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A Study on Lean Manufacturing Techniques and the Impact of E-Commerce on Retail Stores

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ABSTRACT: This paper contains two incline activities, these strategies diminished the number of out-of-stock occasions which is caused in retail stores and expanded the arrange fulfillment rate which is fulfilled by the E-Commerce benefit. The primary activity, a esteem stream mapping (VSM), is to redesign the existing prepare within the new nourishment showcase. The moment activity included an successful stock administration framework utilizing the Kanban framework to optimize the distribution center of the E-commerce division, where FMCG items are put away. This paper illustrates the viable applications of incline apparatuses to move forward operational forms with physical stores.

KEYWORDS: value stream mapping (VSM), out-of-stock, inventory management, Kanban system, lean tools.

I. INTRODUCTION

Out-of-stock (OOS) may be a major issue in retailing since it decreases deals and diminishes shopper dependability. On-shelf-availability (OSA) execution has reduced due to destitute in-store recharging. Client arrange fulfillment primarily depends on OSA's execution in online retailing. E-commerce is these days plays a vital part in retailer's multi- and omni-channel technique, how compelling channel integration is and how it can be progressed. With the fast development of online shopping in later a long time, the opportunity to extend the nourishment e-commerce advertise has gotten to be self-evident. In any case, the special highlights and characteristics of unused items may make shoppers incline toward to keep the general store as their primary shopping channel.

II. SCOPE OF THE STUDY

Analyze how incline fabricating standards increment operational proficiency and client fulfillment in retail stores with physical and online channels. Investigate particular strategies such as esteem stream mapping, real-time planning, 5S strategies and persistent enhancement strategies (kaizen). Looking at how e-commerce stages influence stock administration, arrange fulfillment and client interaction in retail situations. Center on distinctive retail divisions (Eg: design, gadgets, basic supply) to see how incline hones fit into diverse situations. Assess quality and amount impacts, counting fetched decrease, conveyance speed, and client fulfillment metrics. Includes worldwide cases of stores that have effectively actualized incline hones nearby e-commerce procedures. Decide whether the inquire about ought to center on particular locales or the world.

III. OBJECTIVES OF THE STUDY

Analyzing how incline fabricating hones make strides operational effectiveness in promoting situations. Look at the relationship between incline operations and the adequacy of e-commerce techniques in retail stores. Analyzing the affect of incline hones on client encounter and fulfillment levels in brick-and-mortar and online retail. Distinguish effective case considers and best hones for actualizing incline fabricating hones related to e-commerce. Analyze the challenges marketers confront when executing incline hones in e-commerce operations. Give knowledge and significant proposals to stores looking to progress operations through incline operations and e-commerce methodologies.

IV. REVIEW OF LITERATURE

Sven - Vegard Buer, Marco Semini, et. al., (2020). The foremost later slant producers have grasped to look for operational execution enhancements is the utilize of a wide run of advanced advances ordinarily related with Industry 4.0. Be that as it may, few thinks about have explored the relationship between such innovations and the long-established incline fabricating space, and how they, together, impact operational execution. Based on information from a cross-sectional study of fabricating companies, this consider examines the connections between the utilize of incline fabricating, production line digitalisation, and operational execution utilizing various leveled numerous relapse examination.

Matteo Ferrazzi, Stefano Frecassetti, et. al., (2024). In any case, in spite of the natural association between Incline techniques and natural supportability, the academic investigation of their affect remains generally immature. This investigate looks for to bridge this crevice by conducting a comprehensive orderly writing audit to dismember the current understanding of Incline fabricating hones and their impact on natural maintainability execution. The chosen papers were fastidiously screened and gathered into three clusters utilizing the PRISMA graph strategy. The essential objective was to observe the substantial impacts of Incline hones on eco-efficiency execution and investigate joining Incline fabricating standards with broader maintainable fabricating approaches.

Luis Bedoya Jimenez, Carlos Chirinos Cuadros, et. al., (2021). As of now in commerce, the retail segment faces a number of issues such as destitute or powerless trade administration, nearness of squander, nearness of tall inventories, issues with client benefit, wastefulness within the work line, among others. This inquire about raises the address: What research has been tired the retail segment to know how Incline instruments seem offer assistance illuminate their current issues? The sort of inquire about that has been chosen is of narrative plan and for its improvement has been utilized the orderly writing audit of twenty-six (26) articles distributed between 2000 and 2020, chosen on the premise of keywords and which apply the reasoning of Incline fabricating within the retail division. The comes about appear that the application of the Incline strategy permits for superior trade administration, taken a toll lessening, expanded efficiency, moved forward client benefit, decreased inventories and shorter conveyance times.

