

**Leveraging Predictive Analytics to Reduce Non-value adding activities in Brick and Mortar stores via use of Smart Cart.**

Manav Jain

Student

Prin. L. N. Welingkar Institute of Management Development and Research, Mumbai

Mumbai, India

[manavjain76@gmail.com](mailto:manavjain76@gmail.com)

Tanisha Singh

Student

Prin. L. N. Welingkar Institute of Management Development and Research, Mumbai

Mumbai, India

[tanishasingh2109@gmail.com](mailto:tanishasingh2109@gmail.com)

Rohit Kunnath

Student

Prin. L. N. Welingkar Institute of Management Development and Research, Mumbai

Mumbai, India

[rhtsmn93@gmail.com](mailto:rhtsmn93@gmail.com)

Pranjal Metange

Student

Prin. L. N. Welingkar Institute of Management Development and Research, Mumbai

Mumbai, India

[pranjalmetange@gmail.com](mailto:pranjalmetange@gmail.com)

## **Leveraging Predictive Analytics to Reduce Non-value adding activities in Brick and Mortar stores via use of Smart Cart.**

### **ABSTRACT**

The conventional shopping culture of purchasing at mom and pop stores, departmental outlets, kirana and brand stores has been diminishing due to the growth of e commerce. Around 2005, several online shopping outfits emerged to cater to the needs of young and tech savvy consumers who were parched on time and energy to shop physically. However, the brick and mortar stores have lost to competition from ecommerce mainly due to factors such as cost, time and need based display of products. It would be of interest to understand if integration of technology into brick and mortar stores to address these 3 factors through the use of smart carts can induce a shift in the consumers who prefer the ecommerce model for shopping.

The study will be conducted in two phases. Phase 1 of the study engages to identify various non-value adding activities confronted in the store by the staff through the method of observation and in-depth interviews on 60 store managers and staff members. Stores with 2000 sq ft of area have been considered as sample of the present study. Phase 2 of the present study would involve devising a model based on predictive analytics that can be used to develop a smart cart which will eliminate non-value adding activities identified in phase 1. The study intends to develop a smart cart model that would assist in improving conversion rate from mere selection to purchase, effective advertising, instore experience of the customers and effective shelving of the products.

Keywords: Smart cart, Predictive analytics, Non value adding activities, Conversion funnel, Retail, In-store Navigation.

## **INTRODUCTION**

Since a long time, business headlines have been screaming about the downfall of brick and mortar stores at the hands of e-commerce. Consumers are driven towards physical stores due to gratification whereas the major factor driving them towards online stores is convenience. This paper focuses on bringing the physical stores at par with the online stores in terms of provision of services. This can be done by leveraging predictive analytics to reduce the non-value adding activities in brick and mortar stores via introduction of smart shopping carts and IOT. Customers spend long time waiting at the queues during billing. Finding a product in retail stores also takes time. These problems can be countered by developing a smart shopping cart equipped with bar code reader, RFID reader, smart tablet and weighing machine. This will help automate the billing process and ease the process of in-store navigation providing easy accessibility of products. The inclusion of smart tablet will also help in providing engaging information to the customers which will help in increasing the in-house sales. The integrated smart tablet will also be provisioned with the feature of product recommendation. Also, smart tablet can be used to display store advertisements, thereby increasing physical store sales. This will help improve the quality of services provided at the retail markets and bring them in accordance with online stores. At back end, the data collected by inclusion of technology into shopping will also help in customer profiling, and understanding the theory behind customer motivation. It will also capture the user journey that will analyze the customer buying decision. All these services will help in enhancing the shopping experience of customers in physical stores.

## **REVIEW OF LITERATURE**

### **2.1 NEED FOR SMART-CART**

The shopping habits of the customer have been changing at a fast pace. Shopping habits today speak all about convenience. The need of the hour is to provide hassle free shopping experience to the customer. This means making all of your services accessible so that they remain of relevance to the customer. This brings into picture the need for a smart shopping cart. The goal here is to save time of the customers that is being spent on non-value adding activities. A study was performed on 1474 customers to understand their perception about smart shopping and to develop a measure for the same. The study showed that smart shopping for the consumer meant minimizing their expenditure of money, time, and energy to gain a hedonic experience (Kelly Green Atkins and Youn-Kyung Kim, 2013).

The retail giant, Walmart has started working on the development of driverless shopping carts since June, 2016. Walmart has seen a drop in their revenues for the past 12 years since the advent of online shopping stores. To keep up with the competition and provide the consumer with the same convenience as that of the online stores, Walmart took the decision of introducing driverless shopping carts. This cart can enable the customer to scan and purchase item using their mobiles without having to wait in the billing line.

