

“Impact Of Artificial Intelligence In Inventory Management With Reference To Watasale, Kerala”

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Abstract:

As with the advancement of growth and technology, the industrial revolution has been speeding up at a fast pace and many businesses and retailing of businesses with technologies has been growing up tremendously with latest technologies. Most of the technologies are into automation with the use of various technologies like Robotics, RFIDs, IoT, and AIs etc. With reference to such automation this project has been taken into account with a view to studying the business process in retail sectors and its impact on Inventory control. The technological impact of AI has been taken into account and with respect to inventory management has been studied under Watasale store in Kerala.

Keywords: Artificial Intelligence, Retail store, Inventory Management, FEFO – FIFO methods, Watasale store, IOT, walkout technology.

1. INTRODUCTION

The retail store in Kerala, ‘Watasale’, located at the Gold Souk Grande Mall in Ernakulam, Vytilla, Kochi, happened to be the first ever autonomous store in the country that claims to give the customers a very interesting and a different way of shopping with cashier-less exit. This ‘Just Walk-out Technology’ is all about making an entry, browse, shop and walk-away and happens to be the exactly the same that shoppers go through where Amazon gives its customers in the form of ‘Amazon Go’ App and its technology implemented and set up in Seattle, US. The Kerala-based AI automated retail store is totally autonomous with its back-end operations having their

autonomous strategies and are able to give customers a new experience in India. 'Watasale' is India's first automated retail store opened in Kochi, Kerala, offers shoppers a unique 'checkout-free' experience using a combination of advanced technologies like artificial intelligence, sensor fusion and computer vision. So taking reference with this Watasale store, the inventory management has been taken into account and how Artificial Intelligence has been helping it out or managing the processes.

Technologies used by store:

A synergy of Deep Learning, Computer vision as well as Sensor Fusion is being used or implemented in the store.

Computer vision:

Easy to install cameras is the major component of this technology. The cameras are fitted such that the customer privacy is not compromised (no facial recognition). As computer vision advances, it's easy to imagine all sorts of life-improving innovations in store.

Deep Learning:

Deep Learning is used to analyze the interactions with the customers and the store.

It has the characteristics:

- Multiple Layers of Classification
- Novel techniques to items of any shapes
- Novel techniques used to give results in minutes
- Deep Learning is used to make predictive analysis.

Sensor Fusion:

It is a combination of different sensors. Multiple sensors are used to complement the computer vision. Pressure, stress, light sensors used in this completes the technology stack. The combination of sensor fusion and computer vision gives credibility to the results.

- Sensors smoothly integrates to the store.
- Ample data for AI to make decisions
- Makes the technology foolproof.

Artificial Intelligence and its Impact

Artificial intelligence technology has made some interesting advancements across multiple industries. Unobvious to the end consumers, artificial intelligence has been applied in the retail sector as well. Even though not every retailer has been using it due to high costs, inaccessibility and proprietary systems, the largest players in the retailing have been pretty active about it. It's no wonder given the benefits AI can bring to the actual businesses.

Retail AI can learn about customers, their preferences and their behavior to get to know them. And, in the recent years, it can get to know them so well that it knows what they need and when they need it. And it knows this before even they do. When AI is capable of producing such information on the fly, there are numerous benefits that can be obtained immediately for the business cash flow and the general experience.

2. LITERATURE REVIEW

According to the Richu Jose, **Chief Operating Officer (COO)** of Watasale, (Varma, 2018) explains that they use a combination of touch sensors, AI (artificial intelligence) and computer vision—pretty much the same technology as in a self-driven car. He also mentioned that they are looking at the big data analytics about the products being bought to get information about inventory, as they are not venturing anything that is risky that will compromise customer privacy.

As stated by the **CEO** of Watasale, **Subhash S**, that it is a misconception that stores operating on AI require less personnel, in fact they will need more personnel who are skilled in stock management, managing back-end logistics and keeping the tech smoothly running.

Just Walk-out Technology of Amazon Go

Writing of Amazon Go, it is a chain of grocery stores operated by the online retailer Amazon, with three locations in Seattle, Washington, two in Chicago, Illinois, and one in San Francisco, California. The stores are partially-automated, with customers able to purchase products without being checked out by a cashier or using a self-checkout station.

According to (**Weinberger, 2018**), the whole point of Amazon Go is that there are no lines, no cashiers, and no waiting. Those turnstiles seen there are the closest things to cash registers — where we scan our phone as you walk in, and that's pretty much it.

Heather N, (N, 2018) from Las Vegas said that felt like she was in the future. She had to check out Amazon Go while in Seattle. She expressed she would love this technology to be more widely available. The other stores in downtown Seattle and South Lake Union have a smaller selection of items to choose from and feel more like a convenience store than this store. While this store has the convenience store feel, it does offer the luxury of being next to a park space which makes for a nice place to have a picnic during the warmer months.

