**Core idea and concept**

Internet of Things been always an end point of creativity and productivity. There’s been a lot of advancement happening in how we shop. So we decided to create our own version of Amazon Go with tools available to every developer. The main idea is to get Indian retail market at par with their competition abroad and contribute to the Make in India campaign.

What’s special about this idea?

You get into a supermarket, randomly pick up things and just exit. On your way out you are billed for what you’ve picked from the store for which you pay using your card or e-wallet. It’s simpler than it sounds!

The shopkeeper also has several benefits. He'll know which product sells best when (time of the day/season…). Also, he will be aware of the real-time availability of items both in his store and his godown. With his prior permission, the wholesaler can also be shown this data of real-time availability to enable the wholesaler to be prepared to send in the load way before the stock runs out. Also in the coming days, we can predict the best place in the store for a product to sell better. There's a lot more that can be done with the data that the sensors collect and we all know DATA SELLS!

**Breakdown of the idea into modules/systems and their working**

## • **Shelf Setup :**

Shelf with load cell arrangement connected to a raspberry pi, which is capable of sending data using POST and GET methods to an HTTP server.

Load Cell item detection design:-

An items weight say ‘w' gets registered to the system, total weight/w will output the no of items on the shelf. A decrease in weight by w indicates the item has been picked by the user, therefore sending a signal to the server to add the item to the user's cart.

An interrupt driven system with proper calibration and corner-case prevention is to be designed.

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## • **User verification and tracking :**

Verification and tracking of user can happen in 3 scenarios -

Entry - A mobile app which links to the user either by QR code or by facial recognition. Also signals the server to add a user to real-time tracking list.

Item pickup - item information must be updated in the user's cart, using Internal positioning systems (IPS) using wifi or Bluetooth real-time tracking can be achieved.

Exit - The mobile app provides checkout options and signals the server to remove the user from real-time tracking list.

(For purpose of demo IPS and QR code systems shall not be implemented but facial recognition and verification and proximity sensors shall be used instead)

## • **Web/Mobile application and server implementation:**

The app will enable users to take a photo of them and enroll in our database.

Enrolling will be done via an **API/enroll** and the image will also be sent to the server. Enrolled images will also be uploaded to Imgur via Imgur API so their profile photo is seen in the Real-Time tracking app User will also be enrolled in the server; data model: Name, Image URL.

The web app will contain a list of all users in the store at the current moment, complete with their name and photo; actions performed the user, user's cart.

User behavioral analytics can be generated with the data collected and intelligent predictions can be made.

Services/APIs used:

• Google Firebase real-time database

• Google Cloud analytics

• Reactjs and React native

• Imgur API

• Kairos API

Camera recognition can be done using phone camera at the entrance of the store at face-level that will detect when a customer has entered by detecting a face < 1 meter from the camera and sending a picture of the person to the server.

This camera will send a picture to the server which will do **API/recognize** call to the server and attempt to recognize the individual based on :

• API returns all possible matches; sort by confidence score and the highest confidence score.

• After server recognizes the user, send update call to the web app.

Components used

• Weight transducer - Load cell

• Hx711 weight sensor

• Proximity sensor (VCNL4000 or other)

• Raspberry Pi s

• Jumper cables

• Breadboards

• Mobile phones with cameras

• Computers

**Approximate cost of the project**

**Explanation of the real-life application**

We love shopping! Just the view of a store with all those things you love and you've always wish to own gets you so excited! But what about that long queue you'll have to wait in to get your product billed after which you can finally unpack it and enjoy? Kills all your excitement right away? NO MORE! Log on to our website (just once), get in the store with ease, pick up whatever you like(changed your mind? Just keep it back and we'll know), and just walk to the exit. With all that technology we put in place, we'll know what and how much you've chosen to carry with you for which you will be billed and guess what? You don't have to stand in a queue to pay! You have your bill on the phone. Pay using your credit/debit card or e-wallet and you are good to go!

**Beneficiaries**

Everybody in this world shops. So each and every human being is a beneficiary. Also, the owner of the shop cuts down on his expense of paying an amount of salary to each of his employee. He'll also have data which wasn't available to him yet. On a larger scale, for retail changes based in India, this technology will get them ready for a smarter and intelligent tomorrow.

**Market Analysis**

Some 70% of the customers said they were unlikely to return to a store if they were made to wait in a long queue on their last visit, a new study of 2,000 shoppers has found. If your product can get these 70% back, there is a huge market for your product. Also, Amazon Go doesn't plan to get these stores in India or sell their technology to retail chains in India, we see this as an opportunity to boost stores in India both sales wise and technology wise and make them better than their competitors abroad.