Slide 1

Ladies and gentlemen, we are team ACKERMANS, and we are going to present on how Artificial Intelligence can lead to growth in E-Commerce Industry

Slide 2

Why inventory management?

Inventory management has become quite an important task for the e-commerce vendors today. The industry is worth $84 billion in india itself and is expected to grow to 200$ billion dollars by 2026

A major chunk of money flows in inventory management. For Example, flipkart spent 10% of their annual revenue that went in either opening or managing their warehouses in 2020.

So what is the solution for this cash drain? Obviously, it is the Usage of Artificial Intelligence in our operations. It is expected that AI can lead to an overall decrease of 32% in the inventory costs.

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To start with AI implementation, we first need to improve our data. What do we do?

A. We deal with the curse of dimensionality by using PCA and LDA to reduce the computation workload

B. Dealing with the noisy data by techniques of binning and clustering

C. Handling missing data for the models by imputation and interpolation.

D. Handling imbalanced or skewed data by up sampling, cost sensitive analysis, evaluation metric etc.

Now with this refined data, we move to our AI implementation.

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Our Approach?

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Developing 5 modules for AI implementation in Inventory management.

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The following are the five modules:

1. The demand forecasting and order management module

2. Warehouse location and specialization module

3. Best route computation module

4. Inventory quality check and returns module

5. Intelligent IOT tracking module

We get know about them in further slides

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Our first module is the Demand

Forecasting and Order Management module. Demand is the main driver of inventory

and thus

our objective is predicting the demand and

optimizing inventory. Our module analyses internal factors such as seasonal

sales history, external data such as current economic conditions and social

media signals, does the time series analysis giving the risk weighted demand.

This is superior than past systems which

performed only predictive analysis, predicting the demand. Our model performs p**rescriptive** analysis that also weighs in the stock out risk.

Less input variables are required which are

relatively easy to get and implement.

This results in benefits such as

reduction in lost sales, decrease in holding cost, and also a holistic impact on

one major aspect, **Order Management.**

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After prescribing the optimum

level of stock in the inventory, our module acts on this decision by placing

orders to suppliers when necessary, channelizing dead stock by offers and

discounts, predicting buffer stocks for shortages and unforeseen situations,

and most importantly,

dividing the available inventory for sale

through different channels, thus bringing the omnichannel vision of a company

to fruition.

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The second module in our solution

is the Inventory Space Management module which answers two of the biggest

questions in supply chain – “Where should my warehouse be placed? And What do I

put into it”.

We have categorized common goods into three mutually exclusive types - Essential goods that have a stable demand and people buy them every month.  
 shopping goods, which are on the pricier side and people invest a lot of time in making decisions.  
 and specialty goods, which are rare luxury items which are fraigle to handle.  
Each category requires a different technical and structural warehouse setup. For example, warehouses for essential goods should be highly automated to deal with the high demand and repeating processes, whereas for the relatively lower demand for shopping goods, a semi automated warehouse would be optimal.

For luxury goods, we need to handle with special care , so warehouse require more manpower.  
 Our module prescribes the appropriate technical and

structural features of the product specialized warehouse, to get the most juice

out of it.

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After deciding our warehouses’

structure and what it will hold, we also need to decide where to build it.

Construction is costly and irreversible and companies that get it right,

essentially get their whole supply chain right. For example, a company that

places a high tech warehouse in a place where there are frequent power cuts is

sure to go down. The module analyzes various correlating factors

pertaining to location demographics, category of goods, human resource, etc.

and by classification and regression decides the best location for your next

warehouse.

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We arrive at the third module of our solution. - Best route Computation. The name does not do justice to the ideas we suggest as you will see that this is much more than the simple mathematical operation of choosing the best route to ship products.

The integration of AI enables intelligent decision making and results in a dynamic system.

1. The issue we try to address here through this module -- WAREHOUSE CONSTRUCTION IS COSTLY, TAKES CAPITAL AND MAN POWER to hold and maintain storage facilities to hold inventory.
2. The solution we propose is based on the idea of minimizing the number of stops and maximizing the time in transit of a product. The best route is intelligently chosen by the AI keeping in account a variety of real time variables that highly optimize logistics.
3. The greatest impact this produces is by drastically reducing costs associated with holding inventory and maintaining establishments such as warehouses. Also leads to greater degree of robustness and readiness in risks associated with holding stock because a lesser percentage of inventory is stagnant.