According to **Jon L**, it is the first store and still the best. While a couple new Amazon Go stores have opened up, this one still reigns supreme because it is the largest of them all.

Lisa W, from Orlando says that, Amazon go is such a neat concept. A convenient store where you can leave your wallet at home while you shop and check out without any human interaction. After conducting an analysis of customer activity at Amazon Go's flagship store over several days, data analytics firm Brick Meets Click estimates that the store generates \$2,700 in annual sales per square foot of selling space, with an average of 50 inventory turns per year.

According to **Boon C.** from Tampa, Amazon Go is basically a tourist attraction now near Amazon Headquarter. It first virtual shopping. One can download the Amazon Go App before you walk in. Then they track your movements around the store. One can pick up the items and return the item to same place. One important thing is not pick up the item and pass to next person and return to the place. This will count against you as a buy. You can find the chef or work cutting and assemble the fresh food on the window. They have full components kitchen to bake, cook, or made the fresh food of the day.

3. METHODOLOGY AND DATA COLLECTION

Research Methodology used in this study is the **exploratory research methodology**.

Exploratory research helps determine the best research design, data-collection method and selection of subjects. It should draw definitive conclusions only with extreme caution.

The type of research is about the problems identified therein and to construct a model for them in which the automated processes are not hampered by the customer. The research is about studying the operation process of the retail outlet how the automation occurs and it gives an insight to the customers experiencing it.

A brief study of the working of the Autonomous AI based retail store, Watasale is carried out and an outline of processes involved in purchasing of the items is made. The awareness of the technology, downloading of the Application and experiencing, right from the processing of the payment while exiting the store while understanding the inventory of their automated processes and flow of materials is made.

In exploring the technology involved in the store, the problems need to be identified so that the methodology as well as their automated processes, systems do not get effected while implementing the strategies.

Exploratory research often relies on techniques such as:

- Secondary research - such as reviewing available literature and/or data
- Informal qualitative approaches, such as discussions with consumers, employees, management or competitors.
- Formal qualitative research through in-depth interviews, focus groups, projective methods, case studies or pilot studies.

VARIABLES TAKEN FOR STUDY:

Variables taken are Inventory Management, Lead Time, Re-order Point, and Product Type

- Inventory management:**Good inventory management revolves around a single contradiction:** keeping enough stock in the warehouse to ensure the business keeps moving but not enough stock to drain its limited cash reserves.
- Lead time: The Lead Time is the delay applicable for inventory control purposes. This lead time is usually computed in days.
- Re-order point: The **reorder point (ROP)** is the level of inventory which triggers an action to replenish that particular inventory stock.

Reorder Point = Normal consumption during lead-time + Safety Stock

Reorder level = Average daily usage rate x lead-time in days

MODEL SELECTED

FIFO Method:

FIFO is a method of asset management and valuation. It operates under the assumption that the assets that are produced or acquired by a company first are sold, used, or disposed of first. Therefore FIFO Inventory Valuation means, First In (first items to be produced) First Out (First items to be sold).

METHOD OF SAMPLE SELECTED

The method of sample selected is the Non Probability Sampling Method.

Non-probability sampling represents a valuable group of sampling techniques that can be used in research that follows qualitative, mixed methods, and even quantitative research designs. When following a qualitative research design, non-probability sampling techniques, such as purposive sampling, can provide researchers with strong theoretical reasons for their choice of units or cases to be included in their sample. Rather than using probabilistic methods, i.e., random selection to generate a sample, non-probability sampling requires researchers to use their subjective judgments, drawing on theory i.e., the academic literature and practice i.e., the experience of the researcher and the evolutionary nature of the research process.

The non-probability sampling Method used here is judgmental sampling in this exploratory research. Exploratory research is widely used when researchers aim at conductive qualitative research, pilot studies, or exploratory kind of research.

PROCEDURE ADOPTED TIO COLLECT DATA

Procedure adopted to collect data is the **Interview Method** by Qualitative Analysis.

Data collection is an essential component to conducting a research/ an evaluation. In order to collect data, the researcher should be able to access the data that needs to be collected for the study. The nature of the data for collection determines the method to be employed in collecting this data. Interviewing as a data collection method, particularly focusing on its value, strengths and weaknesses.⁴

Interviews are a key qualitative data collection method for social research. There are many reasons to use interviews for collecting data and using it as a research instrument. They are mainly useful in cases where there is need to attain highly personalized data, as well as in cases where there are opportunities for probing to get underlying factors. They also become a viable option where there are limited respondents and a good return rate is important, and also where respondents are not fluent in the native language of a country, or where they have difficulties with written language. The main advantage of interviews stems from their capability to offer a complete description and analysis of a research subject, without limiting the scope of the research and the nature of participant's responses.

