

*A project Report On*

## **Yarn Trading company Inventory Management and Business Intelligence**

Submitted in partial fulfilment for the award of the degree of  
B.tech Computer Science and Engineering

By

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(Deemed to be University under section 3 of UGC Act, 1956)

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## Abstract

Textile trading is a million dollar industry in central Tamil Nadu. But it is composed of several small and medium scale organisations instead of huge corporates. At the same time, most small scale trading companies and manufacturing factories, in the textile industry lack the technological means for any kind of business intelligence. Generation of market insight with existing data is key for a booming business. The aim of the project is to create a simple web tool for a textile trading company that empowers them with business intelligence while also allowing them to reach more potential clients.

T Prevalent situation - trading companies of small/medium scale that cannot afford sophisticated customisable software that exists in the market. (Erode - Tiruppur - Coimbatore). Need is a relatively simpler application which can be easily built with the prevalent technology. This opens up a potential market for simpler web tools which provide business intelligence.

## Acknowledgement

I would like to thank Dr. Deepika S for the constant guidance and support offered during the course of planning, designing and implementation of the project.

# 1. Introduction

## 1.1 Motivation

Coming from a city (Erode) that is heavily reliant on the textile industry for its functioning, it came to my notice that most of the market is dominated by a number of small and medium scale organisations rather than one or two huge companies. The technological tools that these companies use is limited to basic accounted software but there was scope for improvement.

## 1.2 Aim

The aim of the project is to create a simple web tool for a textile trading company that empowers them with business intelligence while also allowing them to reach more potential clients.

## 1.3 Objectives

In small scale textile companies, Inventory details are mostly stored via generic accounting software or even worse, handwritten documents. Sending samples of yarn or fabric manually via post to client base wastes resources. It is also wasted potential data for business intelligence. Through this web application we aim to create a web application where potential customers can look at the catalog of available end products, and inquire the company owners about cost or ask for a quote via the website. The catalog of inventory items can be managed and updated constantly by employees with an employee login. Another important feature, would be the data will be visualised with appropriate graphs for an admin user for business intelligence purposes.

**So the overall Objectives can be summarised as:**

1. Product Inventory Maintenance - Creating, Viewing, Updating and Deleting Products by Employee Users
2. Inquiry Creation - Creating and sending Inquiries by potential customers on the public section
3. Business Intelligence - Creating graphs, charts and visualisations with Inquiry data (Demand Insights Generation) by the Admin User. Creation and Deletion of employee accounts

# Literature Survey

## A. **Research on B2B2C E-commerce Website Design Based on User Experience**

**Method:**The B2B2C model is a new network communication sales method

**Findings:**The focus issue that needs attention in website design is how to help consumers quickly find the target product.

## B. **An Empirical Study of Website Personalization Effect on Users Intention to Revisit E-commerce Website Through Cognitive and Hedonic Experience**

**Method:**Author collected data from web users using both e-commerce websites having personalization features on their web portal.

**Findings:**Presentation personalization adjusts the layout of user interface and provides content with good look and feel in the form of personalized themes, font, and background color generating ease of use and enjoy while browsing personalized e-commerce

## C. **The value of comparative usability and UX evaluation for e-commerce organisations**

**Method:**This paper investigates a method that uses factual user behaviour data that are collected from interaction with the website to be evaluated, as well as data from user interaction with closely competing websites that offer directly comparable services.

**Findings:**Telecom A's results revealed clear usability and navigational issues, especially in comparison to the results of Telecom B and Telecom C. Telecom B users had more fixations on parts of the website indicating that there are more screen elements than on the other two sites. Although TelecomB fared well when compared to TelecomA, its results show that TelecomC supports the top-up functionality much more effectively

## D. **The adoption of eCommerce communications and applications technologies in small businesses in New Zealand**

**Method:**This paper investigates the impact of 10 different factors, extended from the technological innovation literature. They focus on the adoption of different eCommerce communications and applications technologies (EC) in small businesses (SMEs) in New Zealand (NZ).

**Findings:**The extensive testing of the research model can lead to more generalizations across the different countries. Electronic commerce possesses many facets and this research has introduced three categories of adoption to capture the different aspects involved in the criteria for E-commerce adoption in Small to Medium-Sized Enterprises in New Zealand Professionals could focus and prioritise their strategies in marketing/selling their E-commerce products and solutions to Small to Medium-Sized Enterprises by focusing on certain E-commerce technology or by capitalising on certain motivators and avoiding certain hindrances.

## E. **User Attitudes Regarding a User-Adaptive eCommerce Web Site**

**Method:**In this paper, the researchers executed an iterative series of three studies,carried out in multiple laboratory settings. The studies were carried out with a mixed group sessions in which participants were walked through the use of a prototype by an experimenter, and individual user evaluation sessions in which subjects interacted with a working prototype.

**Findings:**This research showed that,overall the users wanted to feel as if they are in control. The feeling of a user's sense of control is in whether they can readily make sense of the

interaction with a site. Not being able understanding why the site is displaying particular content engenders for users a sense of loss of control

#### **F. E-Commerce adoption in developing countries: a model and instrument**

*Method:*The purpose of this paper was to define the E-Readiness concept, to suggest an underlying model of E-Commerce adoption to identify the relevant managerial, organizational, technological, and environmental factors that affect decisions to open or develop eCommerce systems in developing countries; and to develop sufficiently validated measures to show the utility of the model.

*Findings:*They constructed and empirically tested a model of E-Commerce adoption: the PERM. The underlying theoretical perspectives allowed them to identify the relevant eCommerce, managerial, organizational, and contextual factors that could explain E-Commerce adoption and subsequent development.The study served to highlight contextual limitations that often are taken for granted in other markets.

#### **G. The rise of ecommerce as an epidemic in the small world of venture capital**

*Method:*This chapter examines the rise of an industry as a diffusion process across Venture Capitalists . Following a venerable tradition of research on diffusion processes, the percolation mechanism studied here is a network. The network is constituted of syndicated deals among Venture Capitalists and is analyzed as a small world

*Findings:*The epidemic model works well statistically in the presence of key controls, especially contagion effects represented by lagged syndications. Whether E-commerce is the only industry to which the model applies is a question that can be answered in a broader analysis

#### **H. E-Commerce in the Textile and Apparel Supply chain management: Framework and Case Study**

*Method:*The paper aims to understand the current state of ecommerce technologies applications in the Textile and Apparel supply chain and provide recommendations for future improvement. The paper puts forward that apparel supply chain management system should be designed integrated into the e-commerce system. A thorough analysis of the mechanism of e-commerce has been made and framework of e-supply chain analyzed accordingly.

*Findings:*Think about integrating the Internet with the existing supply chain network, rather than setting up a separate e-commerce. Structure e-commerce logistics to accommodate packages instead of pallets. Devise shipping pricing strategies that reflect the costs of activities.

#### **I. Progressive SWOT Analysis of “E” – Textile Industries**

*Method:*This paper mainly focuses on a SWOT analysis for the integration of the already existing textile industry with E-commerce and concludes if is an advantage or disadvantage

*Findings:*E commerce has made its special identity in the textile industry. Nowadays it has become an essential part of the textile industry. With the help of Information & Communication Technology (ICT), people are able to communicate rapidly with each other. More knowledge about EDI will support the quick exchange of products. Establishing & maintaining brand name is the biggest challenge for all the Electronic based textile industries. E commerce is the easiest way to enter in to the global market

### 3. Proposed System Requirements and Design

#### 3.1. Introduction

The proposed solution is a web application. The reason being the textile trading community is filled with a consumers of a wide range of age groups. The best and most effective way of reaching non-tech savvy users is with an impressive GUI. In small scale textile companies, Inventory details are mostly stored via generic accounting software like Tally, Busy etc or even worse, handwritten documents. Sending samples of yarn or fabric manually via post to client base wastes resources. It is also wasted potential data for business intelligence. Most existing companies have one or more computers, so with a web application there will not be a need to purchase or produce new or better performing computers or hardware.

#### 3.2 Requirements Analysis

##### 3.2.1 Stakeholders Identification

The stakeholders are doing to be small-scale textile trading companies. This could include Yarn Trading Companies, Fabric Traders (Bedsheets, Clothes etc) and weavers. The stakeholders studied for this particular project are yarn trading companies and small scale textile manufacturers in the Erode and Tiruppur region. This region quite well known for its textile manufacturers. *Kumar Yarns, Chennimalai* is one such yarn trading company studied for this particular project.

##### End Users

*Potential Customers, Employees and Managers/Owners (Admins)* in Small Scale Trading Companies. Employees use it for inventory maintenance. Admins use it for Inquiry response and marketing insight. (**Direct users**)

*Transport agencies* are secondary users who do not interact directly with the software but benefit from the publicly available inventory and status. (**Secondary Users**)

##### Beneficiaries

*General public and overall supply chain* of the textile industry. The transparency encourages trust.

##### Project Build Team - Development Team and Manager - Sanjit C K S Project

##### 3.2.2 Functional Requirements

Major functional requirements that will be provided by the system are:

1. Web Application
2. Login/Signup page for Employees - The data will be stored in a noSQL database (MongoDB)
3. Webpages - Information about the company/organisation

4. Inventory Management Capability - Inventory items or products can be created, read, updated and deleted (CRUD operations)
5. Publicly available inventory on the website for potential customers
6. Customer should be able to make an inquiry about specific products with customer information
7. Visualisation of inquiries on the products based on different parameters with a visualisation library
8. Search feature for retrieving relevant data

### **3.2.3 Non-functional Requirements**

1. Employees shall be granted secure access to the inventory. (**Reliability**)
2. Sensitive data for business intelligence and insight will be protected due to its sensitive nature. (**Reliability**)
3. Only Admin will be able to view the visualisations and business insight information. (**Usability**)
4. Employees will only be able to update their information and not others' information (**Integrity**)
5. Admin will have the capacity to remove employees if needed. CRUD operations on the inventory shall be accessible to only Employee users. (**Access Levels**)
6. Set minimum password strength based on number of characters and use of special characters.
7. The performance of the application will depend on the number of users over time and the inquiries that app generates. Web traffic is a good metric for this purpose. (**Performance**)

### **3.2.4 System Requirements**

#### **3.2.4.1 Hardware Requirements**

The required hardware components are:

1. A Computer or Laptop or Mobile or Any Gadget with a modern browser to access a website
2. Processor - Minimum i3 - for fluid performance with latest browsers
3. RAM - 4 GB or Higher Recommended

#### **3.2.4.1 Software Requirements**

The Required software components are:

1. Node.js - A JavaScript runtime that uses Chrome's V8 engine - for development.
2. ExpressJS - A Javascript application framework - for development.
3. ReactJS - A frontend javascript library that facilitates re-usability - for development.
4. React-vis or Elastic Search - For purpose of visualisations based on feasibility
5. Browser that supports react and HTML5/CSS3 - for common use.

