

INVENTORY OPTIMIZATION OF A CONSTRUCTION AND SERVICES COMPANY – THIXOTROPIC MARKETING

Janlex D. Serrano¹, Jean Chadler B. Gerona², Ron Gabriel R. Capagcuan³,
John Paolo Severino⁴

Proponents¹²³ Adviser³

Lyceum of the Philippines University – Cavite, Philippines

DOI: <https://doi.org/10.5281/zenodo.8138512>

Published Date: 12-July-2023

Abstract: Thixotropic Marketing is a company that is currently experiencing a high rate of stockouts. It is known that this problem has been unaddressed for the past years. The purpose of this study is to improve Thixotropic Marketing's inventory management in Trece Martires, Cavite, by lowering the stockout frequency rate through implementing certain measures. Inventory management is a critical component of a business that, when done correctly, can improve a company's performance. Thixotropic Marketing is a construction and retail company with a significantly inadequate manual inventory system, which is a problem. Since the researchers were required to compare prior data to data acquired after measures under the methodology were applied, conducted, observed, evaluated, and calculated, the descriptive comparative approach was chosen as a design. This research emphasizes the differences in stockout frequency following the implementation and monitoring of safety stock, an unprecedented measure in this company. Sales and project consumption records and data were gathered, evaluated, analyzed, and compared to the results after the recommended measure was applied. The findings revealed a considerable decline in the rate of stockouts. These results suggest that the stockouts frequency rate significantly decreases and it appears that safety stock fulfilled the demands. On this basis, the concept of safety stocking should be implemented in the company appropriately and hereinafter.

Keywords: Stockout Frequency, Inventory Management, Thixotropic Marketing, Descriptive Comparative, and Safety Stock.

I. INTRODUCTION

Inventory is essential for all businesses. Raw materials, operational supplies, and finished commodities are all part of a company's inventory. Whenever people talk about inventory optimization, there are several different interpretations and definitions. Nonetheless, the whole objective of the optimization is to take advantage of every opportunity for cost savings. Optimization is not simply shifting costs from one location to another. In research from Davis (2016), optimization is all about the actual distribution of costs and the savings enjoyed by either the network as a whole or the end customer satisfaction. Davis also identifies some manifestations of inventory optimization depending on the characteristics of optimization. He remarked that at one time, the element may be *network architecture* to drive the optimum warehouse positioning. Another time it might be a *theory of constraints* project to uncover bottlenecks in the company's supply chain that can be smoothed out. Conversely, it might even be a project about *SKU (stock keeping unit) rationalization* for overall portfolio profitability (2016).

One of the most common problems in capital budgeting arises when the need for the use of an existing but currently unsupplied commodity or equipment is called upon. When this type of problem occurs, it results in inventory stock-outs, unobtained, some inventories are lacking, and deduction of sales and profits. A study of more than 600 retailers finds that

stock-outs are far more costly than most companies imagine, according to Corsten and Gruen (2004). Calculating costs is a daily practice for business owners, such as fixed costs (like equipment, amortization, taxes, rent, and salaries) and variable costs (like utilities, materials, wages, etc.) when optimizing their inventory, purchases, and sales. However, when doing so, there is one kind of cost that has always been neglected by some businessmen: *The cost of opportunity loss*. While astute retail owners significantly consider this element when doing business, most of them are still anxious to encounter this occurrence.

According to Macas, Aguirre, Carrion, and Peña (2021), inventory management has been increasingly critical to business success in the last few years. Inventory management and control systems are not widely advocated in academic research investigations. These vast amounts of literature are meant to be analysed and summarized. SME inventory management trends and indicators have been discovered through a rigorous literature review (SMEs). From 2015 to 2019, the retail industry was examined. In this study, there are several important findings, including the most popular inventory management systems and models, the KPIs used to measure their performance and the benefits and challenges of using or developing an effective inventory control system. SMEs, according to research, are less likely than large corporations to devote substantial resources to the implementation of high-tech systems, preferring instead to use rudimentary ERP software, as well as programs like Excel or paper-based inventories (Vanessa Munoz Macas et al., 2021).