V. RESEARCH METHODOLOGY

In analytical research, the researcher must use existing facts and information and analyze them to critically assess the material. Thorough research and review of available information to clarify complex situations. Analytical research is mainly about testing hypotheses and drawing conclusions and interpreting relationships by analyzing existing facts and information.

THE 14 PRINCIPLES OF THE TOYOTA PRODUCTION SYSTEM (TPS) DIVIDED INTO THE FOUR GROUPS:

1. Philosophy (Long-Term Vision):

Base decisions on a long-term strategy, even if it means prioritizing them over immediate financial objectives.

2. Process (Waste Elimination):

Adopt dependable and well-tested technologies. Implement visual controls to make problems easily identifiable. Standardize processes to facilitate ongoing improvements. Halt operations when a quality issue arises. Balance workloads to prevent bottlenecks. Design processes that expose issues early. Utilize pull systems to avoid overproduction.

3. People and Partners (Respect, Challenge, and Grow):

Value and empower employees and teams, encouraging their development and challenging them to improve. Foster strong relationships with suppliers by treating them with respect and helping them grow. Develop leaders who embrace and promote the company's core philosophy.

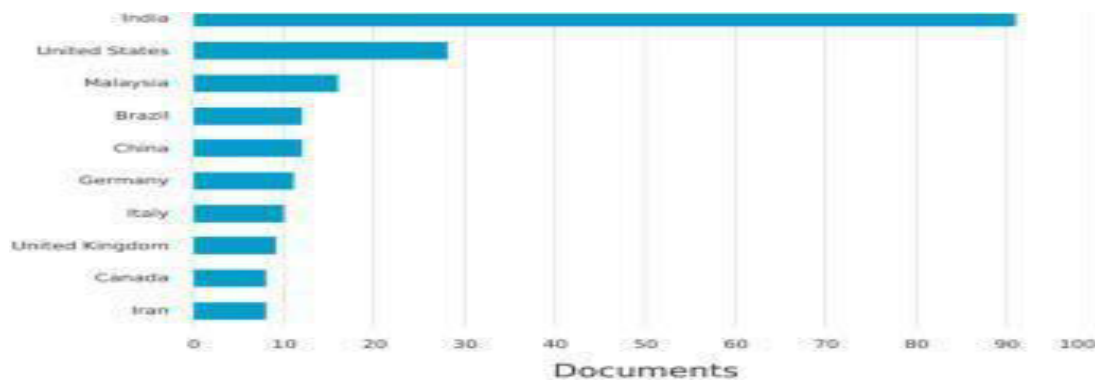
4. Problem Solving (Continuous Improvement and Learning):

Commit to continuous learning and improvement within the organization through Kaizen. Make decisions thoughtfully, considering all alternatives, reaching consensus, and acting swiftly once a decision is made.

VALUE STREAM MAPPING:

The VSM strategy is based on the taking after grouping of five unadulterated standards. Decide the esteem. Understand who the customer is, identify their needs, and define what "value" means from the customer's perspective. Map and analyze the value stream by outlining the flow of value, performing an analysis to identify value-added activities, and

pinpointing areas of waste within the process. This revision keeps the focus on customer needs, value creation, and waste identification within the value stream. Run the esteem. Plan, create and execute a future situation, with less squander scenarios, and esteem proceeds to stream to the client. Let the client get their esteem. Adjust the esteem stream and begin the stream when the customer's needs are met. Point for perfection. Repeat the alter to form future maps and keep making strides to discover the culminate one. The past stages take after a Plan-Do-Check-Act (PDCA) nonstop enhancement cycle.



INTERPRETATION:

This picture represents smart sustainable development through value stream mapping across the world. India is the top most country which uses 90% of usage when compared to the United States and Malaysia. Canada, the United Kingdom, and Italy are the countries with below 10% of usage in value stream mapping.

