Sri Lanka Institute of Information Technology

Project Proposal

Food Distribution Management System

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1. Background

a. Company background

Perera distributors is a food distribution company that started operating in the central province in 1994. Throughout the years, the company has scaled up immensely and has established operation in Western and Southern provinces. The company Buys produce from various suppliers and sells to retailers. Although the company originally distributed fruits and vegetables within the central province, Perera distributors now distributes a plethora of produce such as seafood, meat and processed foods.

As the company scaled, the complexity of the operations within the company increased. And the overall efficiency has been decreasing.

b. Internal operations and structure of the company

- Buying
- Storing
- Transporting**
- Selling

Are the main functionalities of the system. In addition to these, the company also has the following supporting functionalities,

- Employee management
- Handling third party couriers**

The company has the following major resources,

- Warehouses

  Every warehouse can store produce up to a certain capacity. Each warehouse provides specific storing conditions (e.g.: Sealed, Refrigerated). Several staff members consisting of clerks and labor workers work in every warehouse and a warehouse is manages by a single manager. The costs related to maintenance of the warehouse are handled by clerks.

- Trucks

  Trucks are used to deliver** produce in between warehouses. Trucks have drivers assigned to them that take shifts when delivering. Maintenance and fuel costs for the trucks are handles by the drivers.

*** Trucks are used for deliveries in between warehouses. The company **DOES NOT** handle transports to or from buyers/suppliers.*

Buyers and suppliers must use their own vehicles or hire a third-party courier who is trusted by the company.

2. Problem and Motivation

a. Problem

The paper-based system causes numerous issues in several departments of the company. It is necessary to preserve all the documents safely and keep under the supervision of someone that can be trusted since there are no backups of day-to-day transactions. It is also unreliable to handle a company's vast amounts of data because it needs to be carefully monitored and protected. The efficient management of numerous data and the subtle interactions between several sections are essential to the successful day-to-day operation of a distribution center. Every day, Perera Distributors handles a considerable quantity of stocks. Managers and employees must keep track of inventories, deliveries, and work schedules. Adding records one at a time and maintaining the records is quite difficult and takes a huge amount of work hours. Also, it appears to be unable to search for a record and update it.

Since they lack a tracking system or a comparable service, the corporation is unable to monitor the productivity of the drivers who deliver the goods. Also, due to the lack of staffing levels, especially at nighttime 24/7 service is not possible.

Since deliveries are done among the centers, same details are more likely to be added to the records repeatedly due to lack of communication. The business occasionally fails to offer its services to suppliers and customers as a result of poor internal communication. Additionally, it leads to various situations where warehouses store more products than they are designed to, which ultimately lead to product wastage. Therefore, finance handling is not properly done since the managers are unable to have a clear view on profits and loss, delivery costs, warehousing costs, maintenance costs and salaries of the employees.

b. Benefits of proposed system

- *Data safety*

  Having a cloud-based database gives the advantage of having automated backups and data recovery. Through this data can be guaranteed to be safe.

- *24/7 Service*

  At the moment round the clock service is impossible due to the lack of staff at nighttime. But having an automated system can provide services even during non-working hours.

- *Less wastage*

  Produce used to be wasted at an alarming high rate because they expire before being sold. But because the processes of the proposed new system are nearly instantaneous there is much less wastage.

- *Less paperwork*

A software system allows documents to be stored digitally without the need of paper. This makes reading and writing data faster and easier while also saving space.

- *Better organized deliveries among warehouses*

  With an automated system it is easier to track real time locations of the delivery vehicles which will make it easier for the company to manage and assign trucks and drivers. This will allow the company to organize deliveries and reduce the number of deliveries needed between the centers.

- *Better motivation among employees*

  Not using paper and having an attractive user interface makes the system easier to use and motivates. Furthermore, a web-based attendance marking, and scheduling system will encourage employees to work on time.

- *Competitive edge*

  Services offered through the proposed system will attract more buyers and suppliers to the company, due to the attractive UI and round the clock service. This is a significant competitive advantage.

- *Automated report generation*

  Managers can get business reports and analysis of the system functions easily, immediately and accurately. This allows them to make better business decisions.