Focal Systems, a startup from Silicon Valley, established in 2015 makes use of computer vision and machine learning technology in the tablets mounted on the shopping carts. They help in viz. real-time out of stock detection, location based promotion and advertising, in-store navigation and product search, and automated checkout. They basically work on to evolving the shopping habits in the brick and mortar stores and help in bringing the services at par with those of online stores.

### **2.2 PROBLEM OF BILLING QUEUES**

Long waiting queues for billing is one of the major problem faced by all retail brands. This leads to customer dissatisfaction during the check-out process. Billing also involves lot of manpower and resources at the counter which tends to be expensive. A solution was proposed to automate the billing process. This prototype is reliable as raspberry pi systems are combined with Image Processing technique. The decision-making process is done locally within the cart and requires

activation by scanning the customer's barcode. The system is also cost-effective and enhances the shopping experience (Vatsalya Singhi, Kayalvizhi Jayavel, 2017).

A model based on RFID and ZigBee based technology was suggested to automate the billing procedures. Every product will be stuck with an RFID tag, and information will be passed via PID microcontroller and ZigBee modules. This setup will help avoid queues in malls and super markets (P. Chandrasekar, T. Sangeetha, 2015).

### **2.3 ADVERTISEMENT/ RECOMMENDATION USING SMART CART**

In order to reduce the non-value adding activities in a supermarket, and to increase the in-house sales, showcasing advertisements on the tablet of smart cart is an effective idea. As per a patent filed in 2007, integration of a portable wireless user interface with the merchant server and shopping cart can be used for in-house advertising. It generates a predictive response targeting the advertising messages to the customer and provides information about new products and recommends products on the basis of chosen options. The database includes information about the items available for sale at the store and is in operable communication with the merchant (Sean M. Raimbeault, 2007).

A scheme of smart supermarket shopping guide system based on the technology of Internet of Things was also proposed. In this system, electronic tag on the products is identified using IOT technique. The system provides a guidance on future shopping making it comfortable and pleasant for clients (Rong Chen, Li Peng, Yi Qin, 2010).

Recommendation engines are probably the most well-known Machine Learning applications. They are one of the most recognized form of Machine Learning solutions. A lot of people who don't belong to the Machine Learning community often assume that recommendation engines are its only use. Although we know that Machine Learning has a vast subspace where recommendation engines are just one of the candidates, there is no denying the popularity of recommendation engines. One of the reasons for their popularity is their ubiquitous nature; anyone who is online, in any way, has been in touch with a recommendation engine. They are used for recommending products on ecommerce sites, travel destinations on travel portal, songs/videos on streaming sites, restaurants on food aggregator portals, etc. The list is long that underlines their universal application.

## **2.4 CUSTOMER MOTIVATION**

A total of 384 questionnaires' responses on impulsive buying of consumer and non-durable goods was collected, and analyzed them using correlation and regression. The result showed that discount shopping, store's layout and decoration, usage of credit cards, and income levels affects the impulsive buying behaviors (TH Samarin, M Moniri, 2014).

A study was done on 364 shoppers, and results showed that total customer value is perceived by the departmental store shoppers into utilitarian, hedonic and social dimensions. It was also found that social value varies by day of week with a significant increase on Saturday, whereas no such difference in utilitarian and hedonic values was found (Timo Rintamaki, Antti Kanto, Hannu Kuusela, Mark T. Spence).

## **OBJECTIVE OF STUDY**

Main objective of the study is to find methods to equip brick and mortar stores to function better to survive the competition offered by ecommerce stores. It's clear that the factor that gives an edge to the ecommerce stores over the offline stores is technology. This study intends to find methods using which infusion of technology into brick and mortar stores can enable conservation of resources such as cost and time and increase sales. Ecommerce giant amazon has accepted that 60% of their sales come from recommendations made to customers who get on their platform to by other products. Increase in sales is expected as an outcome of making correct recommendations to the right customer. This paper intends to draw out a method using which relevant products can be advertised to customers leading to a boost in sales. It is said that advertisements that reach consumers when they don't intend to shop are comparatively less effective compared to the advertisements that reach consumers at the time of shopping. Need based display of products while they're moving around in the store can be a very effective method to increase recommendation-based sales. Relevancy of a product to a particular consumer can be determined using data of past purchasing and the profile of the customer.

