G26	RUBIO MATE 7.7	9.00	6.00	7.00	3.00	6.00	6.00
G108	CAPA 18A TINTE	1.00	4.00	2.00	1.00	13.00	18.00	G27	RUBIO CLARO MATE 8.7	9.00	4.00	3.00	20.00	15.00	5.00
G109	TEMPORIZADOR	2.00	13.00	52.00	3.00	16.00	19.00	G28	RUBIO CLARISIMO MATE 9.7	3.00	3.00	13.00	2.00	5.00	4.00
G11	CASTAÑO EXTRA INTENSO 4.000	7.00	18.00	23.00	17.00	12.00	7.00	G29	CASTAÑO CALIDO /SABANA 4.003	5.00	7.00	13.00	3.00	3.00	21.00
G110	BATIDOR	2.00	23.00	19.00	1.00	23.00	3.00	G3	CASTAÑO OSCURO 3	5.00	10.00	6.00	2.00	2.00	6.00
G111	BASCULA	1.00	5.00	53.00	6.00	18.00	22.00	G30	CASTAÑO CLARO CALIDO/ SABANA 5.003	4.00	3.00	6.00	1.00	25.00	4.00
G113	'13 In 1 California Glam	356.00	7.00	23.00	38.00	14.00	6.00	G31	RUBIO OSCURO CALIDO NATURAL/ SABAI	5.00	3.00	6.00	6.00	4.00	9.00
G12	CASTAÑO CLARO EXTRA INTENSO 5.000	22.00	640.00	55.00	85.00	1,958.00	21.00	G34	CASTAÑO CLARO NATURAL CALIDO 5.03	3.00	3.00	9.00	3.00	6.00	4.00
G13	RUBIO OSCURO EXTRA INTENSO 6.000	124.00	39.00	598.00	61.00	22.00	1,131.00	G35	RUBIO OSCURO NATURAL CALIDO 6.03	10.00	3.00	9.00	3.00	2.00	4.00
G14	RUBIO EXTRA INTENSO 7.000	82.00	473.00	40.00	59.00	76.00	92.00	G36	RUBIO NATURAL CALIDO 7.03	14.00	5.00	1.00	3.00	1.00	1.00
G15	RUBIO CLARO EXTRA INTENSO 8.000	9.00	447.00	48.00	18.00	48.00	14.00	G37	RUBIO OSCURO CENIZO INTENSO 6.111	9.00	2.00	10.00	10.00	31.00	3.00
G16	RUBIO CLARISIMO EXTRA INTENSO 9.000	9.00	12.00	68.00	2.00	21.00	40.00	G38	RUBIO CENIZO INTENSO 7.111	3.00	1.00	6.00	4.00	51.00	38.00
G17	NEGRO AZUL 1.1	12.00	5.00	40.00	7.00	21.00	41.00	G4	CASTAÑO 4	5.00	1.00	8.00	5.00	46.00	25.00
G18	CASTAÑO NATURAL CENIZO 4.01	3.00	7.00	28.00	13.00	16.00	6.00	G41	VIOLETA CENIZO RUBIO CLARISIMO 9.12	8.00	10.00	8.00	3.00	31.00	25.00
								G42	VIOLETA CENIZO RUBIO PLATINO 10.12	13.00	3.00	18.00	6.00	51.00	11.00

JANUARY | FEB | MARCH | APRIL | MAY | JUNE | INVENTARIO | **Sales Data Jan - June** | (+)

Figure 4 – Inventory Data from Jan to June of California Glam
Source – Purchasing Department of California Glam

3.1.1 Inventory Introspection

Looking at the current inventory we need to come up with a strategy to prioritize the products which matters for California Glam.

For California Glam, product-segmentation activities are critical to tailoring supply chain operations to contribute the most value. Segmentation activities are based on many factors and criteria. Finding the coefficients of fast-moving products based on historic sales data and use a ABC model to set priorities to enable an intelligent ordering strategy.

We have found 23 products with positive sales in last 6 months and are planning to do ABC analysis for those products.

Product Code	Tone	Product Description	$ Sales Price(unit cost)	January	February	March	April	May	June
G113	13en1	13 EN 1 CALIGLAM (Botella 250ml)	72.84	356	640	598	0	1958	1131
G13	6.000	RUBIO OSCURO EXTRA INTENSO	43.09482759	124	473	48	85	76	40
G14	7.000	RUBIO EXTRA INTENSO	43.09482759	82	447	68	61	48	41
G98	DECO	DECOLORANTE CALIGLAM (Bolsa 500grs	159.4827586	3	19	0	38	18	93
G114	GAMA MECHAS	GAMA MECHAS CALIGLAM	257.7586207	0	0	0	0	0	92
G102	VOL 20	PÓXIDO VOL. 20 CALIGLAM (Botella 1000	44.81896552	36	70	78	72	111	61
G108	CAPA TINTE	CAPA TINTE CALIGLAM	128.4482759	1	4	52	0	13	19
G21	7.01	RUBIO NATURAL CENIZO	43.09482759	62	20	57	39	30	33
G6	6	RUBIO OSCURO	43.09482759	47	33	25	31	33	33
G103	VOL 30	PÓXIDO VOL. 30 CALIGLAM (Botella 1000	44.81896552	10	9	39	12	77	47
G22	8.01	RUBIO CLARO NAT. CENIZO	43.09482759	53	25	56	19	15	17
G7	7	RUBIO	43.09482759	37	21	19	34	39	35
G1	1	NEGRO	43.09482759	24	20	24	51	36	24
G12	5.000	CASTAÑO CLARO EXTRA INTENSO	43.09482759	22	39	40	38	22	14
G111	BASCULA	BÁSCULA CALIGLAM	137.0689655	1	5	23	1	18	6
G101	VOL 10	PÓXIDO VOL. 10 CALIGLAM (Botella 1000	44.81896552	0	22	52	11	39	30
G5	5	CASTAÑO CLARO	43.09482759	32	30	16	12	41	24
G15	8.000	RUBIO CLARO EXTRA INTENSO	43.09482759	9	12	40	59	21	6
G20	6.01	RUBIO OSCURO NATURAL CENIZO	43.09482759	12	2	34	31	25	21
G112	TOALLA	TOALLA BORDADA CALIGLAM	50.86206897	0	7	55	6	14	21
G107	CAPA CORTE	CAPA CORTE CALIGLAM	128.4482759	1	5	2	0	13	18
G40	9.111	RUBIO CLARISIMO INTENSO CENIZO	43.09482759	0	3	0	0	51	38

Figure 5 – Sales Data with Positive Sales Products

Apply the ABC analysis model to top 23 products with positive sales to know which of the product could be demanded for the next order by the distributor.

ABC analysis (or ABC classification) is used to help identify the most important products in our portfolio and ensure they prioritize managing them above those less valuable.
ABC classification is based on the premise that not all inventory is of equal value. Instead if follows the Pareto Principle, where 20% of stock accounts for 80% of the value to the business.
Using ABC classification, we can therefore split inventory into three categories:

Category A: This is the smallest category and consists of the most important stock items
Category B: It will generally be slightly larger in terms of volumes of SKUs and will usually be made up of products of less value
Category C: This will typically be the largest category where products will contribute the least to your business's bottom line

In our case inventory's 'value' is based on annual consumption value.