II. METHODOLOGY

Black – Box Diagram

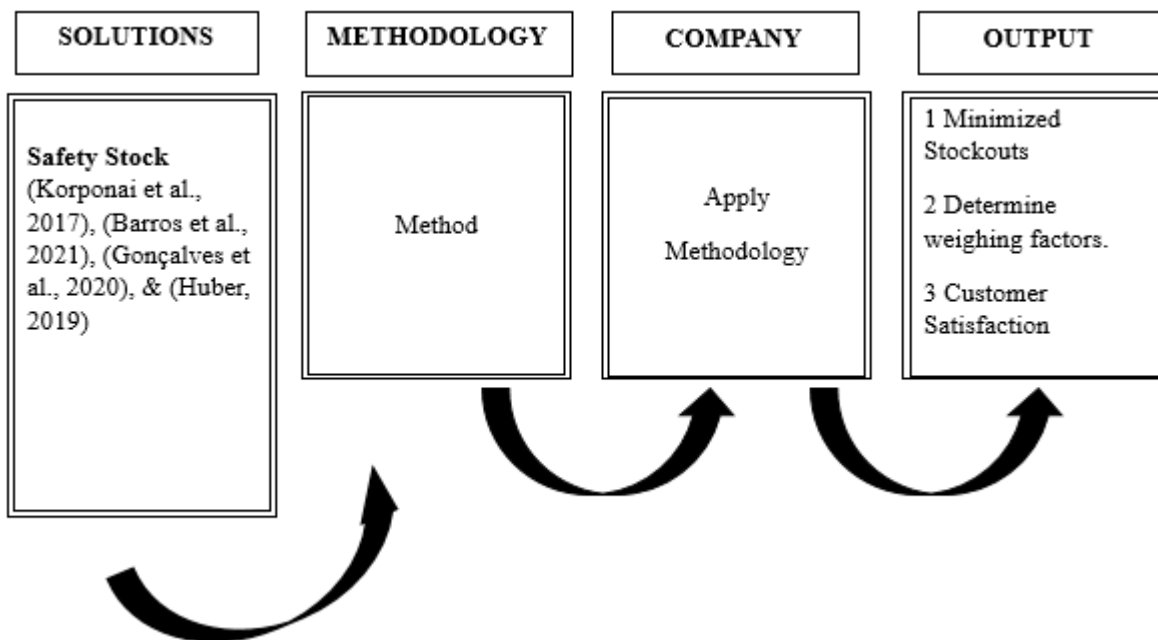


Fig. 1 Black – Box Diagram

Figure 1 shows the better grasp of how the research was conducted would be acquired by using the black-box approach. The black-box methodology, often known as black-box testing, is a type of testing that looks at an application's functionality without looking at its internal structures or working system. This testing approach can be used at all levels of testing, including unit, integration, system, and acceptance. Black-box testing is a type of testing procedure in which the tester has specialized knowledge of the work and develops test cases (methodology) to ensure that its functionality is accurate. **Safety stock** in a company's safety stock is an additional quantity of an item retained in inventory to lessen the chance of the item being out of stock. It serves as a buffer if an item's sales exceed expectations and/or the company's supplier is unable to supply extra units on time. Safety stock is a term used by logisticians to indicate a quantity of additional stock kept on hand to avoid stockouts. A shortage of raw materials or packaging is caused by supply and demand fluctuations. A sufficient supply of safety stock allows corporate activities to run as planned. Because the demand and sales of their products fluctuate every time and are therefore never constant, this strategy would be a huge assistance to the company if utilized properly.

III. RESULTS

Table 1: Frequency Rate of Stockouts 2022

Year	Frequency Rate of Stockouts (in percentage)	
	Before the Implementation of safety stock as proposed solution (January-March)	After the Implementation of safety stock as proposed solution (April-July)
2022		
Annually		
Quarterly	37.5	0
Monthly	12.5	0

The Frequency rate of stockouts in the first quarter of 2022 before the implementation and in the second quarter of 2022 after the implementation are tabulated. Hence, to calculate the frequency of stockouts, completed orders were divided by uncompleted orders and projects. The findings gathered in the second quarter of 2022, when the chosen solution, safety stock, was implemented, were compared to the results gathered in the stockouts quarterly before the implementation, which revealed a significant difference in the rate of stockouts. The results are further discussed in the results section.