3. Aim and Objectives

a. Aims

The business model of Perera distributors is buying goods from registered suppliers and selling them to retailers. The company has multiple warehouses, each with similar business functions. The system is built to streamline the entire process and provide a single view of all warehouse data. The system is also designed to allow for real-time control over inventory levels and other business functions. Ultimately, this allows the company to provide 24/7 service due to the automation.

To ensure data safety, the database platform used is cloud based and it provides security, performance and scalability for processing large amounts of data in real time, in a more flexible manner so that it is easily accessible.

As the company scales, the number of computer systems also increase. But with multiple computer systems controlling different aspects of the company, coordination becomes a challenge. To overcome this, the company needs to be centralized into one easy-to-manage system.

Automated report generation will also be included, which is a great way to help employees to understand how they are performing and what they need to work on.

b. Objectives

- **Create a common, cloud-based database to contain every detail related to the company's business functions.** And it will be more effective than a paper-based system. The information will be more secure, easily accessible, and reduce error rates.
- **Create separate, easy-to-access (browser based) UIs for different functionalities.** It will make consistency, usability, navigation, visual appeal, interoperability, performance and accessibility to be in higher standard.
- **Create distributed microservices for standalone, supporting functionalities (E.g.: delivery tracking through GPS)** will increase productivity and increase the reliability of the overall system.
- **Connect all the UIs and microservices to a central system.** Will result in an easier form for all the internal as well as the external stakeholders to engage with the system.

4. System Overview

a. Delivery Management

This sub-system will record, track and manage the delivery of goods and and all associated resources within the delivery period. Deliveries only transport goods between distribution centers, not to/from any outside party. A delivery includes a vehicle,

driver(s) and goods.

This sub-system provides the following functionalities,

- Create/Cancel/Update delivery
- Change delivery status
- Vehicle tracking through GPS
- View delivery information
- Get fuel allowance
- Report generation

Non-functional Requirements

The system provides estimates regarding the delivery when viewing delivery information. For the estimates to be useful, the delivery tracking service must be timely and accurate. Speed is also a requirement for both delivery tracking and and processing as deliveries cannot be optimized with slow processing. Modularity is also needed for the delivery tracking as the company may choose to change the GPS service provider in the future.

Technical requirements

User Interfaces will be implemented for Clerks and Drivers to access the delivery sub-system. The drivers interface must be mobile friendly as the driver will be connecting to the system through a smart phone during the delivery. Delivery tracking system will be connected to a GPS service provider (Google Maps, Azue Maps etc) and it will be implemented as a microservice to provide modularity and replacability. This will also make the system faster as the tracking system will be deployed on a different server than the main system, diverging the traffic. Choosing a well known GPS service provider can ensure the accuracy and the timeliness of the system. Additionaly, the User Interfaces will be created with performance in mind.

b. Buyer functionalities

Buyer functionality has two main parts as account creation and placing an order.

Account creation – Under account creation the buyer can create an account, update his account details, view order history and can delete the account.

Placing an order – When placing an order, the buyer can select items, select the quantity of items and add them to the cart and continue shopping. Even after adding the items to the cart the buyer can make changes in the cart such as increasing, decreasing the quantity and even removing items. If the buyer wants to remove the added items, he can do it using the “product table”. If the buyer wants to add more products to the cart, he can click on “add new product” so that the buyer will be redirected to the shopping page from the cart page. Meanwhile the buyer adds items to the cart with the required quantity, the subtotal will be calculated and displayed. After completing all the buyer can finalize his order by clicking on the pay button then the buyer will be directed to the payment portal.

After completing the payment, the buyer can view the order details through the order details page and see all his items in order available in our system. Buyer can select whether he is doing self-pickup or wants delivery. Buyer also can schedule the order specifying a date on time to receive it.

Non-Functional requirements

- It is secure because an authorize buyer only can access the buyer user interface and use it.
- The system is an user friendly system
- Since traffic jam is being managed, any amount of buyers can use the system

Technical requirements

- Supporting for mobile devices
- Supporting ms edge and google chrome. 3)Buyer interacting user interface is created using the react library.

c. Supplier Functionalities

Perera Distributors needs suppliers as much as it can get to scale the system better. Any interested supplier can register as a supplier in the system via submitting relevant information (nature of the product, quantity, personal details etc) in supplier registration portal.