The graph below illustrates how 80% of a company's sales revenue comes from 20% of their stock items:
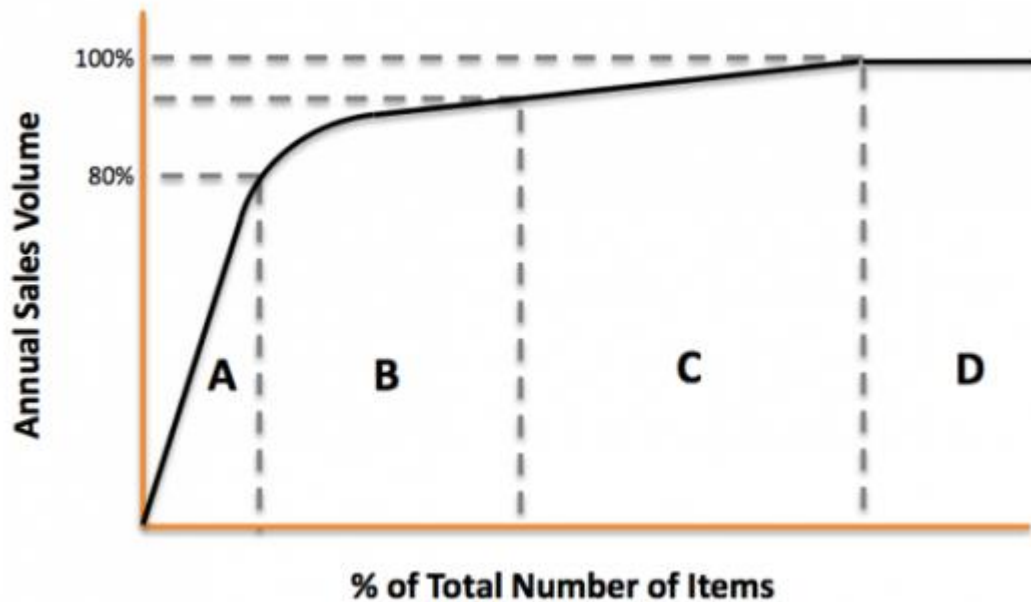
Figure 6 ABC Model
Source – www.wikipedia.org

Here we divide inventory using annual Consumption, we used Frank's Fasteners business as below:
Five steps as bellows:

Step 1 Calculate the annual consumption value of each item by multiply annual numbers of units sold (per item) x cost per unit.

Item code	Product Description	Annual Number of Units Sold	Cost Per Unit	Annual Consumption Value
G113	13 EN 1 CALIGLAM (Botella 250ml)	16897	$ 72.84	$ 1,230,757
G114	GAMA MECHAS CALIGLAM	2042	$ 257.76	$ 526,240
G98	DECOLORANTE CALIGLAM (Bolsa 500grs)	2070	$ 159.48	$ 330,160
G13	RUBIO OSCURO EXTRA INTENSO	4924	$ 43.09	$ 212,189
G14	RUBIO EXTRA INTENSO	4669	$ 43.09	$ 201,191

G103	PERÓXIDO VOL. 30 CALIGLAM (Botella 1000ml)	1427	$	44.82	$	63,976
G107	CAPA CORTE CALIGLAM	469	$	128.45	$	60,253
G40	RUBIO CLARISIMO INTENSO CENIZO	1325	$	43.09	$	57,108
G102	PERÓXIDO VOL. 20 CALIGLAM (Botella 1000ml)	1181	$	44.82	$	52,930
G37	RUBIO OSCURO CENIZO INTENSO	1034	$	43.09	$	44,563
G22	RUBIO CLARO NAT. CENIZO	711	$	43.09	$	30,649
G7	RUBIO	667	$	43.09	$	28,759
G12	CASTAÑO CLARO EXTRA INTENSO	567	$	43.09	$	24,442
G101	PERÓXIDO VOL. 10 CALIGLAM (Botella 1000ml)	536	$	44.82	$	24,036
G108	CAPA TINTE CALIGLAM	176	$	128.45	$	22,665
G15	RUBIO CLARO EXTRA INTENSO	451	$	43.09	$	19,436
G21	RUBIO NATURAL CENIZO	445	$	43.09	$	19,199
G1	NEGRO	440	$	43.09	$	18,971
G5	CASTAÑO CLARO	416	$	43.09	$	17,910
G20	RUBIO OSCURO NATURAL CENIZO	413	$	43.09	$	17,799
G6	RUBIO OSCURO	371	$	43.09	$	16,008
G111	BÁSCULA CALIGLAM	117	$	137.07	$	16,007
G112	TOALLA BORDADA CALIGLAM	192	$	50.86	$	9,775

Figure 7 After Applying Step1 on 23 Products

Step 2 List the Products in Descending Order Based on their Annual Consumption Value

Item code	Product Description	Annual Number of Units Sold	Cost Per Unit	Annual Consumption Value
G113	13 EN 1 CALIGLAM (Botella 250ml)	16897	$ 72.84	$ 1,230,757
G114	GAMA MECHAS CALIGLAM	2042	$ 257.76	$ 526,240
G98	DECOLORANTE CALIGLAM (Bolsa 500grs)	2070	$ 159.48	$ 330,160
G13	RUBIO OSCURO EXTRA INTENSO	4924	$ 43.09	$ 212,189
G14	RUBIO EXTRA INTENSO	4669	$ 43.09	$ 201,191
G103	PERÓXIDO VOL. 30 CALIGLAM (Botella 1000ml)	1427	$ 44.82	$ 63,976
G107	CAPA CORTE CALIGLAM	469	$ 128.45	$ 60,253
G40	RUBIO CLARISIMO INTENSO CENIZO	1325	$ 43.09	$ 57,108
G102	PERÓXIDO VOL. 20 CALIGLAM (Botella 1000ml)	1181	$ 44.82	$ 52,930
G37	RUBIO OSCURO CENIZO INTENSO	1034	$ 43.09	$ 44,563
G22	RUBIO CLARO NAT. CENIZO	711	$ 43.09	$ 30,649
G7	RUBIO	667	$ 43.09	$ 28,759
G12	CASTAÑO CLARO EXTRA INTENSO	567	$ 43.09	$ 24,442

Item code	Product Description		Cost Per Unit	
G101	PERÓXIDO VOL. 10 CALIGLAM (Botella 1000ml)	536	$ **44.82**	$ 24,036
G108	CAPA TINTE CALIGLAM	176	$ **128.45**	$ 22,665
G15	RUBIO CLARO EXTRA INTENSO	451	$ **43.09**	$ 19,436
G21	RUBIO NATURAL CENIZO	445	$ **43.09**	$ 19,199

Step 3 – Sum up the number of units sold and annual consumption value

Item code	Product Description	Annual Number of Units Sold	Cost Per Unit	Annual Consumption Value
G113	13 EN 1 CALIGLAM (Botella 250ml)	16897	$ **72.84**	$ 1,230,757
G114	GAMA MECHAS CALIGLAM	2042	$ **257.76**	$ 526,240
G98	DECOLORANTE CALIGLAM (Bolsa 500grs)	2070	$ **159.48**	$ 330,160
G13	RUBIO OSCURO EXTRA INTENSO	4924	$ **43.09**	$ 212,189
G14	RUBIO EXTRA INTENSO	4669	$ **43.09**	$ 201,191
G103	PERÓXIDO VOL. 30 CALIGLAM (Botella 1000ml)	1427	$ **44.82**	$ 63,976
G107	CAPA CORTE CALIGLAM	469	$ **128.45**	$ 60,253
G40	RUBIO CLARISIMO INTENSO CENIZO	1325	$ **43.09**	$ 57,108

G102	PERÓXIDO VOL. 20 CALIGLAM (Botella 1000ml)	1181	**$ 44.82**	$ 52,930
G37	RUBIO OSCURO CENIZO INTENSO	1034	**$ 43.09**	$ 44,563
G22	RUBIO CLARO NAT. CENIZO	711	**$ 43.09**	$ 30,649
G7	RUBIO	667	**$ 43.09**	$ 28,759
G12	CASTAÑO CLARO EXTRA INTENSO	567	**$ 43.09**	$ 24,442
Total		41542		$ 3,045,021

Step 4 Calculate the cumulative percentage of items sold and cumulative percentage of the annual consumption values using the totals.