### **3.2.5 Requirements Specification Document**

***The Development was done and tested with***

Operation System: Mac OSX 10.15.6  
Processor: 1.8 GHz Dual-Core Intel i5  
Memory: 8 GB 1600 MHz DDR3

***Other dependencies:***

**Backend:**

NodeJS version 12.16.2  
NPM version 6.14.8  
ExpressJS version 4.17.1  
bcrypJs version 2.4.3  
Jest version 26.4.2  
jsonwebtoken version 8.5.1  
mongoose version 5.10.2  
multer version 1.4.2  
Path version 0.12.7  
Sharp version 0.26.0  
Validator version 13.1.1  
Cors version 2.8.5  
BodyParser 1.19.0

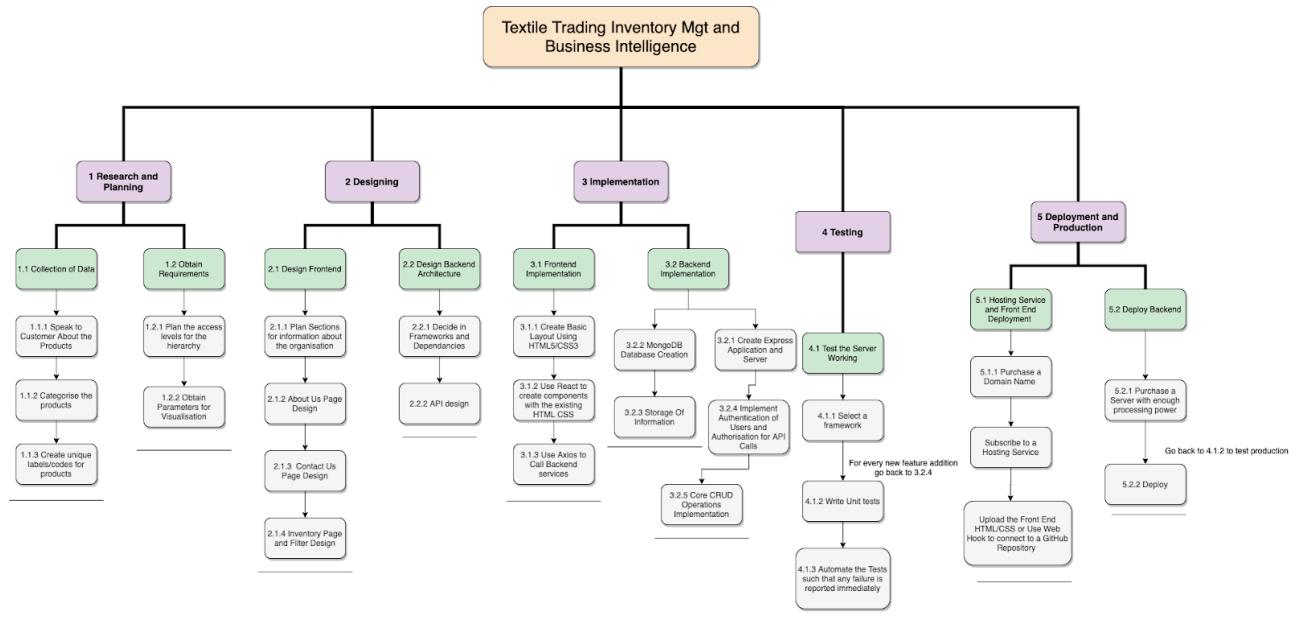
**Frontend:**

ReactJS version 6.13.1  
Axios version 0.20.0  
Express version 4.17.1  
FormData version 3.0.0  
QS version 6.9.4  
ReactCookie version 4.0.3  
ReactRouter version 5.2.0  
ReactVis versino 1.11.7

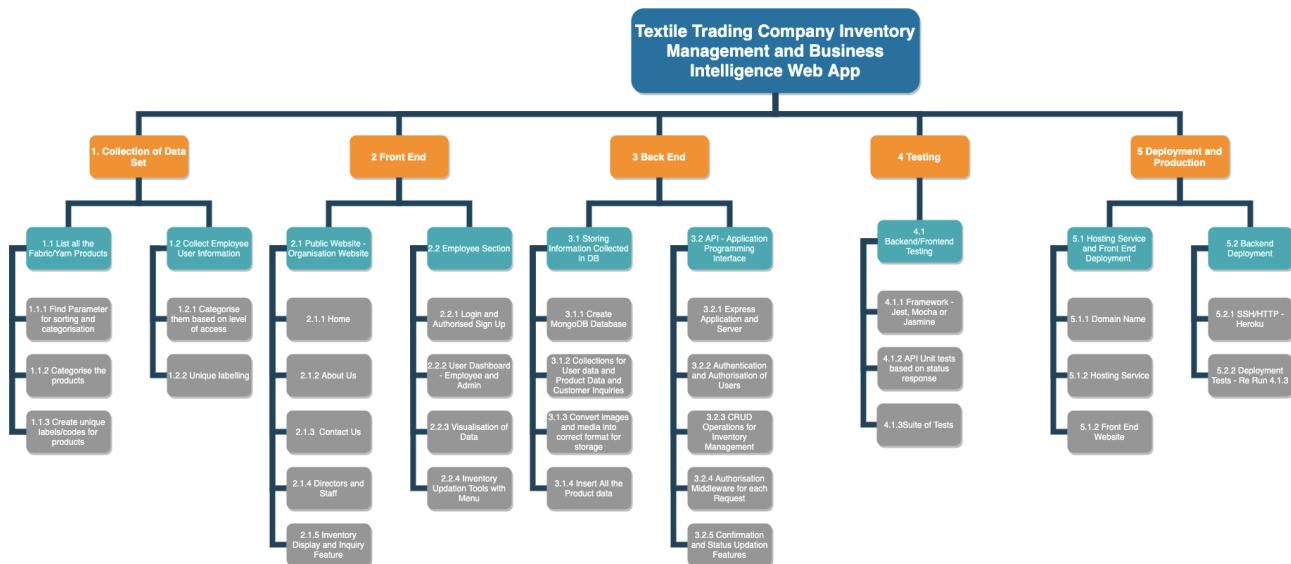
**Browser:** Version 86.0.4240.111 (Official Build) (x86\_64)

### 3.2.6 Work Breakdown Structure

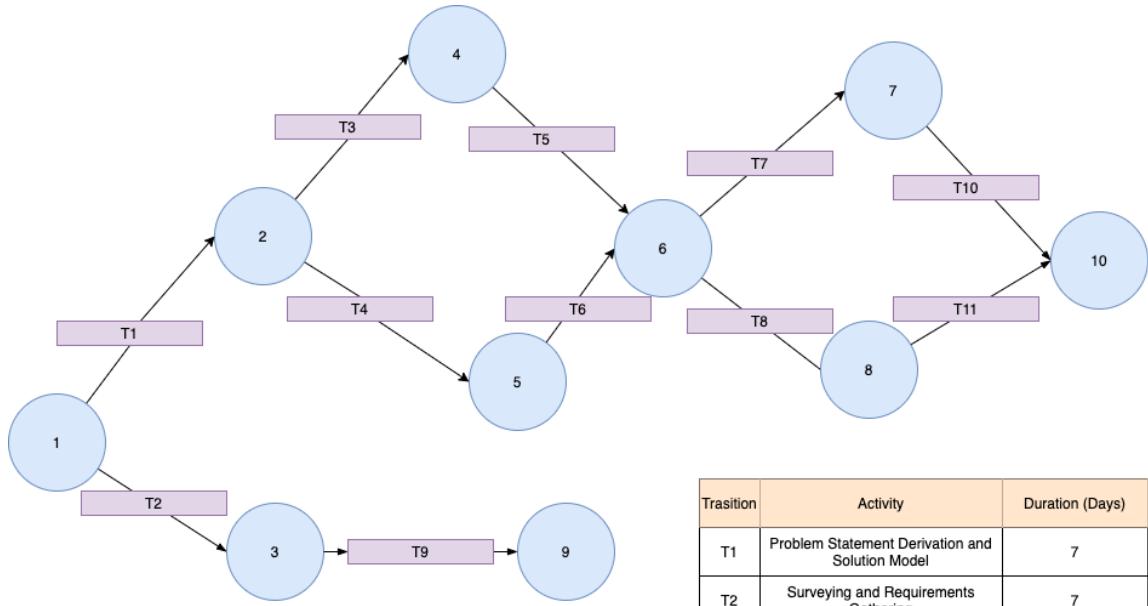
#### Verb based WBS



#### Noun based WBS



### **3.2.7 Pert Chart**



Transition	Activity	Duration (Days)	Required Predecessor
T1	Problem Statement Derivation and Solution Model	7	None
T2	Surveying and Requirements Gathering	7	None
T3	Frontend Designing	4	T1
T4	Backend Designing	5	T1
T5	Backend Server Implementation	5	T3
T6	API Creation	5	T4
T7	Frontend Pages Creation	7	T5, T6
T8	Backend Testing	4	T6
T9	Usability Testing	6	T2

### **3.2.8 Gantt Chart**

# 4. Design of the Proposed System

## 4.1 Introduction

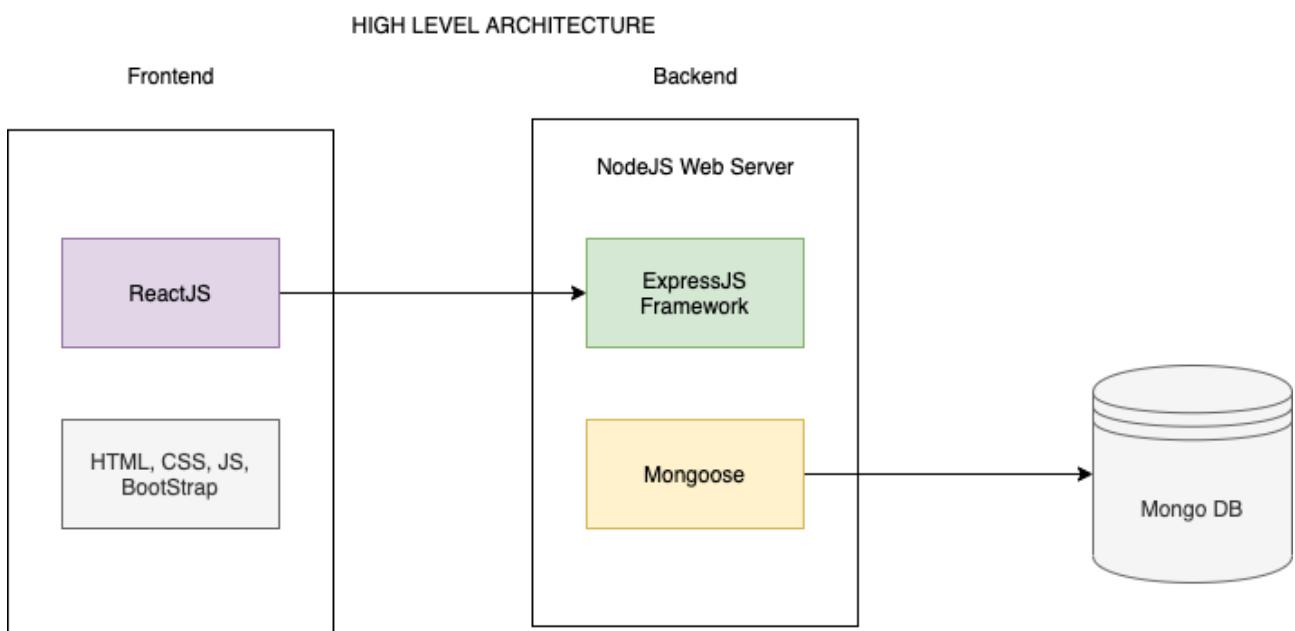
The proposed system will function as a website for public users and potential clients. The landing page will have contact information and client testimonials to improve the trust in a new user. They can either directly get in touch with the user or they can browse the inventory, decide on the product they are interested in and inquire about it. The products are dynamically rendered based on the state of the products collection. Since React is able to keep track of this the information is dynamically updated when there is a change made by the employees (to keep the virtual and real inventories consistent). The inquiry is related to one particular product and they get stored in the backend accordingly. The more the inquiries come in, the visualisations change in realtime. This is later used for generating market insights and gain better returns from improved marketing.