In questioning them the questions were prepared in a word document, the main criterias needed to know as discussed and were put to them. The rest were the queries and the doubts that arose and put to them in order to experience a wider and a broader view of the technology and if any possibilities of improvisations needed to resolve out of it.

4. ANALYSIS OF DATA

The primary data was collected by visiting the store, and by studying the outlet and its functions, displays, arrangements of items, placing of the cameras, turnstiles, entry and exit gates etc. The monitoring of the store and studying of the inventory management done and right from the start till processing and manning of the store, customer experience and feedbacks have been questioned. The outline of the rules can be stated as follows:

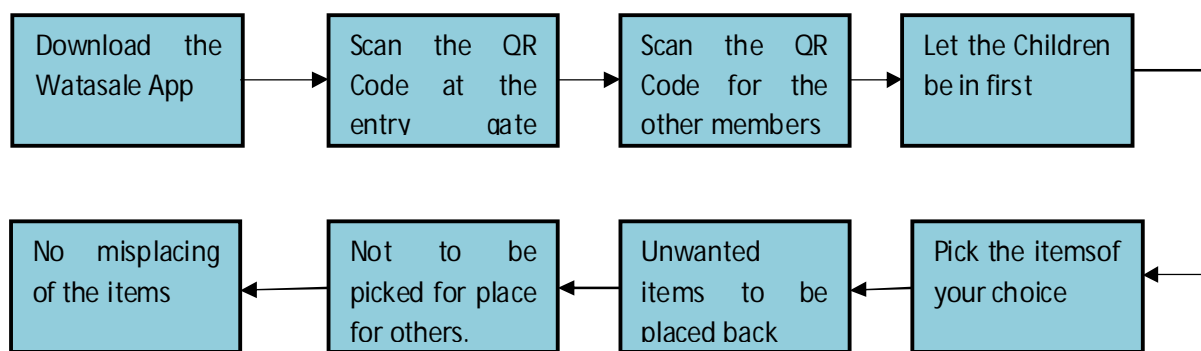


Figure 4.1 Outline of rules

Through Qualitative Analysis for deriving the hypothesis or developing ideas and to gain an underlying reasons, opinions and motivations understanding the technological and automation processes from the store the main concept involved to research is the dealing of inventory and flow of materials.

Based on this a small set of questions have been prepared that were being answered as a part of it and helpful for deriving some useful information. On the other hand, the other unstructured questions through the interview method have been clarified with responses by shooting some instant questions that tickled at the moment.

5. OBSERVATIONS AND DISCUSSIONS

The observations made while visiting the store regarding the information are in the form of structured and unstructured questions. Few of the observations are as follows:

1. Fixed Order Quantity System is followed.

2. Watasale maintain a safety stock in case of any emergencies like stock out or something at the distributor level.
3. For inventory management, Watasale has a custom ERP software according to its needs. All the physical inventory count, costs, vendor accounts, lead times etc. are managed through it.
4. Accordingly, once a product has been picked up and the space remains empty, the sensors senses it and immediately gets notified in the systems and claims for an immediate refillment or purchase of the items or next level of stock soon.
5. There are specific algorithms designed for each unit of product of the same type meant to be on the shack or the row, so the misplacing of the items accidentally may hamper or alter the configuration and the right information, updation and alteration could be a problem in the Software.

The inventory management in Watasale is managed with a custom made automated stock information and updation of the items in the store. Mainly their systems are automated with the appropriate and adequate information regarding the stock of the items they put and arranged in an order. The store has a tie up with some retailers from where they get the items they needed to refill immediately.

The fixed amount of inventory can be replenished at a time when the inventory level reaches the auto set reorder point or the minimum stock level. This order point is set at a level whereby there is sufficient inventory to cover the demand from the time material is ordered from the retailers or distributors until it is received in the store.

The auto-reorders point is linked with the pre-fixed amount of inventory in the system, which automatically places an order with the retailer for the maximum stock capacity, as soon as the inventory level reaches its minimum set-point. The store sets the maximum and minimum stock capacity based on its storage space and the sales trend.

Existing Model

Watasale Kerala follows a FIFO Model showing how the products are arranged in a row after being brought from the other retailers or the distributors. The first batch of the products are being arranged or put or queued in the shacks accordingly with the listed number of products to be sold first. The lead time is less and therefore the ordering the required inventory often is the agenda. This ordering small amounts of inventory more often based on the accurate data regarding sales of their products and realistic forecasts updated in their systems, help increase the rate of inventory turnover, lowering the cost of carrying inventory. This also helps in to keep a track in inventory to stay in control because it helps in determining how much exact inventory available in real time, what customer demand has been in the past and eliminate inaccuracies in stock count.