Item code	Annual Number of Units Sold	Cost Per Unit	Annual Consumption Value	% of Annual Units Sold	% of Annual Consumption values
G113	16897	$ 72.84	$ 1,230,757	41%	40%
G114	2042	$ 257.78	$ 526,240	5%	17%
G98	2070	$ 159.48	$ 330,160	5%	11%
G13	4924	$ 43.08	$ 212,189	12%	7%
G14	4669	$ 43.08	$ 201,191	11%	7%
G103	1427	$ 44.82	$ 63,976	3%	2%
G107	469	$ 128.46	$ 60,253	1%	2%
G40	1325	$ 43.08	$ 57,108	3%	2%
G102	1181	$ 44.82	$ 52,930	3%	2%
G37	1034	$ 43.08	$ 44,563	2%	1%
G22	711	$ 43.08	$ 30,649	2%	1%
G7	667	$ 43.08	$ 28,759	2%	1%
G12	567	$ 43.08	$ 24,442	1%	1%
G101	536	$ 44.82	$ 24,036	1%	1%
G108	176	$ 128.46	$ 22,665	0%	1%
G15	451	$ 43.08	$ 19,436	1%	1%
G21	445	$ 43.08	$ 19,199	1%	1%
G1	440	$ 43.08	$ 18,971	1%	1%
G5	416	$ 43.08	$ 17,910	1%	1%
G20	413	$ 43.08	$ 17,799	1%	1%
G6	371	$ 43.08	$ 16,008	1%	1%
G111	117	$ 137.07	$ 16,007	0%	1%

Figure 8 After Applying Step 4 on 23 Products

Step 5 Determine the thresholds for splitting the data into A, B and C categories. The threshold for determining the ABC split will be unique to California glam and product mix, it's close to 80%/15%/5%.

Item code	Annual Number of Units Sold	Cost Per Unit	Annual Consumption Value	% of Annual Units Sold	% of Annual Consumption values	ABC Analysis
G113	16897	$ 72.84	$ 12,30,757	41%	40%	A
G114	2042	$ 257.76	$ 5,26,240	5%	17%	B
G98	2070	$ 159.48	$ 3,30,160	5%	11%	B
G13	4924	$ 43.09	$ 2,12,189	12%	7%	C
G14	4669	$ 43.09	$ 2,01,191	11%	7%	C
G103	1427	$ 44.82	$ 63,976	3%	2%	C
G107	469	$ 128.45	$ 60,253	1%	2%	C
G40	1325	$ 43.09	$ 57,108	3%	2%	C
G102	1181	$ 44.82	$ 52,930	3%	2%	C
G37	1034	$ 43.09	$ 44,563	2%	1%	C
G22	711	$ 43.09	$ 30,649	2%	1%	C
G7	667	$ 43.09	$ 28,759	2%	1%	C
G12	567	$ 43.09	$ 24,442	1%	1%	C
G101	536	$ 44.82	$ 24,036	1%	1%	C
G108	176	$ 128.45	$ 22,665	0%	1%	C
G15	451	$ 43.09	$ 19,436	1%	1%	C
G21	445	$ 43.09	$ 19,199	1%	1%	C
G1	440	$ 43.09	$ 18,971	1%	1%	C
G5	416	$ 43.09	$ 17,910	1%	1%	C
G20	413	$ 43.09	$ 17,799	1%	1%	C
G6	371	$ 43.09	$ 16,008	1%	1%	C
G111	117	$ 137.07	$ 16,007	0%	1%	C
G112	192	$ 50.86	$ 9,775	0%	0%	C
Total	41542		$ 30,45,021	100%	100%	

Source: Self Prepared for California Glam Intervention
Figure 9: ABC Colorant Segmentation for California Glam

ABC Analysis helps in Product Categorization

Item codes = 'G113' is 'A' categories.

Item codes = 'G114','G98' are 'B' categories.

Item codes = Rest all are 'C' categories.

Based on the 'ABC' analysis the best way to start is to adapt purchasing and inventory policies to each group.

To setting up sophisticated ordering processes for all 'A' items categories, checking every purchase order and spending more time discussing lead times with suppliers to guarantee best value and timely deliveries.

In contrast, 'C' item categories should take up much less of time and could be ordered automatically to save valuable human resource.

Forecasting

Using Exponential Smoothening to forecast the demand for 3 months July, August and September

Period	Month	Demand	Level(L)	Trend(Tt)	Forecast(Ft)	Error(Et)	Error^2	Absolute Error	|Ft-Dt|/Dt
0		26.93333333	-0.314285714						
1	January	32.00	9.69617	2.46873	-0.31429	-32.31429	1044.21306	32.3142857	1.0098214
2	February	30.00	17.68994	3.83128	12.16490	-17.83510	318.09071	17.8350977	0.5945033
3	March	16.00	19.81083	3.40948	21.52122	5.52122	30.48386	5.5212194	0.3450762
4	April	12.00	19.74443	2.55227	23.22031	11.22031	125.89531	11.2203077	0.9350256
5	May	41.00	28.09069	3.98116	22.29671	-18.70329	349.81323	18.7032947	0.4561779
6	June	24.00	29.57132	3.36449	32.07185	8.07185	65.15476	8.0718501	0.3363271
					32.93581				
α	0.309784				36.30029				
β	0.246615				32.57132				
						MSE	322.275		
						MAD	15.611		
		When α = 0.30 and β = 0.24				MAPE	0.613		

The best possible values of α & β , we have select error measurement MSE = 17.879, in order to minimize MSE subject to α = 0.30& β = 0.24 between 0 and 1.

We follow below five steps to calculate alpha& beta values for Exponential Smoothing:
- Plot demand vs. period graph to see if there is trend and/or seasonality.
- Examine the graph and determine the systematic component.
- choose the forecasting method that fits step 2.
- Use the formulas to fill out the tables.

Compute the error measurement.

