DEMAND FORECASTING AND INVNETORY MANAGEMENT IN GAGAN TOOL TECH COMPANY

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ABSTRACT

Demand forecasting and inventory management are crucial components of supply chain management, enabling organizations to optimize their operations, minimize costs, and meet customer expectations. This abstract provides an overview of the importance and challenges of demand forecasting and inventory management, as well as the strategies and technologies that can be employed to enhance operational efficiency and customer satisfaction. Accurate demand forecasting plays a pivotal role in inventory management, enabling businesses to determine the optimal inventory levels required to meet customer demands while minimizing costs associated with stock outs or excess inventory. However, forecasting demand accurately can be challenging due to various factors such as seasonality, market trends, customer preferences, and unforeseen events. This abstract highlights the significance of utilizing historical data, market research, statistical models, and machine learning algorithms to improve the accuracy of demand forecasts. In this study regression analysis been used to know the impact of inventory management on profitability and productivity, efficiency or turnover ratios have been used to know the fluctuations or demand for year to year, ABC analysis used to know control over inventory .

Keywords: Inventory; Demand; ABC analysis; efficiency; regression; forecasting

I. INTRODUCTION

The process of using predictive analysis of historical data to estimate and predict the future demand for a product or service by customers is known as demand forecasting. By estimating the total sales and revenue for a future period, demand forecasting helps the business make better-informed supply decisions. The tracking of inventory from manufacturers to warehouses and from these facilities to a point of sale is an essential component of inventory management. Keeping the right products in the right place at the right time is the goal of inventory management. Inventory can include any packaging, work in progress, finished goods, raw materials, or component parts, depending on the business. The main goal of inventory management is to make sure that there are enough products or materials to meet demand without making too much inventory, or overstock.

STATEMENT OF THE PROBLEM

Company is facing a problem on wrong estimation of orders, and they don't rely on margin which is affecting the profitability of organisation. Stock has a negative effect, and every organization needs to work for different things. Each stock organizer strives for optimal stock management. Because of the impact that having too much, or too little stock has on the business's health and viability.

OBJECTIVE OF THE STUDY

• To forecast the demand for inventory and to understand the inventory management procedures followed by Gagan Tools.

• To find the impact of inventory management on productivity of the company.

• To study the effectiveness of inventory management on profitability of the company.

I I . REVIEW OF LITERATURE

Gaurav Chawla and Vitor machado micel (2019) in the article demand forecasting and inventory management for spare parts - Because of its strategic significance in ensuring the availability of equipment and the continuity of operations, spare parts management is an essential component of many businesses' supply chains.

When compared to more conventional fast-moving goods, the demand for spare parts is naturally more uncertain in many supply chains. This is due to the fact that demand for spare parts is extremely sporadic, typically manifested by a prolonged period of time between orders that are followed by periods of an order signal. Companies tend to stock more inventories in order to reduce the risk of an irregular demand pattern because spare parts are so important to the operation's ability to continue.

Sagar .S (2019) in the article a study of inventory management in ABB India limited - The opportunity to consistently receive praise is presented to the organization. The project enables us to comprehend the organization's profile, Work process, and subtleties, enabling me to explore various avenues regarding experiences within the organization and allowing me to recognize content for my research. One of the vital pieces of collecting associations is stock organization of Stock Administration, the assessment decided for the examination, as the association has a place with the gathering industry. Stock Administration is management of non-advanced assets (endlessly stock things. An association of store network the leaders regulates the Stock Administration stream at the motivation behind offer from the Distribution centre and from these workplaces.

Aja Mathew, Prof.E.M.Somasekaran Nair and Asst.prof.Jenson Joseph (2013) in the article demand forecasting for economic order quantity in inventory management - In the uncertain economy of today, businesses are looking for new ways to stay ahead of their rivals. The quantities that should be purchased, produced, and shipped will be determined by forecasts of future demand. In this work, artificial neural networks (ANNs) and exponential smoothing (ESs) were used as training data to predict the demand for ammonium sulphate fertilizer. Sales data from the previous three years served as the training data.