## 4.2 High Level Design

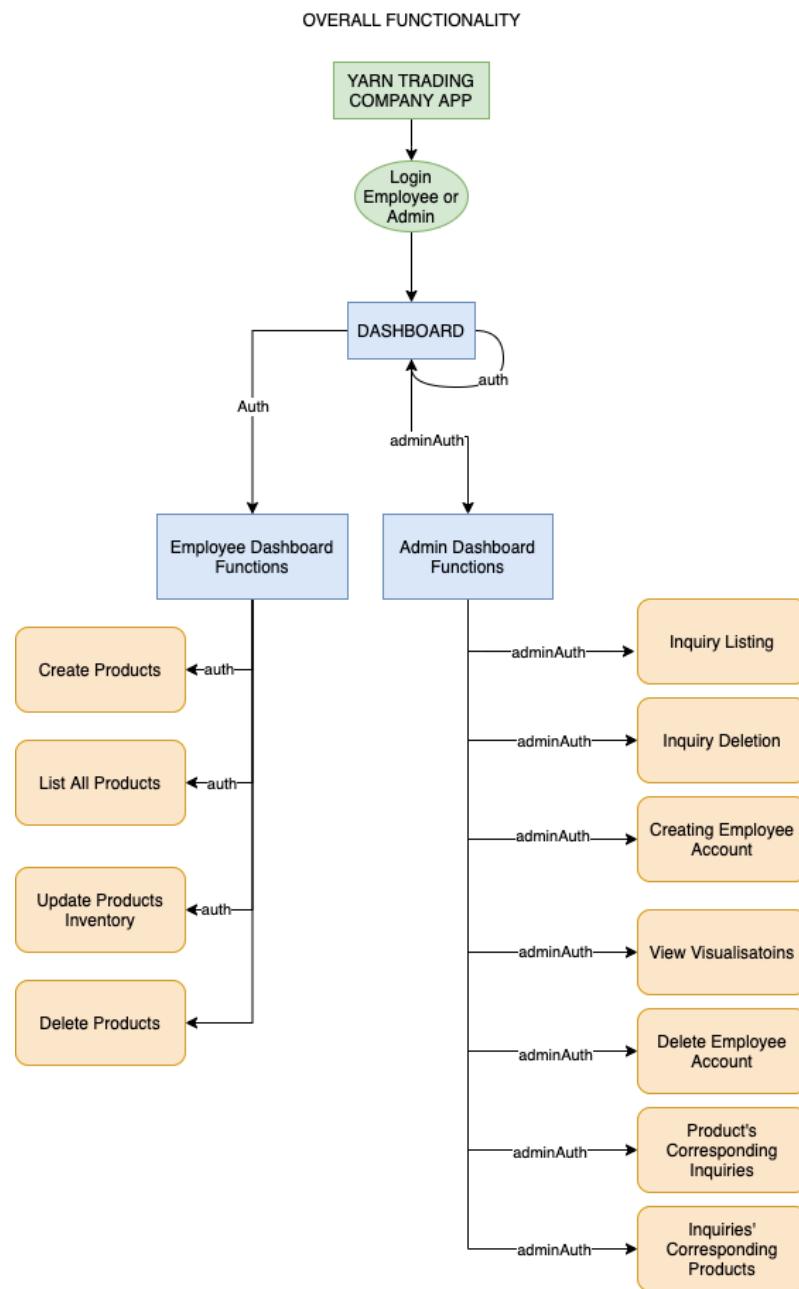
### 4.2.1 Architecture design

The web architecture is designed to function as both a website and a functional web application for the company. On the outside it is a website that people can visit, gather information about the company, view the live status of the inventory and post inquiries for purchases. The APIs are all modular and the virtual relationships are established with Mongoose and MongoDB.

### 4.2.2 Architecture Diagram



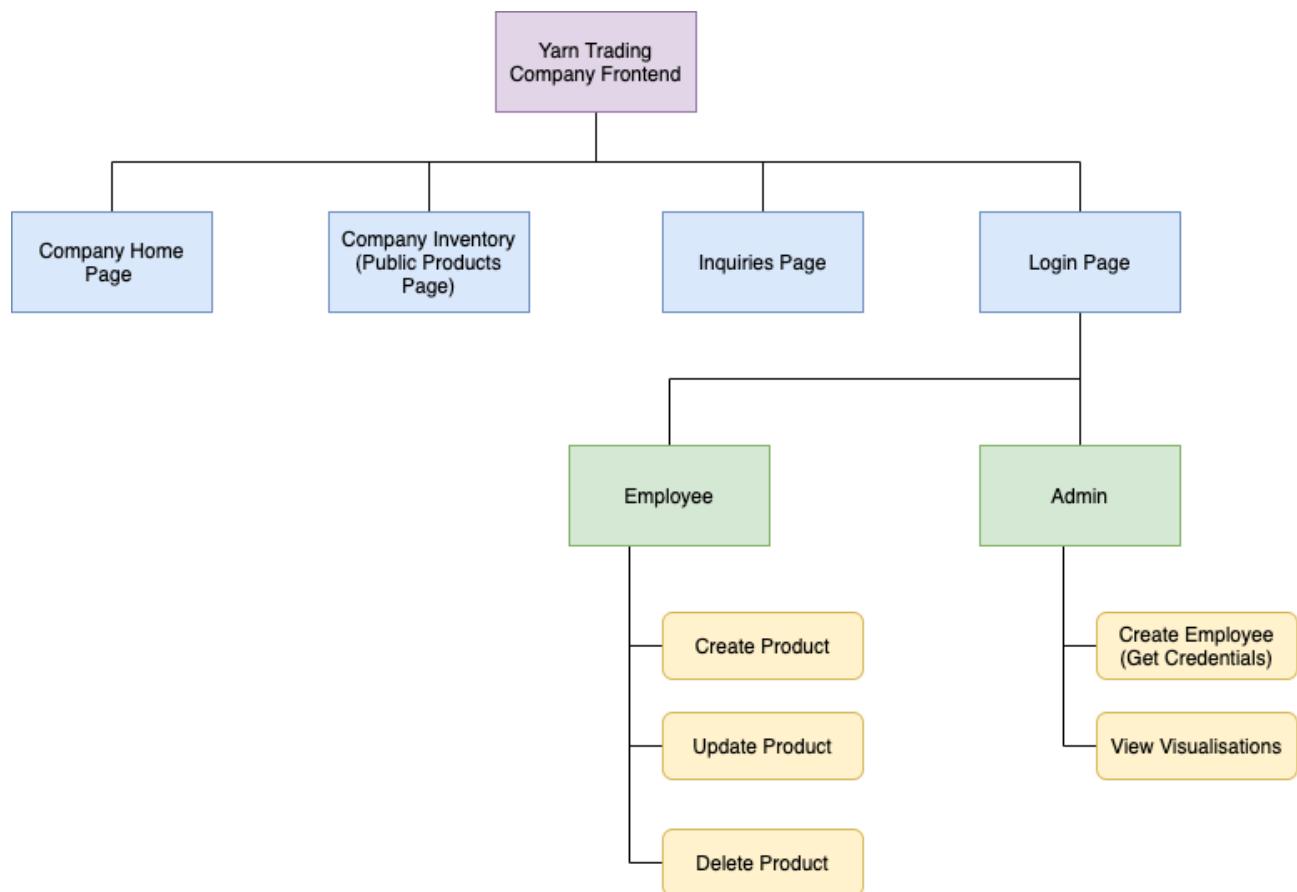
## API architecture



### 4.2.3 UI Design

The Navigation in the Frontend is structured as follows. The UI is designed to be minimalistic and elegant. The landing page is designed with animation to interest the casual user. The UI is **modular and extremely re-usable** since its implemented with ReactJS. The Login page is the same for both the employees and managers for convenience.

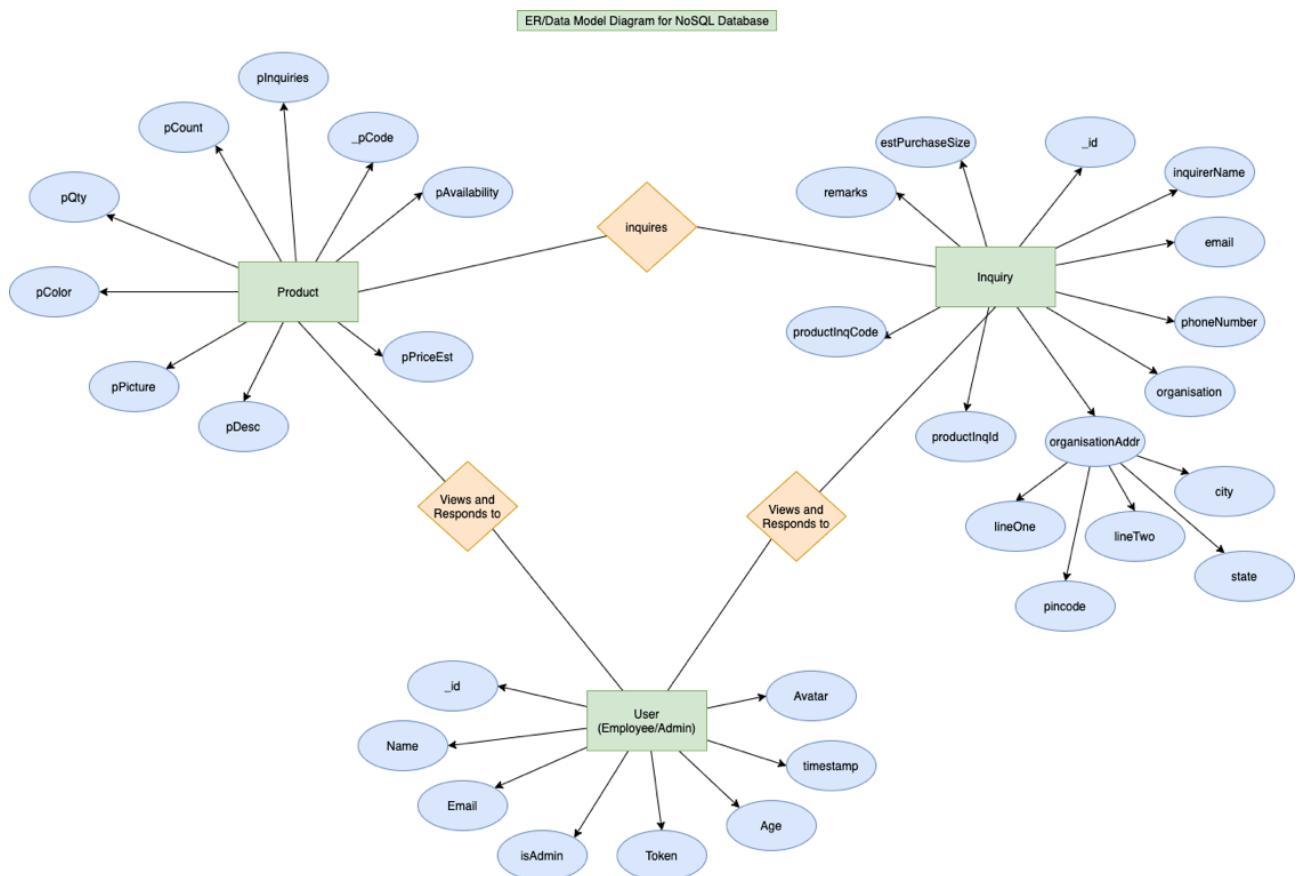
The design is made in such a way that dynamic rendering will not confuse the user.