Calculate Exponential Smoothing   Forecast for Six month based on sales demand

Months	G113	G13	G14	G98	G114	G102	G108	G21	G6
Jan-19	356.00	124.00	82.00	3.00	0.00	36.00	1.00	62.00	47.00
Feb-19	640.00	473.00	447.00	19.00	0.00	70.00	4.00	20.00	33.00
Mar-19	598.00	48.00	68.00	0.00	0.00	78.00	52.00	57.00	25.00
Apr-19	0.00	85.00	61.00	38.00	0.00	72.00	0.00	39.00	31.00
May-19	1,958.00	76.00	48.00	18.00	0.00	111.00	13.00	30.00	33.00
Jun-19	1,131.00	40.00	41.00	93.00	92.00	61.00	19.00	33.00	33.00
Jul-19	1,651.09	83.93	229.00	72.51	72.17	85.09	13.00	33.38	31.97
Aug-19	1,866.85	4.69	186.70	110.33	121.35	83.08	1.68	27.24	34.92
Sep-19	2,082.61	4.47	308.17	146.42	204.81	98.77	5.89	16.28	38.40
Oct-19	2,298.38	63.80	527.78	232.29	350.03	102.70	0.23	8.22	41.97
Nov-19	2,514.14	10.98	950.09	345.43	623.44	125.82	19.48	18.08	52.02
Dec-19	2,729.90	34.94	1,799.99	678.24	1,285.94	186.03	10.34	18.94	75.68

Inventory Analysis

Analysis for last 3 months of Sales for the 23 products for the month April, May and June in order to predict minimum , maximum and optimum inventory by calculating Average Sales Demand , Demand Per Day , Re Order Point , Economic Order Quantity based on Information Lead Time , Supplier Lead Time, In Transit Lead time and Demand Variation

March	April	May	June	July(FD)	August(FD)	September(FD)
598.00	0.00	1,958.00	1,131.00	1651	1867	2083
48.00	85.00	76.00	40.00	84	5	4
68.00	61.00	48.00	41.00	229	187	308
0.00	38.00	18.00	93.00	73	110	146
0.00	0.00	0.00	92.00	72	121	205
78.00	72.00	111.00	61.00	85	83	99
52.00	0.00	13.00	19.00	13	2	6
57.00	39.00	30.00	33.00	33	27	16
25.00	31.00	33.00	33.00	32	35	38
39.00	12.00	77.00	47.00	90	116	198
56.00	19.00	15.00	17.00	13	6	11
19.00	34.00	39.00	35.00	39	50	60
24.00	51.00	36.00	24.00	37	36	28
40.00	38.00	22.00	14.00	10	5	21
23.00	1.00	18.00	6.00	18	19	36
52.00	11.00	39.00	30.00	34	39	53
16.00	12.00	41.00	24.00	30	37	48
40.00	59.00	21.00	6.00	7	8	24
34.00	31.00	25.00	21.00	30	31	31
55.00	6.00	14.00	21.00	18	6	2
2.00	0.00	13.00	18.00	19	29	46
0.00	0.00	51.00	38.00	54	83	131

Source: Self Prepared for California Glam Intervention
Figure 10: ABC Colorant Segmentation for California Glam

Parameters	Quantum
Details Supplier Lead time	Days
In Transit Lead Time	Days
Order Frequency	(2 Times per month)

Example of one of the products which is 80 % of sales based on last 6 months sales demand.

Calculate EOQ, Reorder Point, Daily Demand, Minimum, Maximum & Optimum (Inventory) and cost of Minimum, Maximum & Optimum inventory for the product "**G113**".

Steps as bellows:

Step-1

Last six month actual sales of the product "**G113**"-"13 EN 1 CALIGLAM (Botella 250ml)".

January	February	March	April	May	June
356.00	640.00	598.00	0.00	1,958.00	1,131.00

Step-2

Calculate last 6 months forecast sales of the product "**G113**"-"13 EN 1 CALIGLAM (Botella 250ml)".
Using the Excel Exponential Forecast Analysis formula:

Formula used for forecasting. Let us take an example of a single product G113

Product Code	July (FD)	August (FD)	September (FD)	October (FD)	November (FD)	December (FD)
G113	1651	1867	2083	2298	2514	2730

Step-3

Annual demand = SUM (6-month actual sales + 6 month forecast sales) = 17825.97 units.

Step-4

Standard deviation = STDEV (E3:P3) = 911.08.

Step-5

Note: we have taken last three months (April, May & June) actual sales data for calculating average sales and daily demand.

Last three months average sales = SUM(April+May+June) / 3.

$$= (0.00+1958.00+1131.00) / 3 = 1029.67 \text{ units}$$

Daily Demand = Last three months average sales / 26 = 1029.67 / 26 = 39.60.

Step -6

Parameters	Values
Information lead time	2 days
Supplier Lead time	21days
In Transit Lead Time	28days
Demand Variation lead time	10days
Order Frequency	(2 Times per month)

Based on above parameters:

Reorder Point = (Information lead time+ supplier lead time + In transit lead time) * Daily demand.

$$= (2+21+28) * 39.60 = 2019.73.$$

Step -7

Minimum Inventory = (Information lead time+ supplier lead time + In transit lead time)
$$* \text{ Daily Demand.}$$
$$= (2+21+28) * 39.60$$
$$= 2019.73.$$

Maximum Inventory = (Information lead time+ supplier lead time + In transit lead time
$$+ \text{ Demand variation}) * \text{Daily Demand.}$$
$$= (2+21+28+10) * 39.60$$
$$= 2415.76.$$

Optimum inventory = (Min + Max) inventory / 2 = (2019.73+2415.76)/2 = 2217.74

Step-8

Economic order Quantity (EOQ) = SQRT ((2*Annual demand*Ordering cost)/ (0.2* storage unit cost)).

$$= \text{SQRT} ((2*17825.97*500)/ (0.2*260)).$$
$$= 585.4973444.$$

Note: Here ordering cost = '500' & Storage unit cost = '260', We have taken 0.2 as storage unit cost, the company will pay max 0.2% for storage cost per unit.

Number of order per year = Annual demand / EOQ = 17825.97 / 585.4973444 = 30.4458 (30 orders).

Step-9

Safety stock = (1.28 *STD* SQRT (Supplier lead Time))
           = (1.28*911.08*SQRT (21))
           = 5344.12.

Note: To provide service level 90 % the Z =1.28.

Step-10

Unit cost of the product = $ 72.84.
Minimum inventory = Minimum inventory * Unit cost of the product
           = 2019.73 * $ 72.84   = $1,47,117.19.
Maximum inventory = Maximum inventory * Unit cost of the product
           = 2415.76* $ 72.84 = $1,75,963.70.
Similarly, to hold Optimum inventory the cost equal to
           = Optimum inventory * Unit cost of the product = $1,61,540.44.
The actual inventory for the product based on current stock (10000 units)
           = 10000 * $ 72.84 = $7,28,400.00.

Conclusion: In order to maintain maximum inventory of the product "G113" for 1 year we need maximum 2415 unit which is cost = $1,75,963.70, But currently we have stock 10000 unit in the warehouse, which is cost approximately cost= $7,28,400.00.

% Excess of inventory in term of unit = (10000 – 2415) / 2415 = 75 % excess inventory.
% Excess of inventory in cost = current inventory cost for 10000 units – Maximum inventory cost
           = $7,28,400.00 - $1,75,963.70
           = $5,52,436.30.

Product Code	Minimum Inventory	Optimum Inventory	Maximum inventory
G113	2019.73	2217.74	2415.76
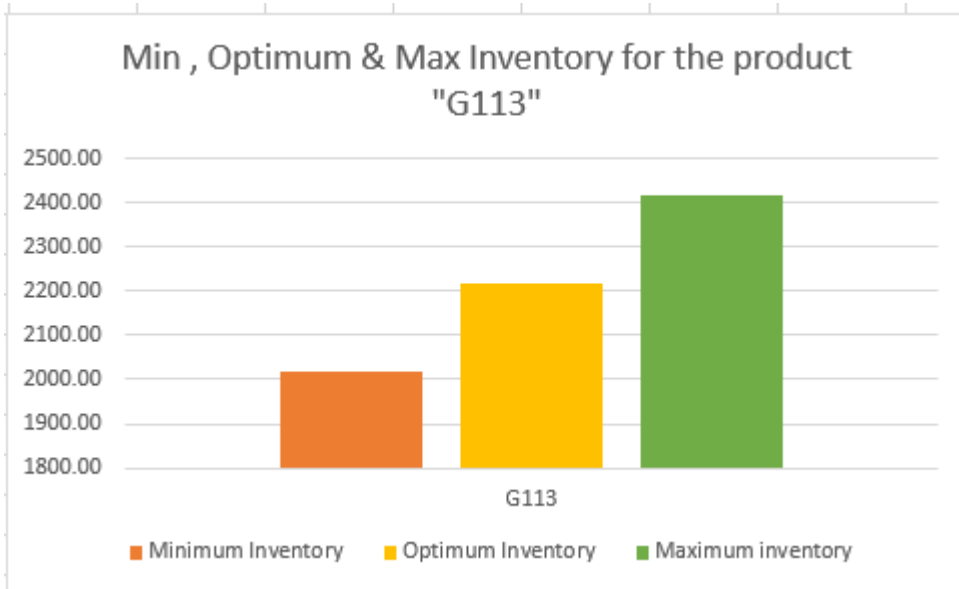
Source: Self Prepared for California Glam Intervention
Figure : Minimum , Optimum& Maximum Inventory for the product "G113" for California Glam