Aris A. Syntetos and John E.Boylan (2008) in the article demand forecasting adjustments for service level achievements- Traditionally, demand forecasting and stock control are examined separately. Although this flaw has been pointed out in academic literature, little empirical research has been done on forecasting adjustments that address how forecasting and stock control interact. The relevant literature is critically examined in this paper. Following that, a comprehensive examination of the empirical performance of a few modifications and adjustments on slow-moving items is conducted. The individual demand histories of 753 intermittent line items from the Royal Air Force (UK) are included in the data set.

Rajat Bhagwat and Milind Kumar Sharma (2007) in the article performance measurement of supply chain management: A balance scorecard approach - A balanced scorecard that measures and evaluates day-to-day business operations from the following four perspectives is developed in this paper for supply chain management (SCM): customer care, internal business procedures, finance, and learning and development. The Balanced Scorecard was created with the help of a comprehensive literature review on SCM performance measures and three case studies, each of which demonstrates how BSC was developed and used in small and medium-sized businesses (SMEs) in India.

V. Viswanath Shenoi, T. N. Srikantha Dath and Chandrasekharan Rajendran (2021) in the article supply chain management in Indian manufacturing industries: An empirical study and a fuzzy approach - The free trade agreement's development over the past ten years has made it easier for goods to move around the world (Moore and Moore, 2003). Companies were able to compete in international markets with domestically produced goods without encountering trade barriers as a result. In addition, India's economic liberalization and subsequent reforms, such as Foreign Direct Investment (FDI), resulted in significant investments in the manufacturing sector, which not only presented an opportunity for the revival of the Indian economy but also increased competition (Kumar, 2005). Companies were forced to adopt an aggressive and integrated enterprise-wide risk management strategy as a result of globalization and fierce competition.

Salwinder Gill, Paras Khullar and Narinder Pal Singh (2016) in the article a review on various approaches of spare parts inventory management - Objectives: The motivation behind this paper is to effectively control the extra parts stock administration arrangement of different Associations.

Statistical Methodology: The strategy adjusted to concentrate on the targets was to control proficiently the extra parts stock administration arrangement of different associations and by investigating the holes of the framework and killing them by setting the rules for estimating of extra parts stock. Findings: Since inventory control management is the most crucial aspect of optimizing spare parts demand by effectively managing spare parts inventory in various aspects in accordance with the requirements of the organization, the paper provides a comprehensive literature review of various techniques for effective control of the inventory management system.

Kavya. B, Deetchika .R, Rahamani .V, Manju. D (2022) in the article food inventory demand forecasting tool - People are busy in today's modern world, and they can't live without food. People benefit from good food provided by food service providers. Be that as it may, they deal with an issue with stock determining. Food service providers rely heavily on demand and inventory forecasting. Products with a short shelf life and seasonal shifts are of greater concern to food companies. The demand may be affected by numerous hidden contexts and seasonal shifts, which is still not straightforward. For better handling of fluctuations in consumer demands, we present an ensemble learning strategy that makes use of dynamic integration of regressors in this paper.

Mosaddek Hassan Chowdhury, Tasfia Ahmed, Md. Bayazid Rahman, A.H.M. Saiful Islam (2023) in the article A smart inventory system with forecasting technique applied to efficiency handle industrial asset - In today's business environment, inventory management has become increasingly intriguing and complicated. While balancing a variety of costs, businesses are working to improve their warehousing operations. Consequently, inventory management is essential for meeting customer demands and maintaining product quality. In order to stop problems like overstocking or understocking, this paper outlines an efficient inventory management system that takes demand forecasting into account.

IⅠⅠ. DATA AND METHODOLOGY

Type of research: Exploratory data analysis is been used.

Data collection Method: Secondary data on Financial Performance. Research data that has already been gathered and can be accessed by researchers are referred to as secondary data. The term appears differently in relation to essential information, which is information gathered straightforwardly from its source.

Sample size: 5years of Balance sheet data and P & L account of Gagan tool tech.