A registered supplier can schedule their supplies, which will take place in regular intervals so that the company knows beforehand the place (warehouse), time and quantity it receives. In some occasions, a registered supplier can notify the company if they can supply some certain goods at a certain time so Perera Distributors can consider and approve it. All notified and scheduled processes will be recorded. In an event where the supplier cannot meet with the required supplies for some specified reason, they can cancel the schedules and also suppliers can update their schedules too. For an instance when a supplier has a schedule to supply 400kg of a product monthly but for a specific reason they couldn't maintain that quantity going forward, in that case they can update their schedule to change the quantity they are willing to supply.

Non-Functional Requirements

- Supplier functionalities must be secure (3rd party users shouldn't be allowed to access supplier related data).
- Supplier functionalities must be user friendly and easily understandable.
- Supplier functionalities should be reliable and relevant details and information should be there.
- Transmission speed between portals should be fast.

Technical Requirements

- Databases related to supplier functionalities should be consistently updating.
- Supplier functionalities should work well in any browser.
- Registered suppliers shouldn't face any errors accessing the system providing valid credentials.
- Supplier functionalities should be accessible with any smart device.

d. Supplier & supply management

This functionality focuses on managing the supply received by the suppliers and the quality control of products. Once the supply management system is implemented staff members that are associated with the supply management will be able to work easily and efficiently. The following will be an overview of how the function is planned to be implemented.

Functional requirements

When a center receives a supply drop, a staff member (clerk) will get the details (such as the product name, supplier's name, quantity, received date and time, and if the product has given a manufacturer date and expiration date by the producer) and send the drop request to the quality control agent. The clerk will also give the request a priority rating if it needs to be inspected immediately or not.

The system will display the drop request to the quality control agent and also validate if the request details match the information in the database. The validation would be whether the supplier has given the right product and if the drop received time and quantity are the same as the scheduled time. After the

inspection, the agent will give the approval with a rating for the supply and expiration date if there isn't one on the product (only for the products such as fish, milk, vegetables, etc.).

Membership requests of the suppliers also will be displayed to the quality control agent by the system. After inspection agent can approve or reject the request through the system. On approval, the agent can also give a rating to the supplier. Additionally, this function will also generate a summary of the transactions of supply for any given time period. It will include details of accepted and rejected supply requests.

Non-Functional Requirements

For the Non-functional requirements security of the data is most important. This function should only be accessible for the stuff members of the company. Any users from the outside of the company should not be able to access or alter the data of this functionality. The data of the functionality should be correct and trustworthy because it is connected to the products quality assurance. Additionally, a high priority request sent to a quality control agent should be immediately displayed to the agent, making the efficiency of this function crucial.

Technical Requirements

Separate user interfaces will be implemented for clerk and quality assurance agent access the features. Interfaces will be simple and user friendly to use. Clerk's interface will contain a format of a form so the input details for the request would be faster. Immediate reports will be generated to monitor transactions of this functionality.

e. Employee Management

Employee management primarily focuses on managing the staff of food distribution company. The staff manager has the facility of recording necessary details of the staff members such as name, NIC number, Address, contact number, position, date of birth, basic salary etc. These details can be viewed and updated when required. When a staff member leaves the company, the system allows updating the employee status.

The system can calculate the total salary by adding all the benefits, overtime compensation such as leaves and OT hours for drivers and clerks of each employee monthly. Employee getting leaves more than once per week some percentage deducted of basic salary. Employees can fill out the required areas on the leave application form. The Manager would approve leave applications based on the stated reasons, duration of absence, and available HR on a department. Employees have to be able to view their accumulated leave days.

Non-Functional Requirements

Employee management functionalities must be fully secure (Any driver or clerk should not be allowed control over their information.)

Employee functions must be user-friendly and simple to comprehend.

There is no restriction on the number of the users to be added to the database.

Technical Requirement

If an employee takes more than one leave day in a week, 5% of his basic salary will be deducted. If an employee has OT payroll, it will be added into their salary. Following that, the system will calculate the monthly salary automatically.

the software system in a real-time environment, monitor the system while it is operating, detect any technical difficulties in the system, and give a solution for resolving the issue.