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We here illustrate the decision flow in our model when the supply chain is called into action upon an order by a customer. The order is sent to our AI system which allocates the supply site, route to be taken and a host of other decisions which may be related to the manufacturing line or choice of supply point based on a host of real time variables we dynamically feed into the module such as raw material availabilities, inventory at a warehouse wrt the expected demand in the near future, weather, probability of damage or late delivery through a route etc. This also helps us establish a very dynamically predicted delivery time which we promise to adhere to, enhancing the user satisfaction.

**Slide 13 :**

Enhancing the performance of warehouses is one of the major concerns of various e-commerce companies. So, we introduce a measure called Warehouse Performance Index to check their performance. It takes factors like ratio of total returns to total shippings in a certain period of time (say X), no. of items missing in a certain period of time(say Y) and feedback from customers and workers. Then by using AI models like classification we can assign every warehouse a WPI and benchmark values of WPI.

WPI assists a company to find which warehouses are in need of training and also audit firms in inspection of warehouses.

**Slide 14:**

Another major challenge is to deal with returns where the goal is to optimise the time taken and the extra funds required to complete the process taking care of customer satisfaction as well.

The model considers an Organization with Offline Accessible Return Points or omnichannel organisations.

It finds the best option through in which the product can be returned be it via online or offline . The model will take information like customer location, product to return and type of refund as inputs.

We can also detect fraudulent returns using Image processing.

# SLIDE 15

What is

INTELLIGENT IOT TRACKING, this is our effective and high return solutions to

track and channel all information of a product in transit. WE plan to implement

this at both stationary establishments such as warehouses and also on

containers of products in transit. The choice of BLE -- BLUETOOTH LOW ENERGY Is

motivated by factors such as low one time costs of setup and then almost

minimal costs associated with data collection, increased range over existing

technologies and extreme reliability. WE monitor several real time important

variables such as -- temperature, humidity location etc. Compared to a recent

leading technology of RFID tags, this provides an increase in range and proves

to be much more cost effective and moreover performs better in terms of

accuracy.

**Slide 16:**

So, as you have observed that all modules are following a structure where we state all the loopholes of the existing system. Then we set some goals which the module fulfils and list all the variables which our model needs as input. We then improve current data .The model tries to optimise the computation costs as well.

The following slide displays the interconnected working of all the proposed models.

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This is how we apply our 5 modules. Each module serves a different aspect but complete efficiency is obtained when the working of all these 5 modules is combined. The purpose of this modular approach is that they can be implemented individually, so companies that lag in any particular aspect of their inventory management can implement a suitable module.

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Finally, we shall look at how our approach helped to fulfil our purpose:

A. We managed the loopholes at various stages of our solution. From Automating the manual labour at warehouses, increasing reliability of the data collected, detecting frauds in returned products, quality assurance of stored products and improving decision making in transit routes for enhanced customer experience, we came a long way

B. With the Demand forecasting module taking in more variables like social media signals and customer sentiments, and also using prescriptive analysis to incorporate the risks associated, we significantly increase our accuracy.

C. We make our system speedy and agile by using our best route computation and iot tracking modules. They decrease the number of stoppages in the supply and hence enhance customer experience.

D. Our system is well equipped to integrate with the current system as most of the variables we listed except a few are already available with the company. The only thing we need to do is refining the data so that it can be taken as an input.

E. With the demand forecasting and best route computation module, we can get well aware of any disruptions in our path. This predictive analysis gives us an edge as we become more adaptive to any risks that might occur in our supply chain.

F. We upgrade and re-design our inventory by using warehouse location and specialization and iot tracking module. With this trick up our sleeves, we get to manage each category of goods better as we mentioned above and we get to upgrade our inventory at low costs.

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Covid-19 surely has had a major impact on the supply chain. But this has not only been the case this time. Any such worldwide apocalyptic situation has left the supply chain of any sector in deep peril. To get out of such big or small interruptions, our AI solution must be well equipped. As it is already proven that AI can find the “hidden patterns” which various statistical models can't. We can use the ability of our demand forecasting and best route computation module to make decisions faster, with very less historical data, getting us back on track. To track and trace our inventory we shall implement IOT solutions to get valuable inputs faster.

Thank You. Now we are open to questions