Tools and techniques

1. Regression analysis is been used as a tool in excel to find out the impact between productivity and inventory management and profitability and inventory management.

2. Ratios related to inventory

3. ABC (always better control) analysis is been performed in excel form 2018 to 2022. An inventory classification method known as ABC analysis divides products into three groups based on revenue: A, B, and C. A' in ABC examination implies the main merchandise, 'B' shows modestly vital products, and 'C' demonstrates the most un-fundamental stock.

Hypothesis

1) H_0 – There is no significant impact of inventory management on productivity.

H_1 – There is a significant impact of inventory management on productivity.

2) H_0 – There is no significant impact of inventory management on Profitability of Gagan tools.

H_1 – There is a significant impact of inventory management on Profitability of Gagan tools.

V. DATA ANALYSIS AND FINDINGS

1. **Stock efficiency ratio (inventory turnover ratio) = Formula** – cost of goods sold / average inventory.

2. **Commodity efficiency ratio (raw materials turnover ratio) = Formula –**commodity consumed / average commodity   Commodity consumed = opening stock+ purchases-closing stock

3. In- process efficiency ratio (work-in-progress turnover ratio) = Formula – production cost / average in-process (Production cost – manufacturing expenses+ selling expenses + Administrative expenses+ personal expenses)

4. Finished product efficiency ratio (finished goods turnover ratio) = Formula – cost of merchandise sold / average finished product (Average finished product **=** opening finished goods + manufacturing expenses – cost of merchandise sold)

5. Comparability efficiency ratio (comparison turnover ratio)

6. Calculation of stock in days (inventory holding period) = Formula –Total days / stock turnover ratio (Total days = 365 days).

7. Calculation of commodity in days (raw materials holding period) = Formula – Total days / commodity efficiency ratio (Total days = 365 days).

8. Calculation of In – process in days (work-in-progress holding period = Formula – Total days / in – process ratio (Total days = 365 days).

9. Calculation of finished product in days (finished goods holding period = Formula – Total days / finished product efficiency ratio (Total days = 365 days).

10. Calculation of compatibility of stock in days (comparison inventory holding period).

1. Stock efficiency ratio (inventory turnover ratio)

Formula – cost of goods sold / average inventory

Table No - 5.1.1 representing Stock efficiency ratio from 2018 to 2022

Year	Net sales	Average stock	Efficiency ratio(cr)
31-3-2018	6,04,35,096	1,08,94,096	5.547509036
31-3-2019	6,02,24,079	2,03,03,045	2.96625846
31-3-2020	5,09,80,096	2,01,99,024	2.523889075
31-3-2021	5,02,42,036	1,07,37,025	4.679325605
31-3-2022	5,02,32,021	1,05,59,054	4.75724634

Source – Gagan tool tech company balance sheet and P and L account

Interpretation - The ratio of stock efficiency is shown in the pie chart. Year 2018 shows the most noteworthy turnover contrasted with rest of the years, in 2021 and 2022 there is brief changes. Essentially 2021 there is an extraordinary change. As a result, changes occurred frequently.

2. **Calculation of stock in days (inventory holding period)**

Formula –Total days / stock turnover ratio

Total days = 365 days

Table No – 5.1.11 representing Stock in days from 2018 to 2022

Year	Stock efficiency ratio	Stock in (days)
31-3-2018	5.55	66
31-3-2019	2.97	123
31-3-2020	2.53	144
31-3-2021	4.67	78
31-3-2022	4.75	77

Source – Gagan tool tech company balance sheet and P and L account

Interpretation – The stock in days is depicted in the above diagram. The stock in 2018 was 66 days, and in the years 2019, 2020, and 2021 and 2022, the period ranged from 123 to 144 days, which is bad news for the company. In 2016 however, the period was lower than in the other years, which is good news for the company.