## 4.3 Detailed Design

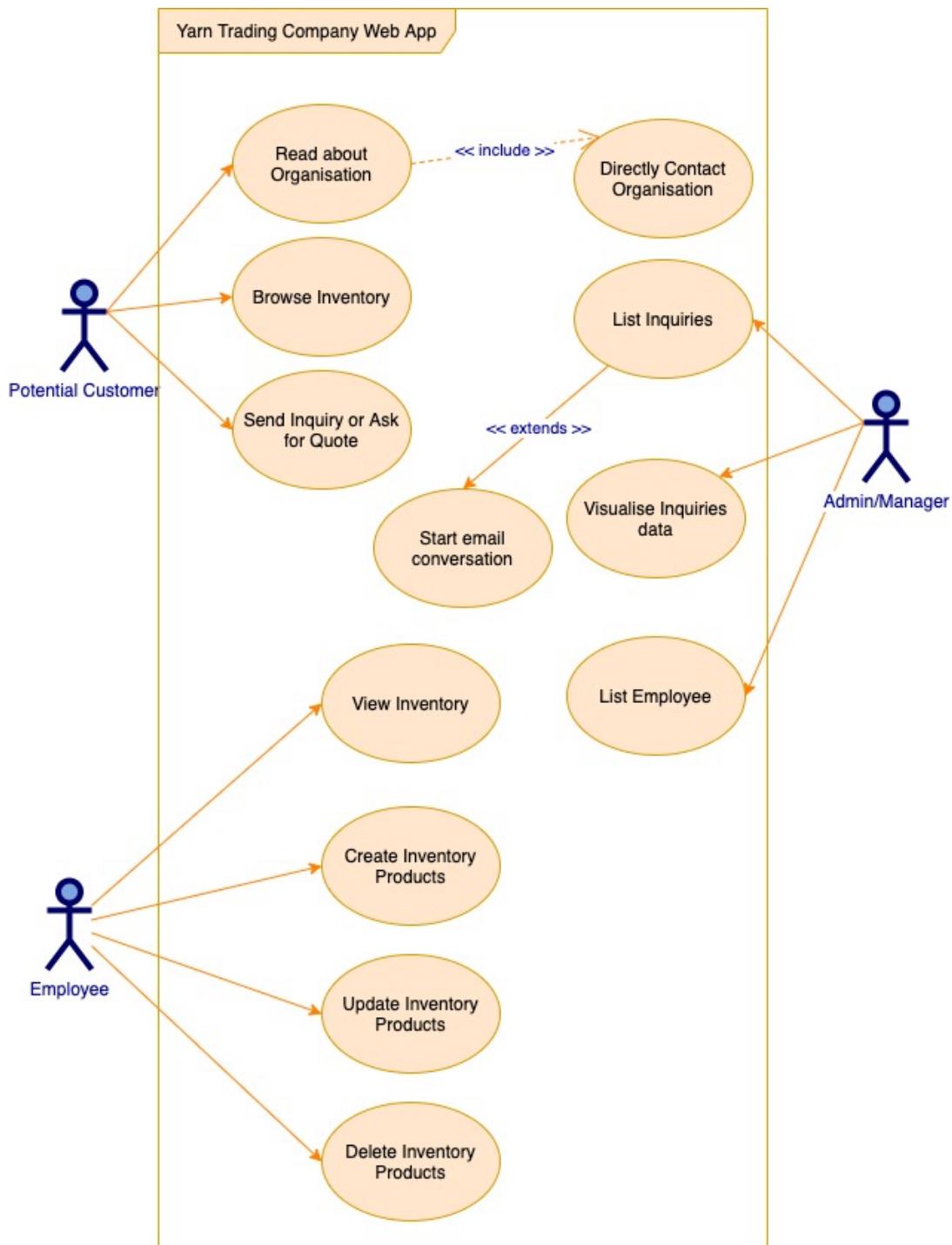
### 4.3.1 ER Diagram

As MongoDB is a NoSQL database, there are not explicitly defined entity-relationships as seen in SQL databases. It is the advantage of MongoDB to be able to quickly set up and start a schema in small and medium scales. So actual and exact ER diagrams might not be possible but the following data model is how the entities are related to each other.