With this study we aim to determine the method to develop a Smart Shopping Cart which can tackle four major issues:

1. Low conversion rate.
2. Effective advertisement.
3. Reducing non-value adding activities such a billing.
4. Optimum usage of available information to improve the instore experience of customers

## **EXPECTED FINDINGS**

In the due course of research that is to be conducted, we intend to find non-value adding activities that a customer and the store staff undertake and come up with solutions that can eliminate such activities. We also intend to quantify the resources involved and also the resources saved with the usage of smart cart so that the investment that needs to be made on this by the store owners can be justified.

In the process the study will also thrive to find methods to enrich user experience by providing facilities like instore navigation using the tablet attached to the shopping cart.

## **RESEARCH DESIGN**

The study will be conducted in two phases. Phase 1 of the study engages to identify various non-value adding activities confronted in the store by the staff through the method of observation and in-depth interviews on 60 store managers and staff members. Stores with minimum 2000 sq ft of area have been considered as sample of the present study. The lower limit of 2000 sq ft has been set so that these stores will already be using shopping cart and the solutions that will be the outcome of this study can be easily implemented in and will be of more relevance to such store. The Phase 1 will be a mix of observation based and descriptive study. Interviews will be conducted to understand the areas that need improvement. Data gathered in this phase will be mostly of qualitative in nature and will be of the form of unstructured text. Methods such as word cloud analysis, content analysis, thematic analysis are to be used in analysis of data gathered by primary research.

Phase 2 of the present study would involve devising a model based on predictive analytics that can be used to develop a smart-cart which will eliminate non-value adding activities identified in phase 1. The study intends to develop a smart cart model that would assist in improving conversion rate from mere selection to purchase, effective advertising, instore experience of the customers and effective shelving of the products. Techniques such as predicative analytics, model building using regression etc are some that are to be used in devising the model based on which the smart cart will function. This phase also involves identifying the correct variables that will improve the accuracy of the model and finding the correct source of data by working on data enrichment.

## **FINDINGS AND PROPOSED SOLUTION**

### **5.1 BILLING QUEUES**

Customer faces the problem of long queue while billing the products they bought. Apart from standing in a queue meanwhile consumers face many problems like whether they have enough money and change to pay their bill, how much bill amount will be, if they have picked up product which had expected discount on it, incomplete information about of the items etc. As per our survey estimated waiting time is 30-35 minutes in billing queue during peak hours and which is even more during occasions and special days. Moreover, Store needs to be redesigned for the occasions and special days to avoid the chaos and crowd. By developing a smart cart which can help in eliminating this non-value activity our aim is to reduce the cost for the store as well as enriching customer experience. Idea is to attach a tablet, card swipe, bar code reader and weighing machine to the cart. When a customer decides to buy a product, they can scan the product in bar code reader machine attached to the cart. Once this is done that product will be reflected on the screen of the tablet attached to the cart of the customer and similarly they can keep adding products which they want. When they want to make payment card holders can checkout and swipe their card whereas the customers who want to make cash payment can take the print of the receipt and can go to billing counter with the generated bill. The bill will also consist of actual weights of the product kept in cart which can be updated from database. The weighing machine attached to it will calculate the weight of the cart. When the cart weight will match billing actual weight then only smart cart will allow checkout and payment options. From store point of view this can help to reduce the number of billing counters and hence cutting down the cost and leaving more space for other uses. From customer point of view, it will reduce the hassle and time spent in billing queue. One of the biggest advantage of this could be reduction in alien trollies in which customers keep their products but don't buy it due to excessive waiting time on billing counters. Sales funnel can be improved by using this technology.

However, loopholes are associated with it. We have no fool proof technology to avoid theft practices after the payment. Let's see this scenario, after checking out and making the payment customer might keep something else in their cart without scanning in between the time of billing the products and packing it. Here we are still relying on CCTV and manpower. The implication of this technology is applicable to the stores where high economical segment visits the stores. Our target is educated and belongs to sec 'A' segment.

## **5.2 LOCATING PRODUCTS**

When the store size increases it gets difficult for the customers to locate the product they wish to buy this can cause fatigue to the customer and can cause threat to the sales. Even after planning visual merchandising, stores cannot provide glimpse of the products available to the customers. Moreover, sometimes people don't get the same item as suggested by the aisle which may be due to wrong aisle placement, which can frustrate the customer. The idea is to provide the customer with an option to navigate through the store. The requirement is the RFID tags for categories (let say Beverages) in the store and RFID reader. When the customer starts moving in the store and comes in the radar of RFID tags, the arrows will show the direction towards the particular category with an option to navigate till the section. Few customers come with a mindset to buy a particular thing. This navigation will have an option where customer can directly search for the category they want to go to. This option will directly take them to that section. Navigation system will not only help the customer to navigate through the store but will also provide them with the related products as suggested by the category name which is missing sometimes in a brick and mortar store. Along with this, In-store customer guidance can also be fulfilled by implementing this technology. For example: A customer doesn't want to buy groceries from a list but wants to be guided through the entire process of making the delicious meal which he got to know from a recipe book. This modification can be done by when we have recipe set for particular keywords in the data base. So, when a customer searches for these keywords (let say Cake), Navigator should tell the customer where all the raw material available for the same.