Formulas Used

S. No	Formula	Calculations
1	EOQ	SQRT ((2*Annual demand*Ordering cost)/ (0.2* storage unit cost)).
2	Reorder level	Maximum usage * Maximum time
3	Maximum level	Reorder level + Reorder Qty – (Minimum Usage *Minimum Time).
4	Minimum level	Reorder level – (Normal usage * Normal time).
5	Average level	(Minimum level + Maximum level)/ 2.
6	Reorder Point	(Information lead time+ supplier lead time + In transit lead time) * Daily demand.
7	Daily Demand	Last three Months average sales / 26 days
8	Minimum inventory	(Information lead time+ supplier lead time + In transit lead time) * Daily Demand.
9	Maximum inventory	(Information lead time+ supplier lead time + In transit lead time+ Demand variation) * Daily Demand.
10	Optimum inventory	(Minimum inventory + Maximum Inventory) /2.

Calculated Annual sales Demand and Standard deviation for 6 months actual sales and 6 month forecast sales data as below.

Product Code	October(Forecast Demand)	November(FD)	December(FD)	Annual Demand	Standard deviation	Information lead time(In Days)	Supplier lead time(In Days)
G113	2298	2514	2730	17,825.97	911.08	2.00	21.00
G13	64	11	35	1,048.81	126.79	2.00	21.00
G14	528	950	1800	4,748.73	517.26	2.00	21.00
G98	232	345	678	1,756.22	196.77	2.00	21.00
G114	350	623	1286	2,749.74	381.99	2.00	21.00
G102	103	126	186	1,109.49	37.91	2.00	21.00
G108	0	19	10	139.62	14.52	2.00	21.00
G21	8	18	19	363.15	16.20	2.00	21.00
G6	42	52	76	476.95	13.53	2.00	21.00
G103	307	563	1157	2,626.15	336.63	2.00	21.00
G22	2	11	2	230.85	17.78	2.00	21.00
G7	80	124	228	766.33	59.35	2.00	21.00
G1	21	19	0	319.69	12.51	2.00	21.00
G12	7	10	12	240.80	12.65	2.00	21.00
G111	54	99	203	482.20	58.26	2.00	21.00
G101	70	108	201	659.52	54.08	2.00	21.00
G5	64	98	184	614.63	47.60	2.00	21.00
G15	8	25	41	260.76	17.08	2.00	21.00
G20	36	45	68	366.26	16.27	2.00	21.00
G112	7	15	6	157.83	14.69	2.00	21.00
G107	71	128	260	591.60	76.06	2.00	21.00
G40	194	354	722	1,629.29	211.78	2.00	21.00
G37	161	292	592	1,350.09	172.94	2.00	21.00

Source: Self Prepared for California Glam Intervention
Figure 11: Annual Demand for California Glam

Product Code	Supplier lead time(In Days)	In transit lead time(In Days)	Frequency of order per Month(2 times	Demand Variation	Last three month average sales(April,May	Daily demand
G113	21.00	28.00	2.00	10.00	1,866.85	71.80
G13	21.00	28.00	2.00	10.00	31.03	1.19
G14	21.00	28.00	2.00	10.00	241.29	9.28
G98	21.00	28.00	2.00	10.00	109.76	4.22
G114	21.00	28.00	2.00	10.00	132.78	5.11
G102	21.00	28.00	2.00	10.00	88.98	3.42
G108	21.00	28.00	2.00	10.00	6.86	0.26
G21	21.00	28.00	2.00	10.00	25.64	0.99
G6	21.00	28.00	2.00	10.00	35.10	1.35
G103	21.00	28.00	2.00	10.00	134.84	5.19
G22	21.00	28.00	2.00	10.00	10.26	0.39
G7	21.00	28.00	2.00	10.00	49.62	1.91
G1	21.00	28.00	2.00	10.00	33.41	1.28
G12	21.00	28.00	2.00	10.00	12.16	0.47
G111	21.00	28.00	2.00	10.00	24.22	0.93
G101	21.00	28.00	2.00	10.00	41.88	1.61
G5	21.00	28.00	2.00	10.00	38.31	1.47
G15	21.00	28.00	2.00	10.00	13.20	0.51
G20	21.00	28.00	2.00	10.00	30.79	1.18
G112	21.00	28.00	2.00	10.00	8.56	0.33
G107	21.00	28.00	2.00	10.00	31.28	1.20
G40	21.00	28.00	2.00	10.00	89.42	3.44
G37	21.00	28.00	2.00	10.00	71.61	2.75

Source: Self Prepared for California Glam Intervention
Figure 12: Daily Demand for California Glam

Minimum , Optimum, Maximum & EOQ Qty Calculation for California Glam using the above formulas taking 3 months actual sales data (April, May and June).

The reason of considering only 3 months of data was because the operations of the company were new and for initial 3 months the sales were very in sensitive and unstable. We wanted to explore the data which makes more sense for data decision and have an approach for giving weight to the most recent data.

(Alvarez, 2019) said to use the most recent history for forecasts when the demand is sensitive and when we don't have much operational data

A	AA	AB	AC	AD	AE	AF
Product Code	Re order Point	Actual Inventory	Minimum Inventory	Optimal Inventory	Maximum Inventory	EOQ
G113	3,661.90	10,000.00	3,661.90	4,020.91	4,379.92	585.5
G13	60.87	886.00	60.87	66.84	72.80	142.02
G14	473.30	971.00	473.30	519.70	566.10	302.19
G98	215.29	4,108.00	215.29	236.40	257.50	183.78
G114	260.45	888.00	260.45	285.98	311.51	229.96
G102	174.54	1,495.00	174.54	191.65	208.76	146.07
G108	13.45	651.00	13.45	14.77	16.09	51.817
G21	50.28	617.00	50.28	55.21	60.14	83.568
G6	68.84	690.00	68.84	75.59	82.34	95.771
G103	264.49	699.00	264.49	290.42	316.35	224.73
G22	20.12	683.00	20.12	22.10	24.07	66.628
G7	97.33	741.00	97.33	106.87	116.41	121.4
G1	65.53	841.00	65.53	71.95	78.38	78.408
G12	23.84	1,848.00	23.84	26.18	28.52	68.05
G111	47.50	434.00	47.50	52.16	56.82	96.297
G101	82.16	1,819.00	82.16	90.21	98.27	112.62
G5	75.14	859.00	75.14	82.51	89.88	108.72
G15	25.89	1,838.00	25.89	28.43	30.96	70.814
G20	60.40	930.00	60.40	66.33	72.25	83.926
G112	16.78	387.00	16.78	18.43	20.07	55.093
G107	61.36	704.00	61.36	67.38	73.39	106.66
G40	175.39	877.00	175.39	192.59	209.78	177.01
G37	140.46	965.00	140.46	154.23	168.00	161.13