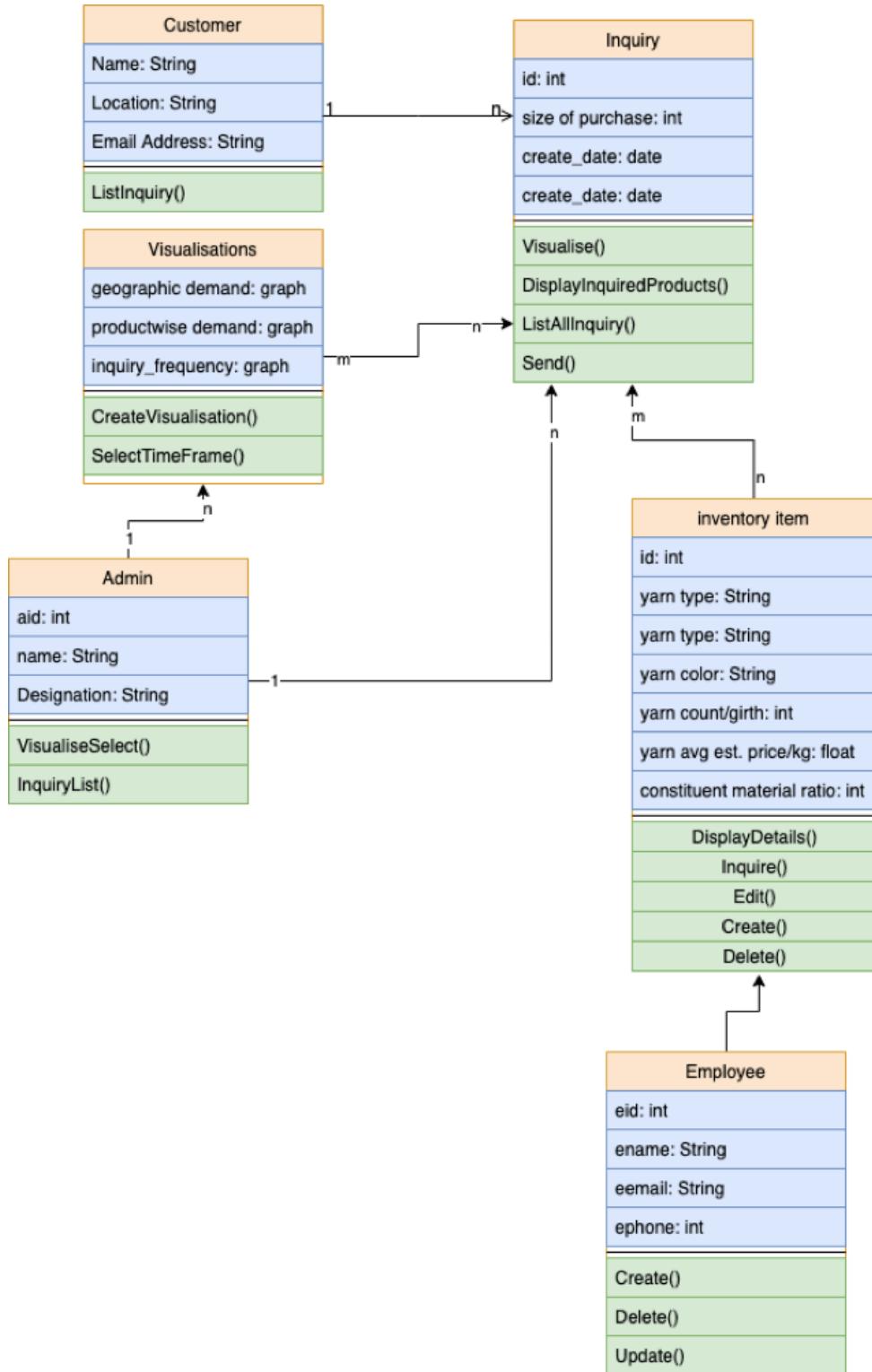


## 4.3.2 UML Diagrams

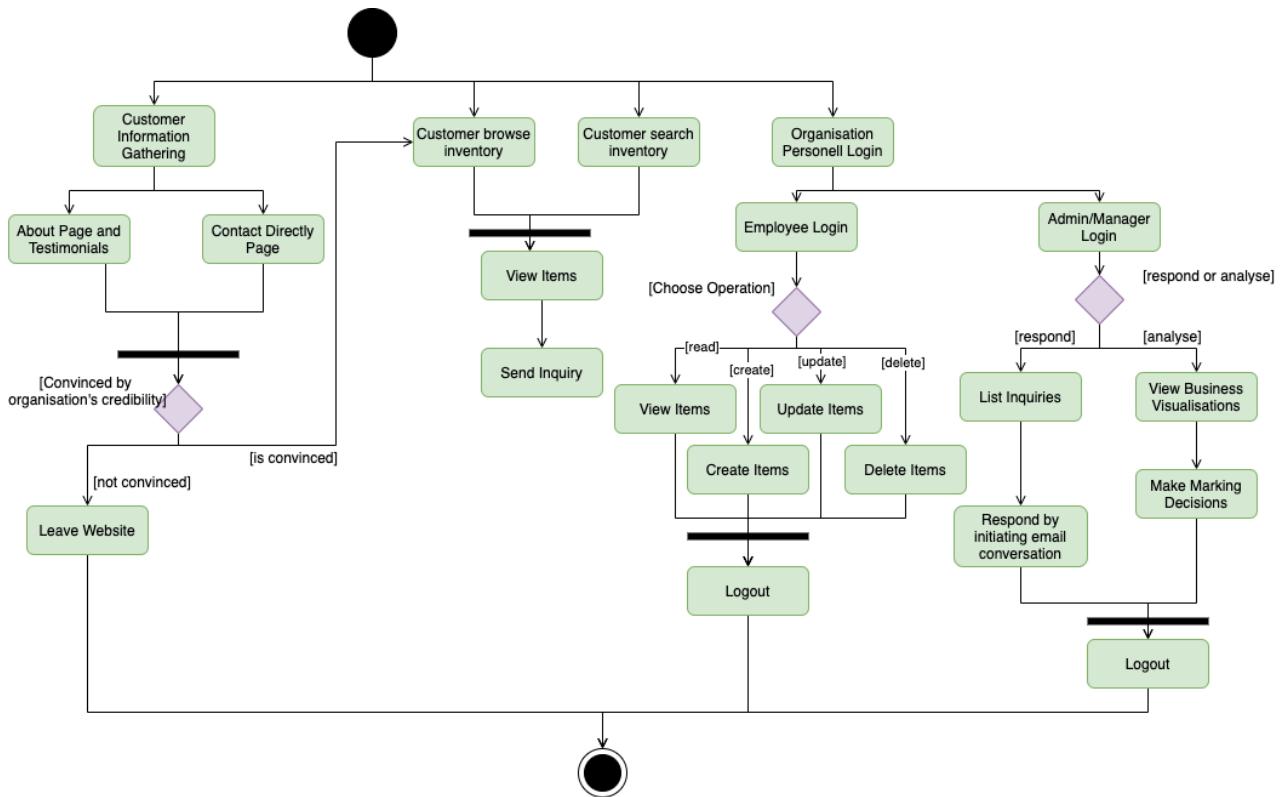
### 4.3.2.1 Use Case Diagram



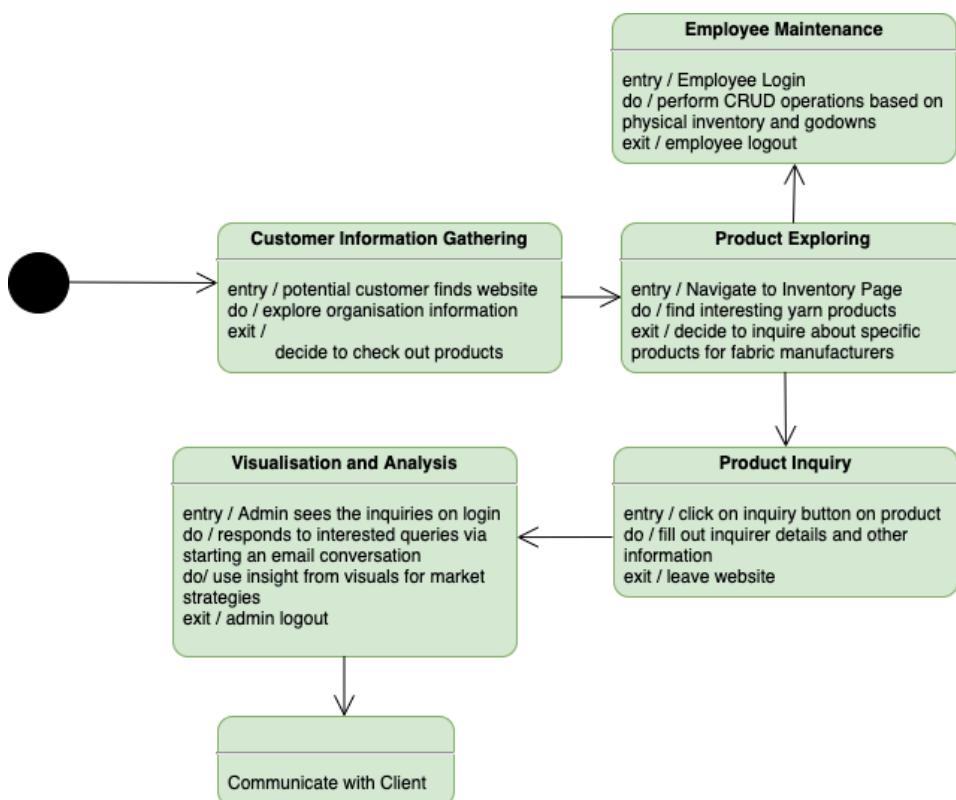
### 4.3.2.2 Class Diagram



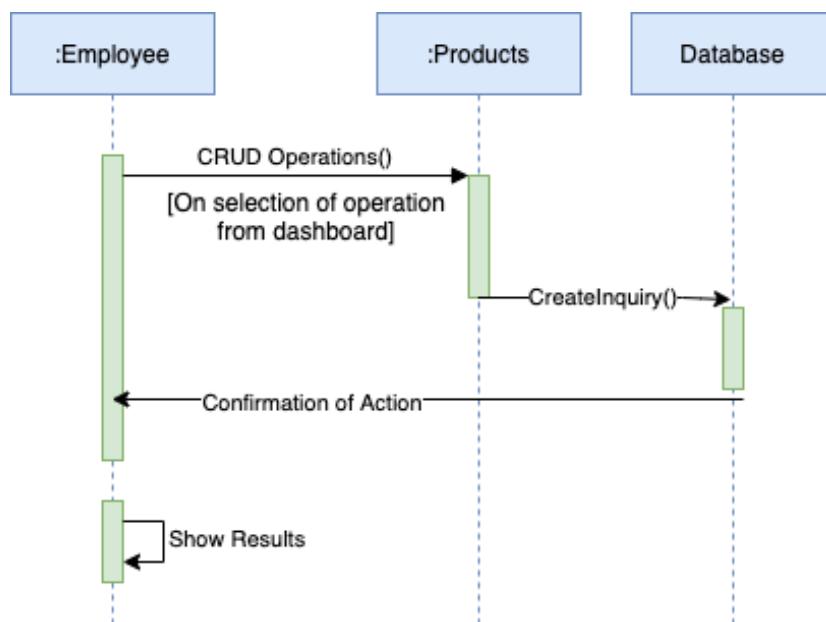
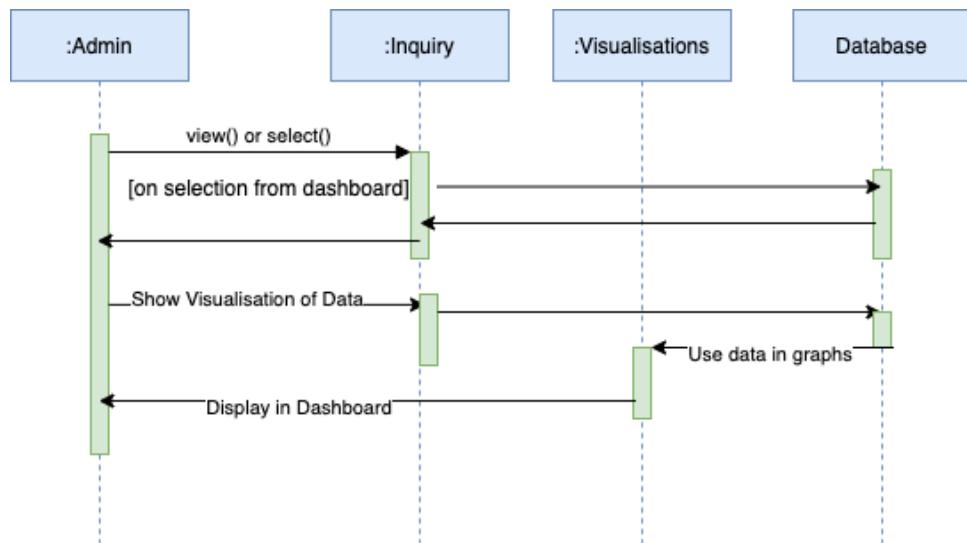
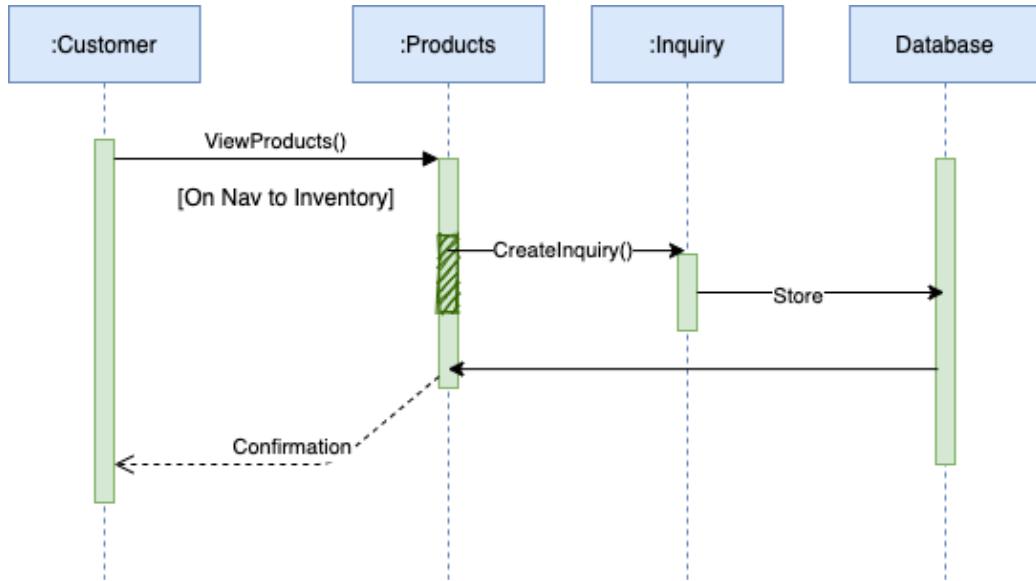
### 4.3.2.3 Activity Diagram



### 4.3.2.4 State Diagram



#### 4.3.2.5 Sequence Diagrams



# 5. Implementation and Testing

## 5.1 Implementation Details

The following are snapshots of the front end of the web application created using ReactJS.

Landing Page with details of the company

The screenshot shows the landing page of a web application for 'Kumar Yarns and Trading Pvt Ltd'. The header features the company name in blue text. Below it is a sub-headline about high-quality yarn made from 10% Polyester and 50% Recycled Cotton Fibre, available in over 100 colors. A large image of several colorful spools of yarn is displayed on shelves. The main content area includes a heading 'Checkout out Current Inventory and Stock' and a paragraph describing the variety of yarn colors available. Below this are four sections: 'On-time Delivery' (with a star icon), 'Pay Online or via Cheque' (with a document icon), 'Export Quality' (with a globe icon), and 'Quality Guaranteed' (with a thumbs-up icon). Each section contains a brief description of the service offered.

Kumar Yarns and Trading Pvt Ltd

High Quality Yarn from 10% Polyester and 50% Recycled Cotton Fibre. Open End (OE) Spun Yarn in over 100 Colors. Looking for something? Leave us an inquiry.

localhost:55317/#0

**Checkout out Current Inventory and Stock**

We have a variety of yarn colors from high quality OE Gray to OE Lemon Yellow. Our current list of products are available in our inventory section which is updated everyday. If you are interested please leave us an inquiry in the inquiry section. We will get back in touch with you via e-mail or phone.

**On-time Delivery**

We deliver in one or two business days from the day of invoice.

**Pay Online or via Cheque**

Owing to the current pandemic we only take online payments either via Net Banking or via a Cheque posted to our address.

**Export Quality**

We sell first quality yarn for manufacture or export quality fabric. Customers from around South India.

**Quality Guaranteed**

For over 20 years we have guaranteed our Yarn Quality. Return goods within 3 business days if not satisfactory\*\*

# About Us

We are a Yarn Trading Company from Chennimalai, Erode. Founded on 1997 we have been in the market for more than a couple of decades now. We started small with 2 employees and now are a mid sized company with a strong focus on yarn quality and customer satisfaction.

CUSTOMER FIRST

## Quality Focused

For us Quality is everything. For great quality fabric and clothes it starts from great quality fibre. We obtain and stock first quality yarn obtained spun from high grade fibre. For other purposes of yarn of lesser quality from recycled cotton is also available.



VALUES

## Employee Centered

We promote a healthy and robust work environment and culture. Our employees come from all spheres of life. The textile market is ever growing and flourishing. Come check us out if you are looking for a job!

HISTORY AND REPUTATION

## Trust

Since we have been in the yarn market for longer than most others, we have a good understanding of customer expectation. We build trust and are always available to feedback.