Inventory management

f. Inventory Management

Functional Requirements

It will be managing the inventory of all the distribution centers that belong to Perera Distributors. General information such as name, supplier, unit price, quantity, expiry date, stored environment, limit, and status is included in the inventory. The clerk adds items to the inventory after goods are approved by the quality assurance agent and updates their details if necessary. When an order is placed, the quantity of that specific batch will be decreased and increased once again if that order gets cancelled. The items will be removed from the inventory when they are delivered and when the goods get damaged or expire. Moreover, the inventory is available for the authorized staff to obtain the necessary information to manage other requirements.

Non-Functional Requirements

Only the clerk has the authority to make changes to the inventory. The functions of adding, updating, and accessing item details will be developed in a user-friendly manner. When an item batch gets added to the inventory or gets updated, the buyers' user interface. also gets updated at once. The inventory's overall performance is good in quality and the accuracy is high most of the time.

Technical Requirements

Inventory management features will be mainly developed for the clerks. Two lists will be maintained for the available items and items to be delivered from the suppliers. The item list will be user-friendly and it should be highly accurate and up-to-date as all the orders are dependent on the item list. The employees will be able to swiftly conduct searches for the items and receive the results.

g. Third party courier functionalities

Function overview

The functionality implemented in the third party courier is buyers and suppliers can order a courier member who is registered to the system, beforehand by entering information such as name, NIC number, age, name of the recruited company, date, abilities, phone number. They are joined to the company in the form of a contract. When the time expires they can rejoin if they wish to continue work in the company.

Once a supplier or buyer needs to transport their goods to or from the company, they can contact a courier service who they wish for through the system. Then available courier list will be shown.

Third party couriers can view the pending order details using a separate dashboard. After the order is delivered or completed the courier will have the ability to update the system regarding the order status.

A report will be generated on the courier reviews by the buyer or supplier . This function will be integrated with the supplier management and the buyer functionalities. Its optional to use a courier, because a third party courier will be an external person for the system that will have no connection with the employee management system. If the courier wants to resign from the company the Clerk can remove the courier member.

Non-Functional requirements

User friendliness of the system for the outsiders. The system Can handle multiple order requests at a time. They can see whether the packaging is done properly.

Technical Functionalities

Courier will have a mobile application to deliver the goods for the desired location. The operating system will be up to date. The available couriers will be there at the moment and supplier or buyer can contact them before the delivery.

h. Order management and common employee functions

This function prioritizes keeping track of the presence of every employee and calculating the hours of each employee. This allows the management team to calculate the salary and OT hours of each employee. This also includes a feature to analyze each employee's work hours and attendance.

When an employee (Clark/Deliverer) arrives at work, their presence would be recorded by a specific employee with the authority to mark their attendees. The user IDs and arrival times would be sent to the management. After the work has been done, the above process would repeat itself to calculate the OT hours.

Overall, each user can log on to their profile and analyze each other's attendance and work hours. These details could be sorted by month and day. This also includes graphically represented charts. The search option could be used to analyze every employee.

NONFUNCTIONAL REQUIREMENTS: -

- This function has high efficiency; it updates real-time in the system.
- Only correct data that was verified by the managers would be updated on the system.

TECHNICAL REQUIREMENTS;

- created with a simple interface that every employee can use without a problem by adding a simple interface
- Data transfer between devices is protected via encryption
- Systems will be updated in real-time by automated systems

system for managing leaves

The management of employee absences is handled by this feature. When an employee needs to get permission from the manager to take an absence, the employee can log in to their profile and fill out a document to explain their reasons and the specified days. This document will be sent to the management with the specific date and the minimum number of employees to cover the work of the day. The management would then send the response to the specific employee, whether the request was accepted or rejected.

NONFUNCTIONAL REQUIREMENTS: -

- Real-time responses are exchanged between managers and employees.
- the communication is highly square and no information about the conversation may be obtained by third parties.
- This function is available on every employee system.

TECHNICAL REQUIREMENTS;

- The document is easy to fill out for every user
- Communication between employees and managers will be encrypted
- Responses between management and employees are made high priority notification

Order Management

There are 3 stages in order management.

1. Processing stage – This stage says that the order is still getting prepared and packed.

2. Ready stage – this stage says that the order is successfully prepared.

3. Delivery stage – Here according to the option selected by the buyer, the buyer can either pick up the order or get it delivered through our company. Along with the parcel, the buyer will receive a receipt with all his order details and the total.