The testing demonstrated a significant decline in the stockout rate, with no stockouts occurring after the proposed solution – safety stock, was implemented. The study found changes in stockout frequency using percentage change, which resulted in a 100 percent change because no stockouts occurred after the proposed solution was implemented. Because there is no ample time to accomplish it annually, a quarter- year is the best timeframe for testing the findings. As a result, the percentage rate of stockout frequency was compared using the statistical tool provided below:

$$\text{Where; Percentage Change} = \frac{\text{new value} - \text{old value}}{\text{old value}} \times 100$$

$$\text{Thus; Percentage Change} = \frac{v_2 - v_1}{v_1} \times 100$$

The researchers used the first quarter of 2022 as the comparable result to the results of succeeding months after the implementation of safety stock. It is shown here the percentage change of stockouts before and after the implementation by dividing the difference of new value and old value to the old value then multiplying it to 100.

2022 1st quarter and 2022s 2nd quarter percentage change, where the 2022 1st quarter stockouts reached 37.5% of stockout frequency rate quarterly.

$$\text{Percentage Change} = \frac{0 - 37.5}{37.5} \times 100 = -100\% \text{ change}$$

100 % decrease in stockouts

These results show that a significant change in the stockouts occurred after the implementation of the proposed solution which is *safety stock*. The result in change after the implementation of safety stock amounted to -100 where the negative indicates the decrease in stockouts, which is the main objective of the study.

IV. CONCLUSION

The main objective of this study was to minimize the stockout of a retail company – Thixotropic Marketing. The first objective was to determine the most significant weighing factors resulting to product stockouts. The second objective was to determine and compare the frequency stock rate prior and during the 3-month study where Safety stock was implemented in the company. Evaluating the customer satisfaction through feedback forms was the third objective. The efficiency of the implemented solution was determined through this 3-month study and was functional and efficient, according to the researchers' test and results. During the inquiry inside the company, out of nine orders and projects, zero was unfulfilled. The findings showed that not having a proper stock management significantly affects the stockouts frequency. Thus, the results showed that after implementing the safety stock, all these criteria were met as shown in the results. the occurrence of stockouts were eliminated. Ergo, minimization of stockout was attained inside the company – Thixotropic Marketing.