## Customer testimonials

Here is what some of our customers have to say about us.

“

— Quality over everything. In all the years I have been involved with SY, I can say without hesitation that they are the most customer friendly group of people out there.

John Doe / ABC Fabrics

“

— Simply one of the best. We are doing much better since moving to better quality yarn with SY.

Diana Rynzhuk / XYZ Traders

“

— I would easily recommend SY, to any fabric manufacturer. There are minimal breaks, better consistency and color stability in the fabric when SY yarn is used.

Ben Stafford / FGH Manufacturers

## Products Page with live inventory status

KY Home Products Inquiry Login

## Products

Currently available Products. Note that this page is constantly updated and you get real time data. Please leave us an inquiry if you are interested in a product.

		
<b>Royal Blue</b> Sample Changed Code: B0001	<b>Biscuit TE</b> Usually purchased for Multi-purpose fabric in South Tamil Nadu	<b>Pink BW</b> Infants clothing and aprons manufacturers are the popular customers

KY Home Products Inquiry Login

		
<b>Sky Blue</b> Popularly used for napkins in Tiruppur, Chennimalai and Nellore. Code: B0002	<b>Gray BL</b> Usually purchased for low quality material and mop heads Code: GY001	<b>Bright Red</b> Finds regular usage in Kids Clothes of Indian Brands Code: R0001
		
<b>Ocean Blue</b> Popularly used for Tshirts in Tiruppur, Erode and Kolkata. Code: B0003	<b>Fancy Green</b> Usually purchased for women's attire in the North-West Code: G0001	<b>Red PK</b> Finds regular usage in Kids Clothes of Indian Brands Code: R0002
		

## Inquiry Page

KY Home Products Inquiry Login

### Inquiry form

You may inquire for upto 1(one) product at a time. Please fill in the details below.

**Billing address**

Your name	Organisation name	
Sanjit	XYZ	
Product Code	Phone Number	
B0001	9842314733	
Email		
ex@ex.com		
Address		
1234, Sanjit		
Address 2		
Chennimalai		
City	State	Zip
Erode	Tamil Nadu	638051
Estimated purchase size	Remark	
140	ASAP	

**Successful!**

## Login Page (Common for Employee and Admin)

KY Home Products Inquiry Login



**Kumar Yarns**

Sign into your account

**Login**

Crud Operations on products is allowed for Employee. Other Functionality blocked for Employee.

Dashboard- employeeTest1								
Products								
<a href="#">New Product</a>								
Code	Available	Color	Count	Quantity	Price	Delete	Edit	
B0001	true	Royal Blue	20	400	120	<a href="#">Delete</a>	<a href="#">Edit</a>	
B0002	true	Sky Blue	10	200	70	<a href="#">Delete</a>	<a href="#">Edit</a>	
B0003	true	Ocean Blue	30	700	89	<a href="#">Delete</a>	<a href="#">Edit</a>	
BR003	true	Brown AEW	40	700	120	<a href="#">Delete</a>	<a href="#">Edit</a>	
BU001	true	Biscuit TE	20	150	90	<a href="#">Delete</a>	<a href="#">Edit</a>	
GY001	true	Gray BL	10	10	40	<a href="#">Delete</a>	<a href="#">Edit</a>	
G0001	true	Fancy Green	10	70	58	<a href="#">Delete</a>	<a href="#">Edit</a>	
G0002	true	Camo Green	20	140	73	<a href="#">Delete</a>	<a href="#">Edit</a>	
G0005	true	Green GR	30	500	90	<a href="#">Delete</a>	<a href="#">Edit</a>	
P0001	true	Pink BW	30	200	100	<a href="#">Delete</a>	<a href="#">Edit</a>	
R0001	true	Bright Red	10	70	120	<a href="#">Delete</a>	<a href="#">Edit</a>	
R0002	true	Red PK	40	20	130	<a href="#">Delete</a>	<a href="#">Edit</a>	
L0002	true	Lemon Yellow	40	100	150	<a href="#">Delete</a>	<a href="#">Edit</a>	

On Clicking Create Product Button - New Modal - Success - Change is reflected in product page immediately.

Create a new product ×

B0011
15
false
Peacock Blue
100
120
Sample v1
<input type="button" value="Choose file"/> 7
<input type="button" value="Close"/> <input type="button" value="Create Product"/>

Create a new product ×

B0011
15
false
Peacock Blue
100
120
Sample v1
<input type="button" value="Choose file"/> 7
<input type="button" value="Close"/> <input type="button" value="Done"/>

## On Failure

Create a new product X

B0011
15
false
Color
100
120
Sample v1
<input type="button" value="Choose file"/> 7

Close Try Again

On clicking Edit. Only some fields are permitted for editing.

The screenshot shows a web-based application interface for managing products. On the left, there's a sidebar with links for Dashboard, Inquiries, and Products. Under Products, there's a 'New Product' button and a table listing various products with columns for Code, Available, Name, Price, Delete, and Edit. A modal dialog box is open over the table, titled 'Update the following product fields'. It contains four input fields with values: '10', 'true', '100', and 'Sample v2'. At the bottom of the modal are two buttons: 'Close' and 'Update Product' (which is highlighted in blue).

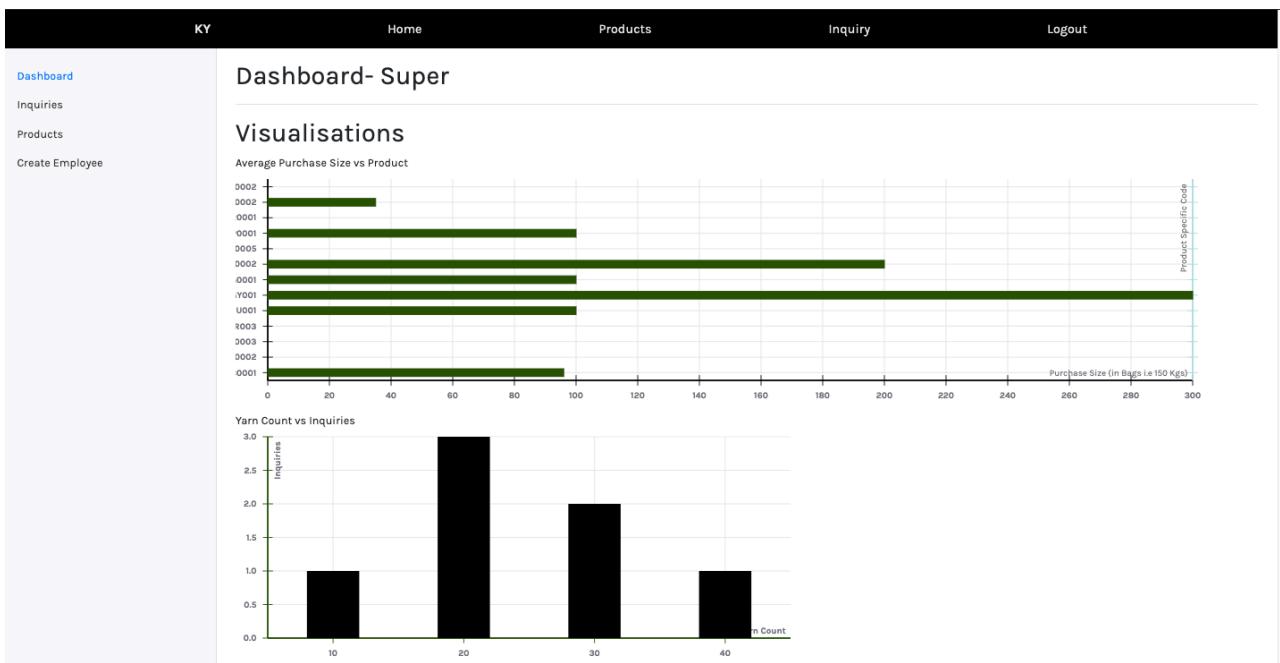
On hitting delete the product is deleted and disappears from the products page.

KY	Home	Products	Inquiry	Logout				
Dashboard	Dashboard- employeeTest1							
Inquiries								
Products								
<b>Products</b>								
<a href="#">New Product</a>								
Code	Available	Color	Count	Quantity	Price	Delete	Edit	
B0001	true	Royal Blue	20	400	120	<a href="#">Delete</a>	<a href="#">Edit</a>	
B0002	true	Sky Blue	10	200	70	<a href="#">Delete</a>	<a href="#">Edit</a>	
B0003	true	Ocean Blue	30	700	89	<a href="#">Delete</a>	<a href="#">Edit</a>	
BR003	true	Brown AEW	40	700	120	<a href="#">Delete</a>	<a href="#">Edit</a>	
BU001	true	Biscuit TE	20	150	90	<a href="#">Delete</a>	<a href="#">Edit</a>	
GY001	true	Gray BL	10	10	40	<a href="#">Delete</a>	<a href="#">Edit</a>	
G0001	true	Fancy Green	10	70	58	<a href="#">Delete</a>	<a href="#">Edit</a>	
G0002	true	Camo Green	20	140	73	<a href="#">Delete</a>	<a href="#">Edit</a>	
G0005	true	Green GR	30	500	90	<a href="#">Delete</a>	<a href="#">Edit</a>	
P0001	true	Pink BW	30	200	100	<a href="#">Delete</a>	<a href="#">Edit</a>	
R0001	true	Bright Red	10	70	120	<a href="#">Delete</a>	<a href="#">Edit</a>	
R0002	true	Red PK	40	20	130	<a href="#">Delete</a>	<a href="#">Edit</a>	
L0002	true	Lemon Yellow	40	100	150	<a href="#">Delete</a>	<a href="#">Edit</a>	

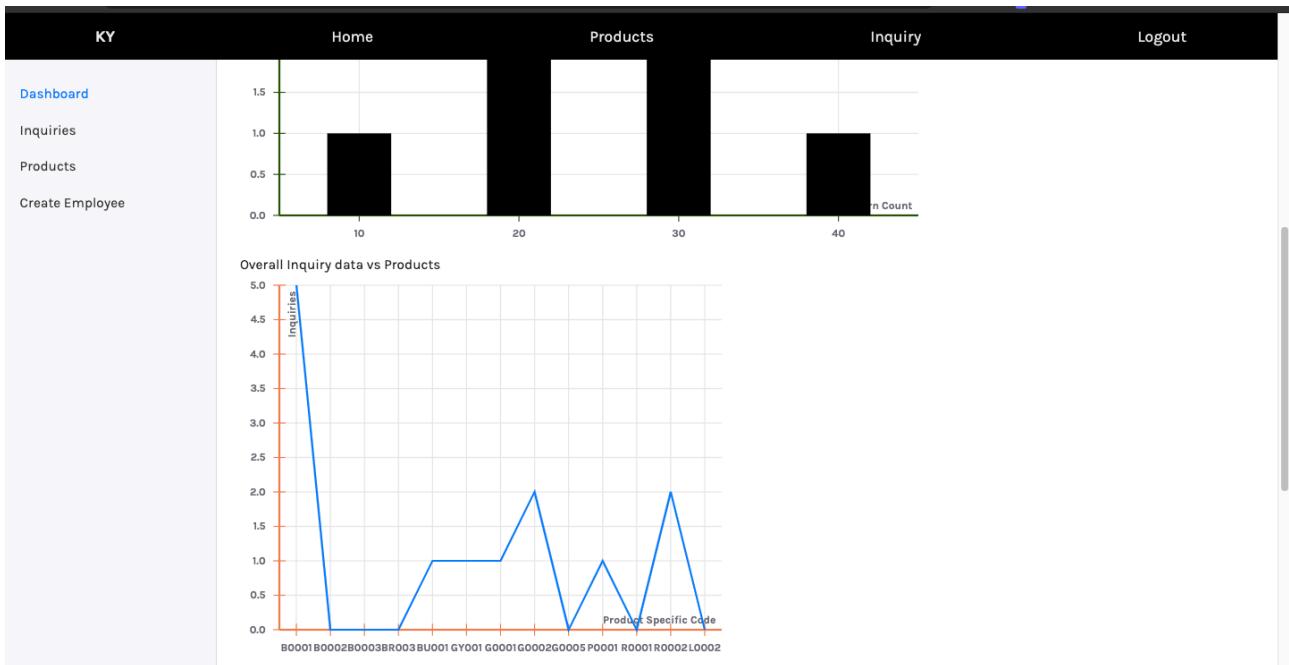
## Admin Functions - Visualisations

**Graph 1:** Product (Code) vs Average Product Purchase Size ( know how much to purchase accordingly). Horizontal Bar graph.