Loophole associated with this technology is RFID tags cost. We can only attach RFID tags with the category (Let say Beverages) not with the Merchandising class (for e.g.: Aerated drinks, Soft Drinks). For making the technology affordable and convenient this idea has been restricted to Categories only and not on Merchandising Class.

### **5.3 WHAT CUSTOMER BUYS AND WHAT THEY INTENT TO BUY**

Traditional Brick and Mortar stores don't keep a record of what customer is buying, what is their purchasing behaviour, what is their previous purchases. If few stores have card program to track the customers, not all the customers become the part of the card program. Just by keeping the track of all the customer's buying behaviour and doing proper analysis of the same, a store can push their products, can create top of the mind recall, can create good marketing strategies which

can help them to increase their sales and give customer an enriching experience. By doing the basket analysis of the customer who will use smart cart, stores can decide their strategies accordingly. Smart cart will not only track the products kept in the smart cart by the customer after scanning the bar code reader but will also try to capture the bounce rate which means what customer has taken out of the cart or which product customer has considered to buy but didn't purchase after scanning the product. All this data gets collected in database which can help to do intense analysis on consumer behaviour, Buying pattern and etc. What a customer intends to buy, and store can provide it as per the customer's demand will be an advanced move towards satisfying the customer and increasing the sales of the store. The idea is when a large number of customer searches for a particular product using a certain keyword and store doesn't cater that product. This data can help us to understand the trend and demand of the customer and can help the store to introduce the related stock. Online marketing thrives on the data that they capture for each customer. Therefore, one of the best use of the smart cart is to collect the data from all the dimensions which can help the brick and mortar stores to do the further analysis and introduce and build strategies accordingly.

However, building the technological infrastructure to cater to all these kinds of analysis will involve a lot of cost. But sooner or later Brick and Mortar stores needs to keep their data structured if they want to work efficiently and effectively in the coming future.

#### **5.4 ENRICHING ENGAGING INFORMATION**

The best strategy of online marketing it wide variety of choice to the customers. They keep giving options to the customers till the time they end up buying something. This customer engaging information needs to be there in brick and mortar stores as well. The idea is when a customer will scan the product a catalogue will appear in which the model will be displayed wearing the same attire which customer wants to buy. This will give the knowledge to the customer that how the product will look after wearing it and what are the ways of carrying it (if more than one). This feature will not be applicable to food section however will enhance the customer experience. This feature will reduce the hassle to try each and every product that the customer wants to see how it looks after wearing. On the same screen just below the section of catalogue, other products will be displayed in which the related products will be displayed, and most demanded product will be displayed. This will be just an attempt to give more options to

the customer so that they end up buying something from the store. Related products section could be done for food section as. Database will have recipe related to the products. Here when a customer will pick and scan more than one product which belongs to recipe, Related items section will start coming to show. This can help to increase the sales of the stores and enhance customer experience as well.

## 5.5 ADVERTISEMENT/ RECOMMENDATIONS

One of the major advantage of Online Shopping Platform is Recommendation Engines. Understanding Customer and serving them better is always priority for the brick and mortar stores. Although serving these many customers distinctively is nearly impossible without the help of technology. With recommendation engines, it would become easy to understand customers and recommend them product which they are looking. These recommendations constitute major sales conversion in online market place. It would be advantageous, if these recommendation engines can be added to Brick and Mortar Stores. The Smart Shopping Cart has smart Screen where we can show customer specific recommendations generated via recommendation engine. There can be two type of Recommendation. (i) Organic Recommendations; (ii) Paid or Inorganic advertisement's/ Recommendations;

### 5.5.1 ORGANIC ADVERTISEMENT

These are the recommendations are generated via recommendation engine on the basis of Customer profile, Similar customer and associated products. These recommendations will be actual results of algorithm.