REFERENCES

- [1] Aastrup, Jesper and Kotzab, Herbert (2010) 'Forty years of Out-of-Stock research - and shelves are still empty', *The International Review of Retail, Distribution, and Consumer Research*, 20: 1, 147 — 164
- [2] Apuke, O. D. and Apollos, I. N. (2017). Public perception of the role of Facebook usage in political scampaign in Nigeria. *Informing Science: International Journal of Community Development & Management Studies*, 1, 85-102, Retrieved from: <http://ijcdms.org/Volume01/v1p085-102Apuke4069.pdf>
- [3] Barros, Júlio; Cortez, Paulo; Carvalho, Maria S. (2021) : A systematic literature review about dimensioning safety stock under uncertainties and risks in the procurement process, *Operations Research Perspectives*, ISSN 2214-7160, Elsevier, Amsterdam, Vol. 8, pp. 1-25, <https://doi.org/10.1016/j.orp.2021.100192>
- [4] Chao & Izaguirre. *Identifying the Root Causes of Stockout Events in e-commerce Using Machine Learning Techniques* (2021).https://dspace.mit.edu/bitstream/handle/1721.1/130986/Chao_dos%20Santo_project_Identifying%20the%20Root%20Causes%20of%20Stockout%20Events%20in%20ecommerce%20Using%20Machine%20Learning%20Techniques.pdf?sequence=1&isAllowed=y
- [5] Chuang, H. H. C., & Oliva, R. (2016). Erratum to 'Inventory record inaccuracy: Causes and labour effects.' *Journal of Operations Management*, 42–43(1), 96–110. <https://doi.org/10.1016/j.jom.2016.01.002>
- [6] Corsten, D., & Gruen, T. (2003). Desperately seeking shelf availability: an examination of the extent, the causes, and the efforts to address retail out-of-stocks. *International Journal of Retail & Distribution Management*, 31(12), 605–617. <https://doi.org/10.1108/09590550310507731>
- [7] Davis, R. A. (2016). *Demand-Driven Inventory Optimization and Replenishment (Wiley and SAS Business Series)* (2nd ed.). Wiley.
- [8] Esser, F., & Vliegthart, R. (2017). Comparative Research Methods. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/9781118901731.iecrm0035>
- [9] Gonçalves, J. N., Sameiro Carvalho, M., & Cortez, P. (2020). Operations research models and methods for safety stock determination: A review. *Operations Research Perspectives*, 7, 100164. <https://doi.org/10.1016/j.orp.2020.100164>
- [10] Hoskin, R. E. (1983). Opportunity Cost and Behavior. *Journal of Accounting Research*, 21(1), 78–95. <https://doi.org/10.2307/2490937>
- [11] Koh, S. C. L. (2004). MRP-controlled batch-manufacturing environment under uncertainty. *Journal of the Operational Research Society*, 55(3), 219–232.
- [12] Korponai, J., Tóth, G. B., & Illés, B. (2017). The Effect of the Safety Stock on the Occurrence Probability of the Stock Shortage. *Management and Production Engineering Review*, 8(1), 69–77. <https://doi.org/10.1515/mper-2017-0008>
- [13] Krugman, P., & Wells, R. (2020). *Microeconomics* (Sixth ed.). Worth Publishers.
- [14] Lum, Joseph, "On-Shelf Customer Availability Research: The Effects of the Day-of-the-Week, Product, and Category Characteristics on Stockouts" (2012). Marketing Undergraduate Honors Theses. 9. <http://scholarworks.uark.edu/mktguht/9>
- [15] McLaughlin, R., & Taggart, R. A. (1992). The Opportunity Cost of Using Excess Capacity. *Financial Management*, 21(2), 12. <https://doi.org/10.2307/3665660>
- [16] Milićević, N., Grubor, A., Đokić, N., & Avlijaš, G. (2018). Retail Out-of-stocks in the Context of Centralized and Direct Delivery. *PROMET - Traffic Transportation*, 30(1), 105–114. <https://doi.org/10.7307/ptt.v30i1.2466>
- [17] Oja K. (2018) *Reducing Overissues to Increase Inventory Accuracy and Minimize Impact to Company's Profits*. <http://digital.library.wisc.edu/1793/81219>
- [18] Palmer, S., & Raftery, J. (1999). Economics Notes: Opportunity Cost. *BMJ: British Medical Journal*, 318(7197), 1551–1552. <http://www.jstor.org/stable/25184862>

- [19] Qiu, M., & Dungca, G. (2015). An analysis of drug stock-outs in rural Western Kenya and subsequent patient impact. *Annals of Global Health*, 81(1), 197. <https://doi.org/10.1016/j.aogh.2015.02.953>
- [20] Sampaio, E. Q. D., & Sampaio, M. (2015). Managerial response to stockouts: the effect of remedies on consumer behaviour. *Production*, 26(1), 66–77. <https://doi.org/10.1590/0103-6513.156113>
- [21] Sanchez-Ruiz, L., Blanco, B., & Kyguolienė, A. (2018). A Theoretical Overview of the Stockout Problem in Retail: from Causes to Consequences. *Management of Organizations: Systematic Research*, 79(1), 103–116. <https://doi.org/10.1515/mosr-2018-0007>
- [22] Silver, E. A., Pyke, D. F., & Thomas, D. J. (2016). *Inventory and Production Management in Supply Chains* (4th ed.). CRC Press.
- [23] Stone, D. F. (2013). Clarifying (Opportunity) Costs. *SSRN Electronic Journal*. Published. <https://doi.org/10.2139/ssrn.2321382>
- [24] Vanessa Munoz Macas, C., Andres Espinoza Aguirre, J., Arcentales-Carrion, R., & Pena, M. (2021). Inventory management for retail companies: A literature review and current trends. *2021 Second International Conference on Information Systems and Software Technologies (ICI2ST)*. <https://doi.org/10.1109/ici2st51859.2021.00018>
- [25] Zakumumpa, H., Kiweewa, F. M., Khuluza, F., & Kitutu, F. E. (2019). “The number of clients is increasing but the supplies are reducing”: provider strategies for responding to chronic antiretroviral (ARV) medicines stock-outs in resource-limited settings: a qualitative study from Uganda. *BMC Health Services Research*, 19(1). <https://doi.org/10.1186/s12913-019-4137-7>