Calculation of ABC (always better control) analysis for five years i.e. from 2018 to 2022 (inventory controlling technique)

Table ABC analysis for the year 2018

Class	Items	Value	Usage Volume	Cumulative%	% of items
A	Brass, Nylon, Aluminium 95.5% grade Stainless steel	6,57,96,000	64.89%	64.89%	20%
B	Helium, Alloy Steel, Scriber & Polymer	22060000	21.77%	86.66%	30%
C	98% pulse pure grade Mild steel Copper Washer & Angel Plate	13528480	13.34%	100	50%
		10,13,84,480			

Source – Gagan tool Tech Company

Interpretation - ABC classification is purely done based on Gagan tool Tech Company inventory, in the year 2018 in A category there are items consist of 4 items and the usage volume % is 64.89%, in B category the value consist of 21.77% and there items are 4, the category C consist of 5 items and the value is 13.34%.

Regression Analysis:

Dependent variable – inventory   **Independent variable –** net income

Regression Statistics	
Multiple R	0.153545174
R Square	0.023576121
Adjusted R Square	-0.301898506
Standard Error	613.1968081
Observations	5

ANOVA	Df	SS	MS	F	Significance F
Regression	1	27236.731	27236.73	0.0724361	0.80527114
Residual	3	1128031	376010.3		
Total	4	1155267.7			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	5995.0640	766.2196	7.8242	0.0043	3556.6110	8433.5169
X Variable	-0.01705	0.0633	-0.2691	0.8052	0.2187	0.1846

Source – Gagan tool Tech Company

Interpretation – The above table depicts that R value is 0.023576 i.e. 23.57% this value is between productivity and inventory it shows the variation between both of the variable, and the multiple R is 0.15**,** t static value of intercept value 7.824**,** significance F value is >0.05 hence H0 is accepted and H1 got rejected which shows that there is no significant impact of inventory management on productivity.

FINDINGS OF THE STUDY

• The Gagan tool Tech Company's inventory is the sole basis for the ABC classification. In 2018, there were four items in the Always category, with a usage volume percentage of 64.89 percent. There were four items in the Better category, with a value of 21.77 percent, and there were five items in the Control category, with a value of 13.34 percent.

• Stock efficiency ratio is depicted in the table above. The year 2018 has the most efficiency among the other years, with minor shifts in 2021 and 2022. In 2021, most of the change will occur. So there was an unending changes should be visible.

• The commodity efficiency Ratio. In 2018, it was 3.72, 2.01 in 2019, 1.51 in 2020, and 1.92 in 2021. The proportion was greater than the standard in 2022, when deals were also expanded. There was significant expansion in the proportion of unrefined substances consumed.

• The above outline portrays that in 2018 the work in progress proportion was 6.05, in 2019 6.02, there was an efficient decrease in 2020 and 2021 for example 4.75 and 3.97 and afterward in 2022 the proportion increment to 4.01. It decreases annually.

• Compatibility efficiency ratio is shown in the chart above. It portrays the increase in all four combined ratios—commodity efficiency ratio, In-process efficiency ratio, finished product efficiency, and stock efficiency—in the years 2019 and 2022, company yield also rises significantly. The rate is more for completed products than for the other three. In 2019, the rate of finished product produced per worker was 40.54, and in 2022, the rate of finished product produced per worker was 35.58.

V.CONCLUSION

By involving key stakeholders in the forecasting process, collaborative forecasting improves accuracy. Although historical data analysis is useful, this can be supplemented by other elements like market trends and customer behaviour. Forecast accuracy would be changed and real-time adjustments made using advanced analytics and machine learning techniques. Forecasting can be more precise and inventory system would be tailored thanks to demand segmentation. The reduction of lead times reduces inventory costs and increases responsiveness. Optimizing safety stock is essential for balancing customer demand and reducing excess stock. Technologies for demand sensing and real-time data increase adaptability to shifting demand patterns. Nonstop checking and criticism assortment assist with further developing gauging models over the long run. Inventory management and the performance of the supply chain are improved when demand forecasting and supply chain planning are combined. By inculcating these outcomes into their operations, businesses have the potential to increase inventory control, minimum costs, and increase customer satisfaction. Effective demand forecasting and inventory management enable businesses to adapt to shifting customer demands, effectively respond to market dynamics, and maintain a competitive edge in today's dynamic business environment.

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