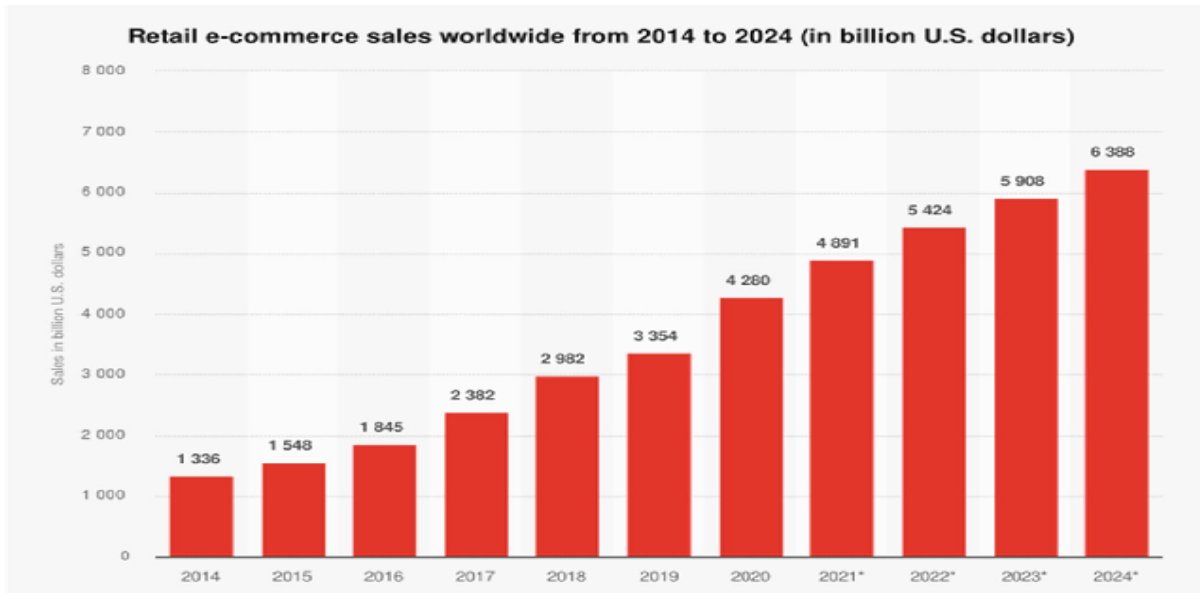
KANBAN:

Kanban is a subsystem of the Toyota Production System (TPS) designed to manage inventory levels and regulate the production and delivery of components, including raw materials. The term "Kanban" literally means "signboard" or "visual card" in Japanese. According to Taiichi Ohno, the concept of Kanban was inspired by inventory management practices in American supermarkets, where products are replenished as customers purchase items off the shelves. In this way, clients get what they need, when they need it, and within the amount they require. Kanban was created to flag development within the esteem stream. The Kanban framework gives a good form of visual control for administration to get it JIT generation. Basically, Kanban could be a signaling gadget that authorizes and gives enlightening to produce/drop or choose up/transfer things in a drag framework. Be that as it may, there are distinctive sorts of arrangements to execute a Kanban drag framework. Kanban does not cruel cards, commands, hand signals, flags, lights or other gadgets, counting electronic or computerized arrangements. Kanban can be classified concurring to their work, which suggests that there's a qualification between a single Kanban card framework and a twofold Kanban card framework. The last mentioned can be separated into outside kanban (moreover known as exchange or discharge kanban) and yield kanban.

VI. IMPACT OF E-COMMERCE ON RETAIL STORES

E-commerce has escalates competition, as buyers can effortlessly compare costs and items from different retailers online, regularly favoring lower costs and comfort. Customers progressively incline toward the comfort of online shopping, driving to a move in acquiring propensities. This incorporates a more prominent accentuation on quick conveyance and simple. Retailers have embraced omni-channel approaches, coordination online and offline deals channels to upgrade client encounter.

This incorporates administrations like click-and-collect, where clients purchase online and choose up in-store. E-commerce can decrease operational costs for retailers by minimizing the require for broad physical storefronts and permitting for streamlined stock administration. E-commerce gives retailers with important client information, empowering personalized promoting and stock based on client needs and obtaining designs. Retailers are utilizing just-in-time stock frameworks and utilizing e-commerce stages to way better oversee stock, diminish stock, and increment deals. in reaction.



INTERPRETATION:

This picture explains the retail E-Commerce sales worldwide. In the year 2014, \$1336 billion in sales happened which is the beginning of retail E-Commerce. In 2019, because of pandemics across the world, the total market in the retail industry was shrunken. After this, there was a drastic change in the year 2024 which indicates the increase of retail E-Commerce.

CASE STUDY:

The case study took place in a shopping mall near Lisbon, Portugal, in 2018, with data collected from that year. Therefore, the research findings are unaffected by the impact of COVID-19. In addition to its physical store, the hypermarket operates an e-commerce warehouse that serves the Lisbon metropolitan area. This warehouse holds 600 high-demand consumer goods, including best-sellers, while some high-volume items are stored and shipped when customers place online orders. Other products, such as new releases, are fulfilled directly from the physical store. The purpose of this case study was to improve the "order fulfillment rate" for the online business, a key performance indicator (KPI) used to assess the level of service provided to customers.

PROBLEM STATEMENT:

The order fulfillment rate was identified as a key performance metric, and its performance was deemed unsatisfactory.