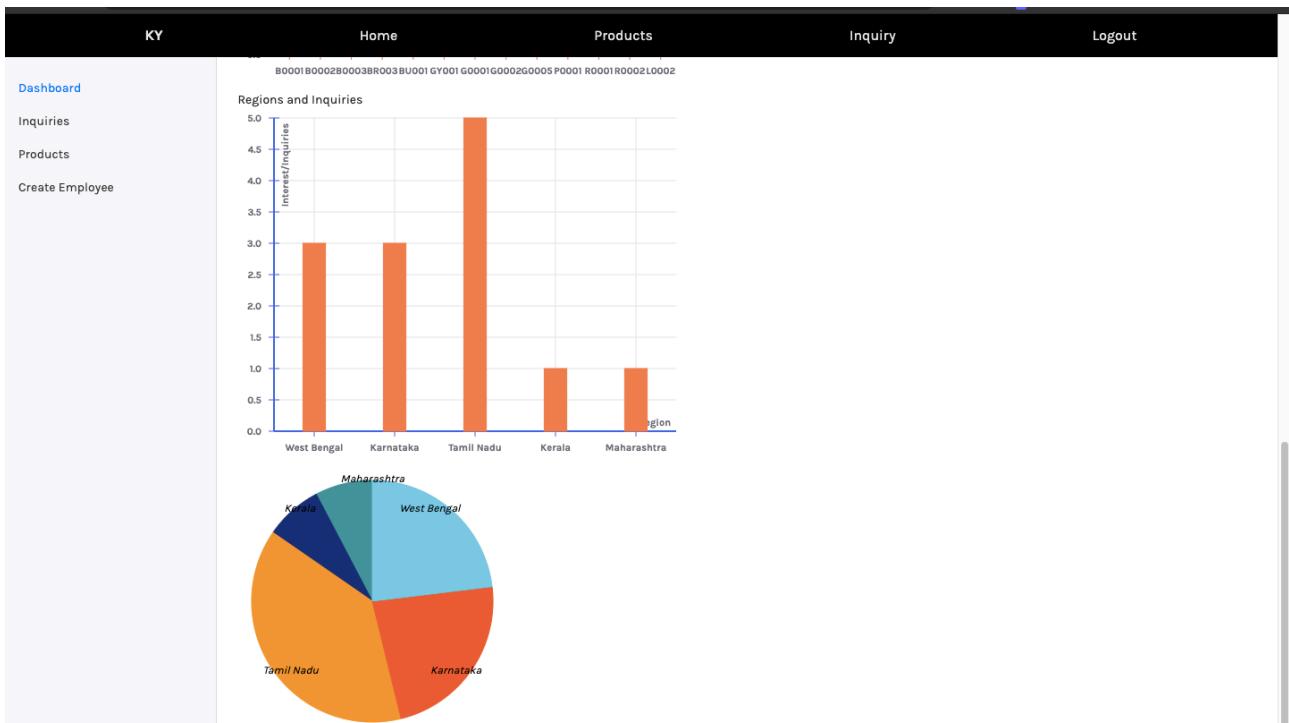
**Graph 2:** Yarn Count vs Inquiries ( know which kind of counts receive major interest). Vertical Bar graph.



**Graph 3:** Overall trend of inquiry reception. Line Graph.



**Graphs 4 and 5:** State-wise interest shown in products. Both as Bar graph and Pie Chart.



Create employee account or manager account for existing admin

The screenshot shows a web-based application interface. At the top, there is a navigation bar with links for KY, Home, Products, Inquiry, and Logout. On the left side, there is a sidebar with links for Dashboard, Inquiries, Products, and Create Employee (which is highlighted in blue). The main content area has a title 'Dashboard- Super'. Below it, there is a section titled 'Create' containing four input fields: 'Full Name', 'Email address', '\*\*\*\*\*' (representing a password), and 'Admin? 'true' or 'false''. There is also a field for 'Age'. At the bottom of this section is a large green button labeled 'Login'.

## 5.2 Testing

### 5.2.1 Types of Testing

The Complete web application is tested. Firstly, **equivalence tests** have been designed for the different modules of the project. These are tabulated as below. Also these unit route tests have been **implemented with JEST** (a JavaScript Testing Framework). Further **usability tests** have been carried out with *Tree Jack* with end user surveys.

### Equivalence Testing

#### Login Module

S. no	Class	Input Conditions	Expected Results	Actual Results
1	Correct Credentials	Valid Input Email and Correct Corresponding Password	Successful redirect to homepage of Employee	Successful redirect to home page of employee
2	Incorrect Credentials	Invalid Email (doesn't exist) and password  Or  Correct Email and incorrect corresponding password	Stay in Login page and ask to retry	Error is thrown and user is notified to retry
3	Empty Input Credentials	Blank Email or Blank Password Fiels	Stay in Login page and ask to retry	Highlight blank fields and display that they are mandatory

## Product Creation

S.no	Class	Input Conditions	Expected Results	Actual Results
1	Successful	Product attributes: 1. Color 2. Quantity (Non-negative) 3. Availability 4. Price (Non-Negative) 5. Count ( $0 < \text{Count} < 100$ ) 6. Code (length=4) 7. Picture Are provided.	Database updation and success message	Database updated with new product and success message
2	Invalid Range of Input	Product attributes with range: 1. Color 2. Quantity (negative) 3. Availability 4. Price (Negative) 5. Count ( $0 < \text{Count} < 100$ ) 6. Code (length=4) 7. Picture Are provided.	Throw Error and Stay in Creation Page	Throw Error "Invalid Input Fields" and stay in page
3	Mandatory inputs missed	Any of the following mandatory fields are missed: 1. Code 2. Color 3. Quantity 4. Count	Throw Error and Stay in Creation Page	Throw Error "Empty Input Fields" and stay in page

## Product Updation

S.no	Class	Input Conditions	Expected Results	Actual Results
1	Successful	Updation attributes selected within correct fields: 1. pCount 2. pAvailability 3. pPriceEst 4. pDesc	Database updation and success message	Database updated with new value and success message
2	Invalid Fields	Updation attributes selected within incorrect fields: 1. pQty 2. pCode	Throw Error and Stay in Creation Page	Throw Error "Fields are not allowed for updation" and stay in page

## Product Deletion

S.no	Class	Input Conditions	Expected Results	Actual Results
2	Invalid Fields	Correct ID of the product is specified (product with the provided ID does not exist)	Throw Error and Stay in Creation Page	Error message "Invalid Product ID Please try again"

### Product CRUD Operation Access (Authorisation Middleware)

S.no	Class	Input Conditions	Expected Results	Actual Results
1	Successful for Employee level operation	The Bearer Token in the 'Auth header' of API call is valid and verified.	Access to API end point granted	CRUD operation is performed
2	Successful for Admin level operation	The Bearer Token in the 'Auth header' of API call is valid the isAdmin field is true on decrypting the JWT token.	Access to Admin only API end point granted	Operation is performed
3	Invalid Auth Header of User (Employee or Admin0	The Bearer Token in the 'Auth header' of API call is invalid.	Access to API end point denied	CRUD operation is not performed
4	Correct Auth Header of Employee for Admin Only Operation	The Bearer Token in the 'Auth header' of API call is valid but isAdmin is false on decrypting the JWT token.	Access to API end point denied	Display Error "Admin Privilege Required"

### Inquiry Creation

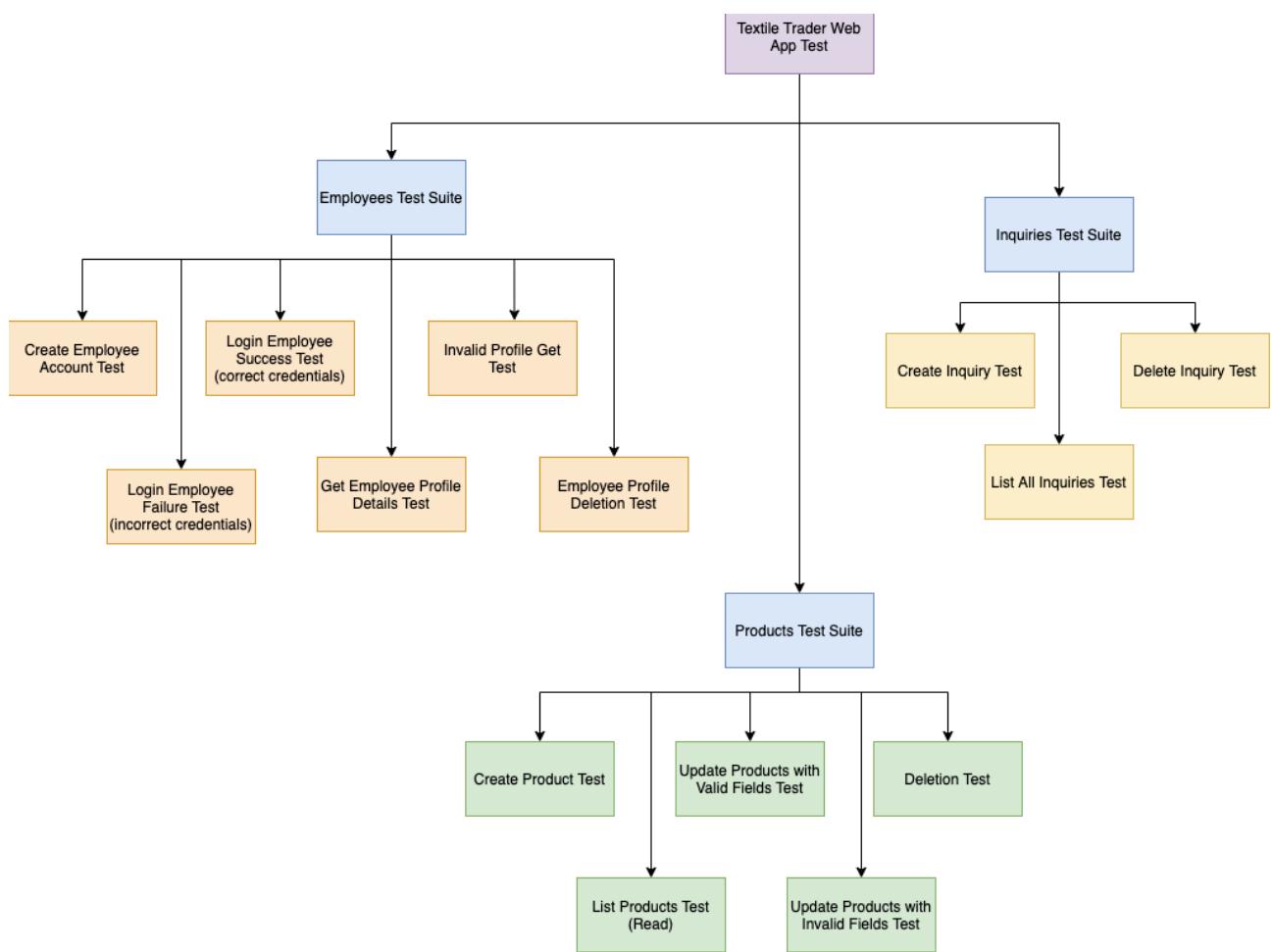
S.no	Class	Input Conditions	Expected Results	Actual Results
1	Successful	Inquiry attributes: 1. inquirerName 2. email (valid email range) 3. phoneNumber (valid ph no) 4. Organisation 5. Organisation Address 6. Estimated Purchase Size 7. Remark Are provided.	Database updation and success message	Database updated with new inquiry and success message
2	Invalid Range of Input	Inquiry attributes: 1. inquirerName 2. email (invalid email range) 3. phoneNumber (invalid ph no) 4. Organisation 5. Organisation Address 6. Estimated Purchase Size 7. Remark Are provided.	Throw Error and Stay in Creation Page	Throw Error "Invalid Input Fields" and stay in page