Source: Self Prepared for California Glam Intervention
Figure 13: Minimum , Optimum, Maximum & EOQ for California Glam


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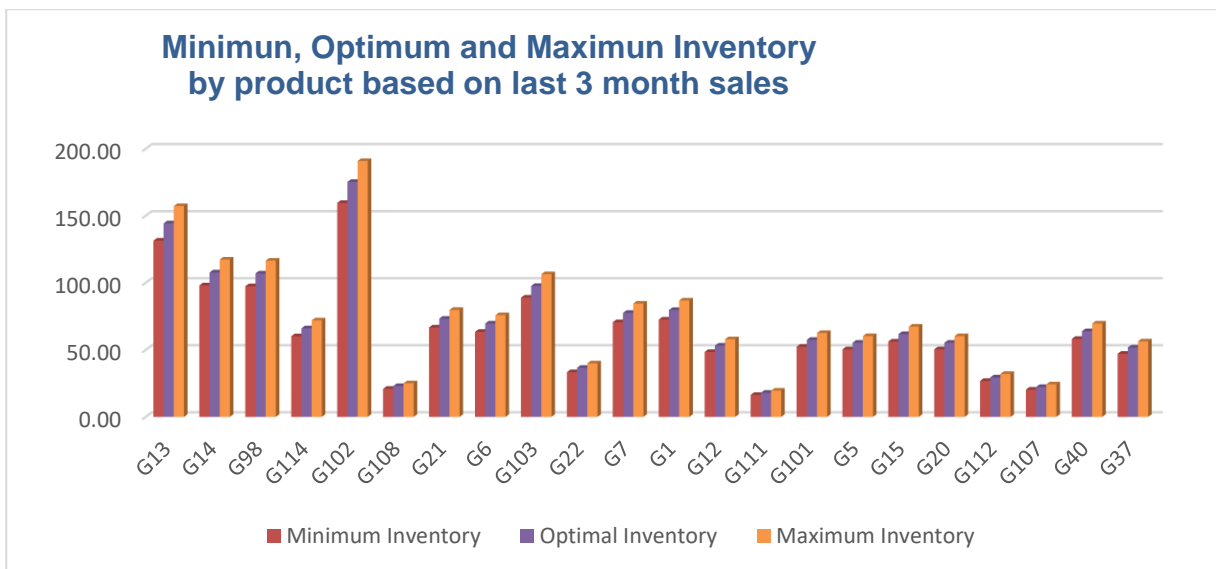
3.4 Goals

Inventory Management - Our Goal is to analyze all the data points related to Inventory management to explore the inventory of each product and find a strategy to control in a better way for distributors based on forecast.

Implement a dashboard using excel to help California Glam to see the overview of all 23 products which were considered as a part of this study to highlight the required inventory to have at any point of time for smooth running of the business and show in a traffic light manner

3.4 Design Approach to Implement in California Glam

California Glam Stages for Implementation in a Design Way.

Learn → Assess → Implement → Inspect and Adapt
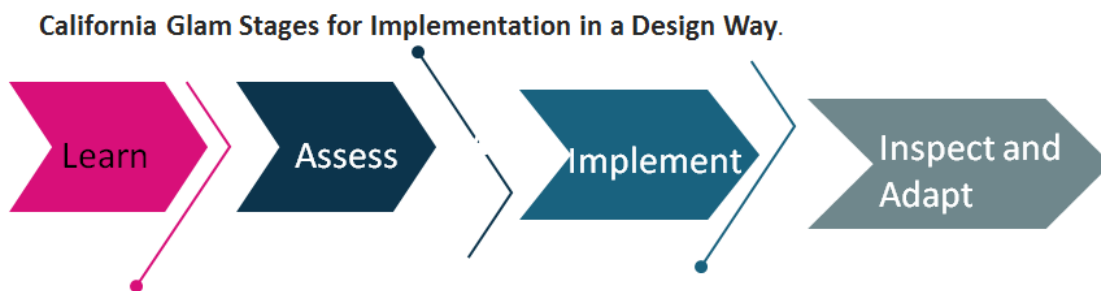
Source: Self Prepared for California Glam Intervention
Figure 11: Design approach for California Glam

1. Learn - First understand extensively the current flow of processes at all levels (Strategic, Tactical and Operational) by having a value stream mapping of the Inventory Management supply chain of California Glam

2. Assess - Here we would introspect the possibilities of improvements, advance planning and optimization opportunity for California glam by reducing the excess inventory and control the inventories of distributors and overall efficiency of supply chain.

3. Implement – Planned recommendations would be part of intervention and consulting for California glam to adopt and improve the current supply chain inefficiencies.

4. Inspect and Adapt – As we know never a supply chain is complete, we have to keep an eye on all the elements throughout the lifecycle of the value chain to better it each time. Learn what works for the organization, take feedback and Keep on improving the value chain.

Chapter 4

Exhibition of findings

4.1 Product Segmentation

Use ABC analysis to segment the products based on sales and distributor demand and segment it as A, B and C. Categorizing the products help California Glam to know their fast-moving products and can always have right inventory maintained for them at any point of time.

4.2 Better Forecast – Better Visibility

The suggested improvement opportunities for California Glam were based on studying their actual inventory and sales and use calculations of reorder point, minimum level and maximum level to find the minimum, maximum and optimized inventory for maintaining the inventory depending on the service level company want to operate.

Product Code	Daily demand	Re order Point	Actual Inventory	Minimum Inventory	Optimal Inventory	Maximum Inventory
G113	71.80	3,661.90	10,000.00	3,661.90	4,020.91	4,379.92
G13	1.19	60.87	886.00	60.87	66.84	72.80
G14	9.28	473.30	971.00	473.30	519.70	566.10
G98	4.22	215.29	4,108.00	215.29	236.40	257.50
G114	5.11	260.45	888.00	260.45	285.98	311.51
G102	3.42	174.54	1,495.00	174.54	191.65	208.76
G108	0.26	13.45	651.00	13.45	14.77	16.09
G21	0.99	50.28	617.00	50.28	55.21	60.14
G6	1.35	68.84	690.00	68.84	75.59	82.34
G103	5.19	264.49	699.00	264.49	290.42	316.35
G22	0.39	20.12	683.00	20.12	22.10	24.07
G7	1.91	97.33	741.00	97.33	106.87	116.41
G1	1.28	65.53	841.00	65.53	71.95	78.38
G12	0.47	23.84	1,848.00	23.84	26.18	28.52
G111	0.93	47.50	434.00	47.50	52.16	56.82
G101	1.61	82.16	1,819.00	82.16	90.21	98.27
G5	1.47	75.14	859.00	75.14	82.51	89.88
G15	0.51	25.89	1,838.00	25.89	28.43	30.96
G20	1.18	60.40	930.00	60.40	66.33	72.25
G112	0.33	16.78	387.00	16.78	18.43	20.07
G107	1.20	61.36	704.00	61.36	67.38	73.39
G40	3.44	175.39	877.00	175.39	192.59	209.78
G37	2.75	140.46	965.00	140.46	154.23	168.00

Figure 14: Minimum , Optimum, Maximum & EOQ for California Glam for Forecasted Data (July, August and September)