VALUE STREAM MAPPING:

Step 1 - Defining the Customer Value Stream: The value stream to be improved includes all processes involved in handling product pallets: inspecting them, separating pallets, and ensuring the correct version of goods is placed in the right location. It also involves implementing a FIFO (First In, First Out) system for storage, replenishing items at the point of sale, and removing damaged products. There are two types of customers in this value stream: those who make online orders and those who shop in-store.

Step 2 - Mapping the Current Value Stream: This step involves creating a map of the current process flow, which includes the movement of products, people (including service users and stakeholders), and information throughout the value stream. To create this map, individuals from different departments need to actively engage with the process by observing it directly ("go and see"), tracking the flow at each stage, and understanding how each part of the value stream interacts.

Step 3 - Identifying Kaizen Opportunities: The previous step helps the team pinpoint inefficiencies and areas for improvement within the value stream. These opportunities are the focus for process enhancement and continuous improvement.

Step 4 - Mapping the Future State: Based on the identified improvement opportunities, a new value stream map is created, representing the desired future state. In this revised model, the e-commerce department sends a daily list of products to temporary workers for collection, operating similarly to a Kanban system. By eliminating unnecessary obstacles, the new process enables workers and stakeholders to operate more efficiently.

Step 5 - Implementation, Comparison, and Monitoring: The operational plan, including the identified improvements, was developed, planned, and implemented in the following weeks. Standard operating procedures were created, and all participants were trained accordingly. Key performance indicators (KPIs) were established and are regularly monitored to ensure improvements are being realized as per the operational plan.

KANBAN:

Step 1 - Inventory Management Models and the Kanban System. This step involves describing inventory management models, with a focus on implementing a Kanban system. A specific type of Kanban card was selected to serve as a visual inventory management tool for the marketing warehouse. The goal of using this system is to reduce inventory risks, as measured by the Out-of-Stock (OOS) rate at this location. The Kanban card was designed to include two key pieces of information: the order code and the order quantity, both of which are critical for the inventory process.

Step 2 : Process testing with Kanban cards. Different iterations of the Kanban card pattern were produced, tested, and proposed. On a platform, the tests got underway. This made it easier for staff members to comprehend and use the new procedure, which entails just scanning the EAN code upon arrival at the order point to initiate the order process and digitize the quantity of units, arranged.

Step 3: Kanban procedure and card validation. The idea was first tested on a particular platform before being introduced to the whole gourmet market and, finally, to every warehouse shelf.

Step 4: Like the VSM project, step four involves putting the new procedures and management plan into place, deciding on them, and keeping an eye on them in order to reach the target KPI (OOS in the warehouse e-commerce)

VII. RESEARCH RESULTS

- This research represents the first published study examining the impact of Lean process improvements specifically through the use of Value Stream Mapping (VSM) and Kanban on key operational metrics in both physical retail stores and e-commerce operations.
- While not all of the company's stores adopted the FV market replenishment method, a few did implement it.
- Standardizing procedures across different stores can be challenging due to the varying levels of autonomy each store has. However, the Kanban card solution described earlier was successfully implemented at a store in northern Portugal. This location, which operates a smaller e-commerce warehouse holding around 250 fast-moving consumer goods (FMCG) references, was able to reduce its daily stockouts from eight to three.

VIII. LIMITATIONS AND FUTURE DIRECTIONS

- To the authors' knowledge, this is the first case study published that applies Lean methodologies to simultaneously improve operations in both e-commerce and physical retail environments.
- While some interactions between the two types of processes were examined, a limitation of the study is that it was carried out at just one store.
- Additionally, this study was conducted in a large retail setting, suggesting that future research could benefit from exploring the application of Lean principles in other types of stores to broaden the findings.

IX. SUGGESTIONS

- It is necessary to extend the application of the method described to food markets other than FV.
- The research should be done on other stores with different size layouts.
- The application of the Lean Six Sigma program in marketing, as there is very little current literature on this topic.

X. CONCLUSION

The effectiveness of this metric is influenced by the Out-of-Stock (OOS) levels within both the store and the associated e-commerce-managed warehouse located in the store's backroom. The reduction in OOS within the warehouse was achieved by implementing a simple inventory management method, utilizing a visual Kanban card, which highlighted the value of this Lean tool. The warehouse holds over 600 SKUs of high-demand items from the FMCG category. Efforts to reduce OOS in the store itself focused not on these high-demand items, but rather on new product categories, particularly FV (Fast-moving/Value items). A value stream management approach was applied to design and implement a faster replenishment process for these products. The outcome of both initiatives was a significant reduction in OOS occurrences, driven by notable improvements in order fulfillment rates.

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