User- Feature Matrix							
Facewash	Colour	Fragrance	Paraben free	Oil Control	Texture	Anti Pollution	Foming
Aman	1	0.8	1	1	1	1	1
Ram	0	0.9	0	1	0	0.8	1
Shyam	1	1	1	0	0.8	0.9	0.7
Rahim	0.8	0.9	0	1	0.9	0.65	0.8
Mohan	0.7	1	0	1	0.7	0	1
Guru	0.8	1	1	0	1	0.2	0.4

Item- Feature Matrix							
Facewash	Colour	Fragrance	Paraben free	Oil Control	Texture	Anti Pollution	Foming
Pond's Pure White Anti Pollution Face Wash	1	0.8	1	1	1	1	1
Neutrogena Deep Clean Face Wash	0	0.9	0	1	0	0.8	1
Himalaya Moisturizing Aloe Vera Face Wash	1	1	1	0	0.8	0.9	0.7
Dove Deep Pure Face Wash	0.8	0.9	0	1	0.9	0.65	0.8
Clean and Clear Foaming Face Wash	0.7	1	0	1	0.7	0	1
Swiz Temple Deep Clean Purifying Foaming Facewash	0.8	1	1	0	1	0.2	0.4

### 5.5.2 PAID AND INORGANIC ADVERTISEMENTS / RECOMMENDATION

There are certain products which need to be promoted. Be it in-house products or if the brand is paying to promote the product. The Traditional TV commercials, Radio broadcast are for the mass and people skip advertisements because all the advertisements are not appealing to them. The Social Media Advertisements are different. They show advertisement on the based on user profile, there likes, dislikes, demographics etc. These Social media advertises are more effective then TV commercials and Radio broadcasts. Although these advertisements are effective but the effect of advertisement shown 15-20 days before the actual shopping day are less effective than the live instore advertisements. The instore advertisements are less effective. If we add instore advertisements generated by Recommendation Engine than it would be more effective. For Example If customer is searching for “Harpic Toilet Cleaner” then some other brand Toilet Cleaner will be shown to them as an In-organic recommendation.

## **6.0 TIME MOTION STUDY**

Time Motion study is a direct and continuous observation of a task, using a timekeeping device (e.g., decimal minute stopwatch, computer-assisted electronic stopwatch, and videotape camera) to record the time taken to accomplish a task and it is often used when:

- there are repetitive work cycles of short to long duration,
- wide variety of dissimilar work is performed, or
- process control elements constitute a part of the cycle.

In retail store, the one who accomplishes task is the customer and visual merchandiser need to take time motion of customer to enrich their customer experience. If there is some path where customer spends lots of time, the area of that point need to sufficiently maintained so that customer do not find any hazel. There is no concrete method to preform time motion study of all customer. With this smart cart, time motion information of all the customer will stored in database and will be helpful for merchandisers to preform time motions study better. This study will help merchandisers better arrange items and make better customer experience.

Doing Time Motion study is essential to improve customer experience. Although, algorithms don't always give best results and human interventions are required to validate the algorithmic

insights. With the human intelligence and algorithmic insights this time motion analysis will help us achieve better customer experience.

## 5.7 UNDERSTANDING USER JOURNEY

One of the main advantage of Online retailer is they capture data at various customer touchpoints like User Experience, Calls-to-action, Reachability, Engagement , what customer buys , what customers don't buy etc. This data is very useful in analyzing what store is good at and where does it need to improve. The data driven continuous improvement will be the key to success for Offline stores. For example, when customers buys soap and travels some distance in store and come across liquid body wash if customer removes soap and buys liquid body wash, these type of information might be very crucial for the business.



As shown in the fig above, the purchase funnel in online retail has four steps Awareness of product, Interest Generated for the Product, Desire to purchase that product and finally the action take by the customer to buy the product. All these four steps determine the number of prospective customers.

## **CONCLUSION**

Though we've put together all the above mentioned methods to improve the functioning of brick and mortar stores, we don't believe that implementing these solutions is a cake walk. These are the following challenges that we expect will be faced by the solutions devised.

1. Resistance to change: traditional offline stores have been doing business in a certain way in India for years now. When we took our solutions back to them they were in two minds whether or not these solutions will work. They trust their instinct and business sense more than modern technology. There is also a barrier in the minds of shop owners when it comes to accepting new technology and trusting it. A solution to this would be to create awareness among shop owners and staff members so that they become more accepting of technological changes.

2. Human resource: these solutions will involve hiring of people with technical background and also reducing man power where it is not needed. This would more or less require restructuring of workforce.

3. User/customer being familiar: considering that the technology being suggested to use is very basic in nature, learning curve is expected to be short for customers.

Apart from these reasons, the solutions we've suggested should be implemented without major obstacles and these solutions at the end of the day will take the offline shop owners closer to the growth rate of ecommerce stores.

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