Minimum , Optimum, Maximum & EOQ Qty Calculation for California Glam using the above formulas of forecasted data of 3 months (July, August and September   ).
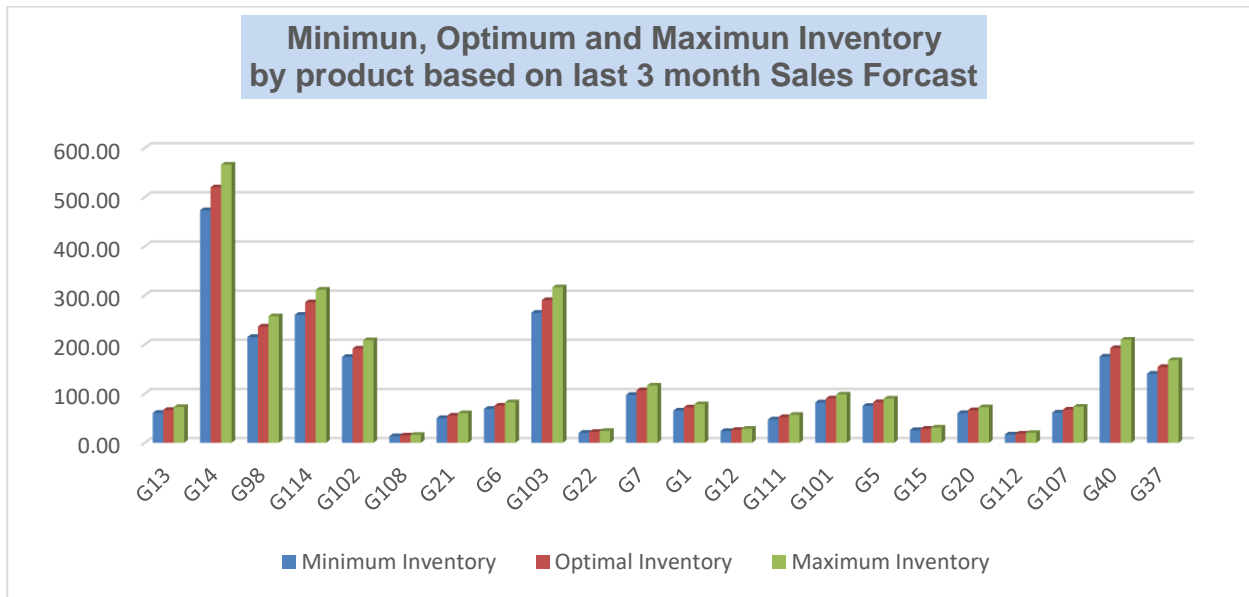
4.3 Return of Investment Analytics

Analyzing the inventory and forecasting the date, we found that there is an excess inventory for all the products of California Glam and they could present some new promotions for sell of the C category products.

As of now the fueled investment by the company is far beyond what is needed to full-fledged operate to have maximum operating way considering demand variations.

Product Code	Annual Demand	Last three month average sales(April,May &June)	Daily demand	Re order Point	Actual Inventory	Minimum Inventory	Optimal Inventory	Maximum Inventory	Excess Inventory in qty	Multiply minimum inventory with unit cost	Multiply Optimal inventory with unit cost	Multiply Maximum inventory with unit cost	Actual inventory multiply with unit cost	Traffic Light
G113	17,825.97	1,866.85	71.80	3,661.90	10,000.00	3,661.90	4,020.91	4,379.92	5,620.08	$2,66,732.72	$2,92,882.99	$3,19,033.25	$7,28,400.00	EXCESS INVENTORY
G13	1,048.81	31.03	1.19	60.87	886.00	60.87	66.84	72.80	813.20	$2,623.12	$2,880.29	$3,137.46	$38,182.02	EXCESS INVENTORY
G14	4,748.73	241.29	9.28	473.30	971.00	473.30	519.70	566.10	404.90	$20,396.68	$22,396.36	$24,396.03	$41,845.08	EXCESS INVENTORY
G98	1,756.22	109.76	4.22	215.29	4,108.00	215.29	236.40	257.50	3,850.50	$34,335.00	$37,701.18	$41,067.35	$6,55,155.17	EXCESS INVENTORY
G114	2,749.74	132.78	5.11	260.45	888.00	260.45	285.98	311.51	576.49	$67,132.25	$73,713.84	$80,295.43	$2,28,889.66	EXCESS INVENTORY
G102	1,109.44	88.98	3.42	174.54	1,495.00	174.54	191.65	208.76	1,286.24	$7,822.76	$8,589.60	$9,356.63	$67,004.35	EXCESS INVENTORY
G108	139.62	6.86	0.26	13.45	651.00	13.45	14.77	16.09	634.91	$1,728.13	$1,897.55	$2,066.98	$83,619.83	EXCESS INVENTORY
G21	363.15	25.64	0.99	50.28	617.00	50.28	55.21	60.14	556.86	$2,167.00	$2,379.45	$2,591.90	$26,589.51	EXCESS INVENTORY
G6	476.95	35.10	1.35	68.84	690.00	68.84	75.59	82.34	607.66	$2,966.78	$3,257.64	$3,548.50	$29,735.43	EXCESS INVENTORY
G103	2,626.15	134.84	5.19	264.49	699.00	264.49	290.42	316.35	382.65	$11,853.97	$13,016.12	$14,178.28	$31,328.46	EXCESS INVENTORY
G22	230.85	10.26	0.39	20.12	683.00	20.12	22.10	24.07	658.93	$867.19	$952.21	$1,037.23	$29,433.77	EXCESS INVENTORY
G7	766.33	49.62	1.91	97.33	741.00	97.33	106.87	116.41	624.59	$4,194.43	$4,605.65	$5,016.86	$31,933.27	EXCESS INVENTORY
G1	319.69	33.41	1.28	65.53	841.00	65.53	71.95	78.38	762.62	$2,824.01	$3,100.88	$3,377.74	$36,242.75	EXCESS INVENTORY
G12	240.80	12.16	0.47	23.84	1,848.00	23.84	26.18	28.52	1,819.48	$1,027.51	$1,128.25	$1,228.98	$79,639.24	EXCESS INVENTORY
G111	482.20	24.22	0.93	47.50	434.00	47.50	52.16	56.82	377.18	$6,511.41	$7,149.79	$7,788.16	$59,487.93	EXCESS INVENTORY
G101	659.52	41.88	1.61	82.16	1,819.00	82.16	90.21	98.27	1,720.73	$3,682.17	$4,043.16	$4,404.16	$81,525.70	EXCESS INVENTORY
G5	614.63	38.31	1.47	75.14	859.00	75.14	82.51	89.88	769.12	$3,238.24	$3,555.72	$3,873.19	$37,018.46	EXCESS INVENTORY
G15	260.76	13.20	0.51	25.89	1,838.00	25.89	28.43	30.96	1,807.04	$1,115.62	$1,225.00	$1,334.37	$79,208.29	EXCESS INVENTORY
G20	366.26	30.79	1.18	60.40	930.00	60.40	66.33	72.25	857.75	$2,603.08	$2,858.29	$3,113.49	$40,078.19	EXCESS INVENTORY
G112	157.83	8.56	0.33	16.78	387.00	16.78	18.43	20.07	366.93	$853.55	$937.23	$1,020.91	$19,683.62	EXCESS INVENTORY
G107	591.60	31.28	1.20	61.36	704.00	61.36	67.38	73.39	630.61	$7,881.56	$8,654.26	$9,426.97	$90,427.59	EXCESS INVENTORY
G40	1,629.29	89.42	3.44	175.39	877.00	175.39	192.59	209.78	667.22	$7,558.46	$8,299.49	$9,040.52	$37,794.16	EXCESS INVENTORY
G37	1,350.09	71.61	2.75	140.46	965.00	140.46	154.23	168.00	797.00	$6,053.12	$6,646.56	$7,240.00	$41,586.51	EXCESS INVENTORY
					33,931.00			7,338.33	26,592.67	$4,66,168.77	$5,11,871.59	$5,57,574.41	$25,94,808.97	
Mini mu										Excess Amount in term of inventory	$20,37,234.56			

But the Actual Investment by Company is **excess by 73%** which they could operate it for next 3 years considering the variable demand

Investment Needed for Top 23 Products is $ 557574
Actual Investment done by Company is $2594808
Excess Investment is $ 2037234 (73% excess than needed)

4.4 Actual Inventory Comparison between Require Inventory

In average if we analyze the inventory for all 23 products, we can see the percentage of excess inventory what California glam is having.