Proposed Model: FEFO Model

FEFO is first expired, first out, which means the product that reaches expiration first will be sold first. Expiration dates are important because companies use them to eliminate the possibility of selling expired goods to consumers. This will make the business more profitable. This method is useful for companies working with perishable goods to maximize inventory.

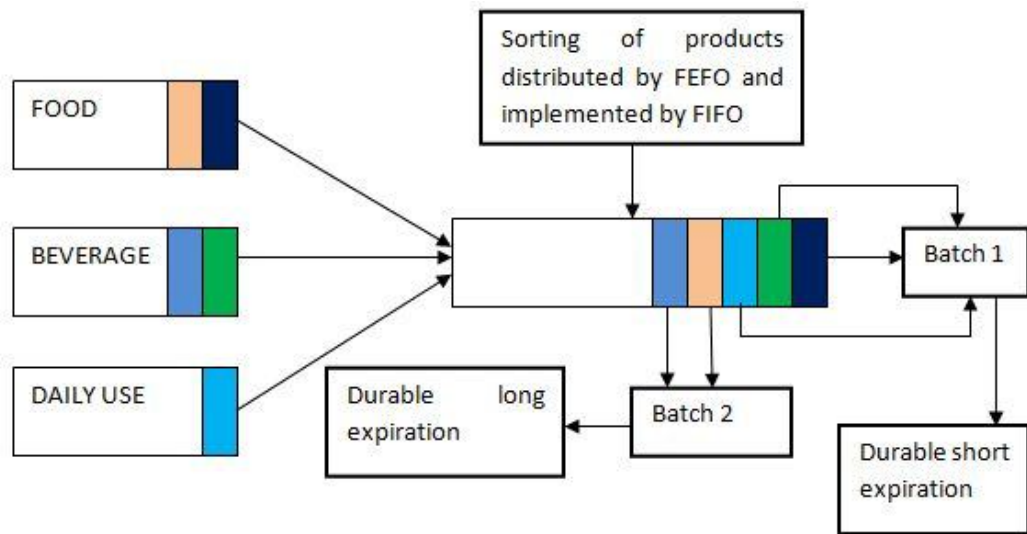


Figure 4.3.1.1: A depiction of proposed FEFO-FIFO method

FEFO and FIFO are inventory management methods that help control logistical processes, of consumption or distribution of products. By practicing FEFO and FIFO, companies and can have very high standards for safety and quality of products. The life cycle of products to manage its shelf life is the axis of inventory management practices FEFO or FIFO, the logistical processes of the operation depend on date driven factors that determine how you prioritize the distribution of an inventory.

FINDINGS:

- The experience mainly is thrilling out people in exploring a new technology of AI
- The processes are automated and it is manned by atleast one person to help customers seeking queries or facing any issues
- Related to technology, it is been fantastically brainstormed into a similar concept of Amazon Go that has vision-cameras, sensors, computer vision all into AI.

- AI do not detect the expiry dates
- AI may (in rare cases) face issues while similar like people with same shape structure color enter the store after some time
- The algorithms were designed specifically for particular shacks and its product aligned and the number of units.
- Misplacing of products by people accidentally may cause problem and therefore they are notified very well in each shack.
- The products are to be well arranged as the lead time too is less and therefore with the help of FEFO and FIFO model they can seem to be convenient and may require less time in manually handling and checking out products from time to time.

6. SUGGESTIONS AND RECOMMENDATIONS

- The systems need to update a software by which they can assign a lot number to each product based on expiry date. This can help tracking the nearing of the expiry date and get updated in the systems quickly.
- Improvisations needed for more like facial recognition with the systems while people enter the store, so that the systems need not face problem in future if it fails to distinguish between same structured people.
- Payment procedure can be more made convenient, as to pay at the specified time provided else one can flee to never get contacted.
- Return policy can be updated if possibly manually, and so the lot number has been suggested so that people do not have to find issue sitting home and registering for return or refund. It can be an optional just in case.

7. CONCLUSION

The exploratory study made with respect to the Watasale, Kerala has been wonderful in experiencing the technology as well as learning the management of the store as well as the models involved in and the materials flow. Based on their custom made inventory model that runs with the help of an automated software, autonomously made by them the store handles the

refillment and the ordering based on the sales of the products. The technological impact has been great and they claim the systems work quite well in handling the automation and the experience has been great to people by far and did not seem to face much issue. It is a wonderful example of the technological advancement of our country as it has been recently opened after brainstormed by a team of 3-4 members. The inventory model is a custom made one and based on the expiry date of the product, a model FEFO-FIFO has been suggested to carry out the manual handling of the products to arrange it systematically.

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