S.no	Class	Input Conditions	Expected Results	Actual Results
3	Mandatory inputs missed	Any of the following mandatory fields are missed: 1. Inquirer Name 2. Email 3. Phone Number	Throw Error and Stay in Creation Page	Throw Error "Empty Input Fields" and stay in page

### Implemented with JEST (APIs tests)

We have also performed our API testing with JEST (A JavaScript testing framework). The architecture for the test suites for the same are as follows.

*Test Command: npm test (or) env-cmd -f ./config/test.env jest --watch –runInBand Dependencies*



### Dependencies of Test Module:

- 1.JEST JAVASCRIPT TESTING FRAMEWORK
2. SUPERTEST (From Express For Asynchronous Api Testing)
3. ENV-CMD (Npm Module For Configuring Test Environment And Variables)

DB is set up and turndown for testing purposes with 1-2 sample entities.



## Successful test results

```
PASS tests/employee.test.js (6.88 s)
● Console
```

```
  console.log
    MONGO DB CONNECTED!
      at src/db/mongo.js:10:13
        at runMicrotasks (<anonymous>)
```

```
PASS tests/inquiry.test.js
● Console
```

```
  console.log
    MONGO DB CONNECTED!
      at src/db/mongo.js:10:13
        at runMicrotasks (<anonymous>)
```

```
PASS tests/products.test.js
```

```
● Console

  console.log
    MONGO DB CONNECTED!
      at src/db/mongo.js:10:13
        at runMicrotasks (<anonymous>)
```

```
Test Suites: 3 passed, 3 total
Tests:       13 passed, 13 total
Snapshots:   0 total
Time:        10.317 s
Ran all test suites related to changed files.
```

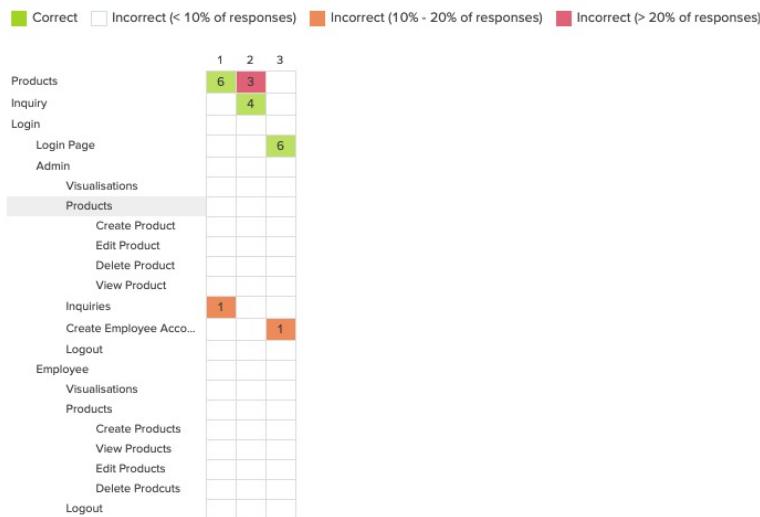
```
Watch Usage: Press w to show more. □
```

## Usability Testing

First usability testing is done with the help of tree jack. Tree Jack is a free online usability testing software that tests navigation and generates graphs for the same. It does so with the help of test taker surveys. We tested our project with it and the results we obtained are as follows

The tests show the success ratio and comfort of the users in reaching the correct destinations. Some screenshots of the result are shown below.

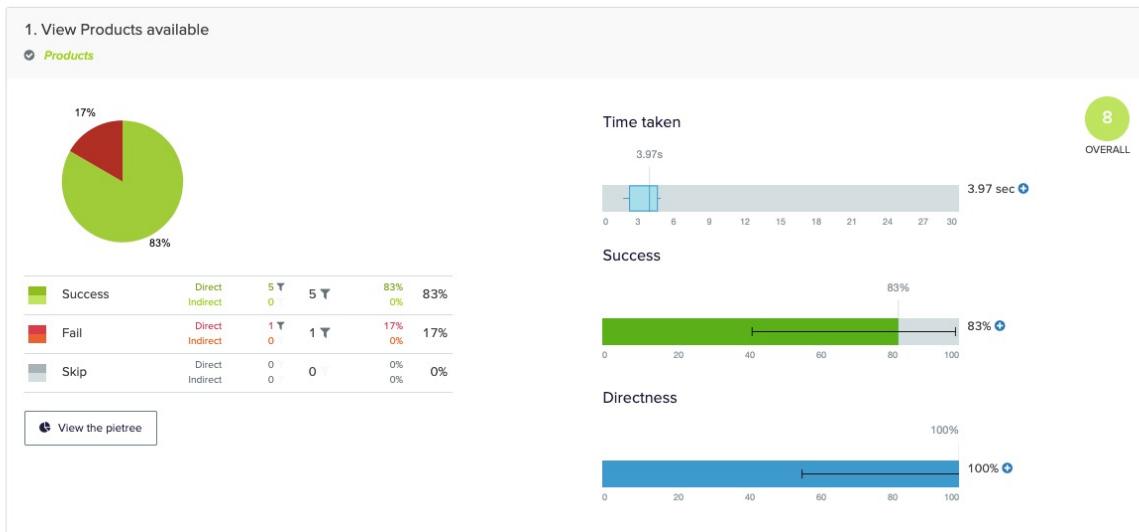
### Participant destinations



### Participant paths

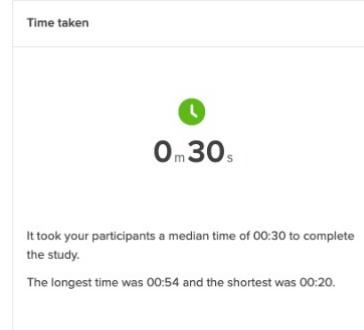
A screenshot of the Tree Jack interface showing participant paths for the task "1. View Products available". The table lists participants (2, 3, 4, 5, 6, 7, 8) and their corresponding paths. A filter bar at the top allows selecting Direct success, Indirect success, Direct failure, Indirect failure, Direct skip, and Indirect skip. The table shows that participants 2, 3, 4, 5, and 7 followed a direct path to the "Products" module, while participant 6 took a longer route through "Login > Admin > Inquiries". Participant 8 also took a direct path to "Products".

Success	Participant	Path
Green	2	> Products
Green	3	> Products
Green	4	> Products
Green	5	> Products
Red	6	> Login > Admin > Inquiries
Green	7	> Products
Green	8	> Products

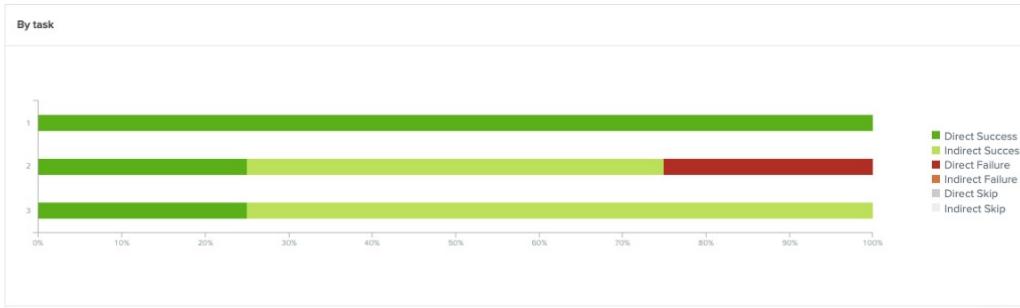
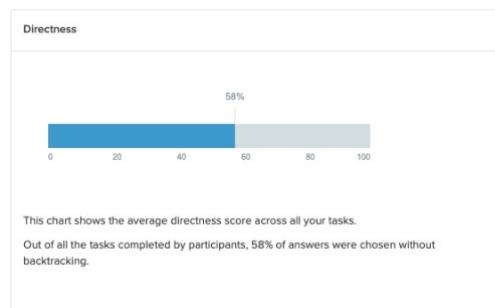
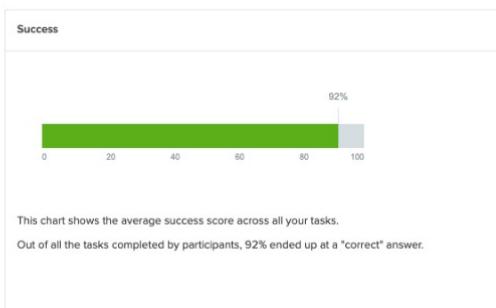


## Participants

There is still 1 active participant



## Tasks



Click to go forward, hold to see history

# Conclusion

Through this project we have created a minimal and simplistic prototype for a full scale web application that can act as an inventory tracking and inquiry generation system while at the same time creating visualisations that provide meaningful insights. We have done so while keeping the interface minimal and simplistic to make it available to anybody who can handle a normal website since our target audience are not exactly tech savvy. We have made sure to test all the functionality and the usability too.

## Limitations and Scope for Future Work

The scope for this project is really interesting. This is a very prevalent situation in trading companies of small scale that cannot afford sophisticated customisable software that exists in the market. What these companies need is a relatively simpler application which can be easily built with the prevalent technology. This opens up a potential market for simpler web tools which provide business intelligence. These are companies that have *just* enough financial means to pay for a reasonable software but do not have the exposure or means to access such technology. Business insight is usually gained by information gathering and word of mouth. This is not always reliable. With proper marketing, by gaining a few clients it is possible to make this a successful business venture.

That said, there is room for improvement in the sense that, with feedback from the end users we should be able to improve the visualisation standard. Although the UI is clean and minimal, it is still possible to make it fancier.

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