Actual Inventory	33931 Units
Inventory needed	7338 Units
Excess Inventory	26592 Units

Excess Inventory in Percentage – 78%

4.5 Lead Time

Our focus and recommendation for California Glam was to attain operating efficiency by improving the lead time based on two possibilities. One was to reduce the internal order processing time for raising a new PO which was 2 weeks earlier due to absence of a forecast model and bad predictability

Improved Value Stream Mapping after lead time reduced

Chapter 5

Results and Conclusion

The concept of SCM is complex to understand because it consists of many elements, components, and interlinked relationships. So the intervention of any supply chain is not easy. The key message is all the elements in the supply chain network are equally important.

Analyzing the actuals after California Glam implemented the first 3 recommendations

5.1 Segmentation of product

In our intervention the first draw of study was to segment the product based on distributors and tell the company to keep the right inventory needed

5.2 Forecast

Our forecast made for the month of July was close to accuracy of 82.67% comparing actual and forecasted values.

We have provided our forecast to the company and when we compared the actual sales that happened in July was having an error rate of 17.33%. We have posted the date below for reference.

Interpretation is that we have improved the forecast accuracy of California glam by 83%

Product Code	July month Actual data	July(Forcast Demand)
G113	935.00	1651
G13	33.07	84
G14	33.89	229
G98	76.88	73
G114	76.06	72
G102	50.43	85
G108	15.71	13
G21	27.28	33
G6	27.28	32
G103	38.85	90
G22	14.05	13
G7	28.93	39
G1	19.84	37
G12	11.57	10
G111	4.96	18
G101	24.80	34
G5	19.84	30
G15	4.96	7
G20	17.36	30
G112	17.36	18
G107	14.88	19
G40	31.41	54
G37	31.41	45

5.3 Lead Time Improvement

Currently California Glam has an inventory management plan so the internal processing of any next PO based on new Value Stream Mapping and Excel Dashboard helps processing or taking the decisions quickly. We have cut down the order processing time by 1 Week.

5.4 Inventory Management Metrics - Financial Improvement

As per using calculated functions for a better inventory management, we did all analysis for the California Glam's last six months of data and provided our interventions of excess inventory for each product and also the revenue impact due to those products.

Our recommendation to the company was find promotion to offload the C category items and find ways to ship A and B category of excess products to their other stores because the current inventory

accumulates to next 3 years for the 23 products analyzed on the forecasted demand based on the performance of California Glam

Excess Inventory as calculated in Exhibition 4. 4 is 78%
Similarly, Financial Impact due to holding these products is close to 74%

5.5 Recommendations

5.5.1 Recommendation to the company was to the financial department of California Glam to understand that 76% of their excess inventory is not adding any business value or cash flow for next 3 years, As we studied and forecasted the next 3 year demand we found based on the projected values that we have an inventory to sustain for 3 years. As SCM consultants our strategy would be to move these products/offload to the other distribution centers near to Mexico which is US. Other suggestion to offload the excess inventory would be giving promotion to increase the sales and get over the products out of the warehouse as soon as possible. This is up to California Glam Financial Analysts to revisit our findings and agree upon an approach to consume these excess inventory somehow so that it does not add as a cost to the company, Any way our data analysis suggests that this inventory will take minimum of 3 years for a turn around to generate cash for the company which in turn does not make any sense to the company as well it will create operational efficiency problem by taking the space in the warehouse of other high runners causing more financial losses . Currently it's a negative cash flow of the company which blocks their investment for other high runner products.

5.5.2 Second Recommendation to the company should be using our Inventory Management tool built with excel to streamline their processes and use for ordering by knowing the forecasted values of top 23 products. This will give them a flexibility to focus on the top runners and without piling up their inventory. This would improve their cash flow and they can use the excel built in tool for minimum and maximum inventory requirements for the subjected period to make data-based decisions of selecting the right products.

5.5.3 As per our intervention we have asked California Glam to re-negotiate the minimum ordering quantity of 1000 per product variant with a new approach to use the grouping of B and C type of products together seeing the forecast values and get it delivered in multiple PO schedule lines to get a run time of flexibility so that they manage the inventory better without losses of extra stocking.

5.5.4 In addition to the above recommendations we have recommended to California Glam to rely on more suppliers and also look for the opportunity to have their B and C type of color variants produced (local sourcing) in Mexico to get more value adds and efficient lead time and cost benefits; Also when California Glam gets a flexibility to deal with multiple suppliers help position them in better negotiation strategies and value benefits in terms of Financial and Operational.

6 Conclusion

The whole idea of California glam intervention was to identify their product catalog of 99 color gammas and how we can reinvent or strategize their plan to improve their supply Chain Management. We studied the history of last 6 months of their sales data and deeply introspected to find the product that actually matters for California Glam. Using last six months of data we wanted to intervene the products or categorize in such a way which are fast moving. The best way to do was using ABC analysis to find the top products out of 99 color variants. We found that there are only 23 products which was moving fast in sales of 6 months of data. Now to intervene this data further to have a better inventory management in place we tried to use Holt's Exponential forecasting method which gives a flexibility of smoothening parameters like alpha and beta which can be adjuster later based on our error accuracy actual vs forecasted. Since California Glam be a new company they did not had any inventory management system nor a supply chain strategy to manage their inventory because of which they had random orders placed and piled up inventory and also the demand being sensitive it was hard for Calfornia Glam to analyze or do a better forecast to manage efficiently. We used double exponential smoothening and forecasted the demand for next six months starting July. When we compared the forecasted data of July and Actual products sold in July , there was an error accuracy of 17% which we re-adjusted for subsequent months adjusting our alpha parameter in exponential smoothening. This improved forecast was eye opening for us as we found that California glam is having 76% of excess inventory which means their present inventory could only be cleared in 3 years. That means California Glam is not going to have any profit in next 2 years as they are excess in inventory. Now this is something up to the Financial Analyst to know that having these products which will be get sold in 3 years will not add any financial income to the company and also occupy the ware house space and cost. We recommended California Glam to look for possibilities to propose rebate on these excess products to take out of warehouse or look to move to other distribution centers. We also gave our inventory management excel based system to use so that they can do better planning and forecast and look for the demand every month for placing order efficiently without resulting in excess inventory. We have improved their internal ordering process by giving an excel based system and also helped facts to analyze their inventory and help take decisions which matters to the firm. In this competitive world we also requested California Glam to find other suppliers also and not to rely on a single supplier. We also recommended for low priority items to be locally sourced in Mexico if possible, This is how our intervention for California Glam opened many facts for their business and supply chain execution.

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