For each of the above stages, there are employees assigned to update the status of relevant orders to make them visible to the buyers through our system

NONFUNCTIONAL REQUIREMENTS: -

- The system will display the order updates' details in real-time.
- The order's details will be kept confidential.
- The system is always available to the user.

TECHNICAL REQUIREMENTS;

- created with a simple interface that can be used by both employees and customers
- Privacy of the order will be protected and those data will be encrypted
- The database will be updated in real-time.

5. Literature Review

Perera distributers company currently uses a traditional paper-based system for the day-to-day operations. if they are to use a web-based system they must use different systems for different operations.

a. Similar solutions

- Oracle SCM – Organizations using Oracle Supply Chain Management (SCM) & Manufacturing can react swiftly to shifting supply, demand, and market conditions. Create a resilient network and procedure that can keep up with change by seamlessly connecting the supply chain.
- GoFrugal - GoFrugal POS is a hybrid point of sale (POS) solution that aids businesses in managing their invoicing and distribution processes and automating financial transactions across a range of sectors. Both on-premises and cloud hosting options are available for the solution's deployment.
- Oracle Fusion Cloud Inventory Management – Oracle Fusion Cloud Inventory Management gives you total insight and control over the movement of items within your business and throughout the world's supply networks. It is a comprehensive materials management and costing solution.
- Megaventory - It is a medium-sized business-focused cloud inventory management and order fulfillment software solution with excellent manufacturing and reporting features.
- Hubstaff - It is a software for time monitoring and labor management that automates many functions of managing an expanding company. Using the desktop, web, or mobile applications from Hubstaff, teams may monitor the time spent on tasks and projects.
- Zoho - The four separate attendance views offered by Zoho People's attendance management module enable employees to understand their check-in and check-out times, overtime information, absences, and more. Managers and staff may now make better plans thanks to this.

b. Why the other solutions are not viable

- All most all the other systems have inventory management, employee management, Distribution management and etc. as separate systems compared proposed system where they want all of those functions together in one system.
- Switching to an intricate and advanced system would be a problem because employees were using a paper-based one. Therefore, it would be unnecessary to use sophisticated systems like Oracle SCM and GoFrugal. The new system should be user-friendly.
- There are some out of stock products in Oracle Fusion Cloud Inventory Management displayed as available because of that, when a consumer tries to purchase that product, it shows an error whereas proposed system updates and maintain their system immediately when a product gets sold out to show real time details.

- Hubstaff doesn't allow users to calculate salaries considering overtime hours compared to Perera Distributors.
- Tracking public holidays when managing attendance of employees in Zoho is very difficult
- Generating reports is essential to make business decisions, systems such as Megaventory system doesn't generate very detailed reports on orders.

With the current paper-based system all the data processing and analysis can be time-consuming and inaccurate because of that it takes time to make any business decisions. the proposed system is easy to implement and accessible from any device. with the new system, they can get immediate reports of day-to-day interactions. The existing system can only be accessed on work hours compared to the new system which can be accessed 24/7.

6. Methodology

a. Technologies

The system will be built using the MERN technology stack, using trusted NPM packages when necessary. The MERN stack includes,

- MongoDB – database

  MongoDB is a cross-platform document-based database program. It is classified as a "NoSQL" database, meaning that it does not store data in a tabular format and that SQL queries are not supported. MongoDB stores information in documents with a JSON structure.

- Express.js – A server framework for Node.js

  Express is a Node framework for building web backends and APIs. Express is the de facto standard server framework for Node.js. Express is equipped with a robust routing capability and HTTP helpers to help with redirection, caching, parsing etc.

- React – A frontend Javascript framework

  React is a declarative, component based Javascript framework meant for the front end of web applications. Because react is component based, React has high code reusability and modularity. React also uses JSX to provide HTML-like syntax for creating components

- Node.js – A backend Javascript runtime environment

  Node isa back-end JavaScript runtime environment. Node includes a Javascript engine that allows the execution of Javascript code outside a web browser. Node is asynchronous and event driven, allowing for better resource allocation.

In addition to React, we will also use Tailwind CSS for the frontend. Tailwind is a CSS framework that allows easier coding and reduces redundancy in CSS.

b. Work breakdown structure

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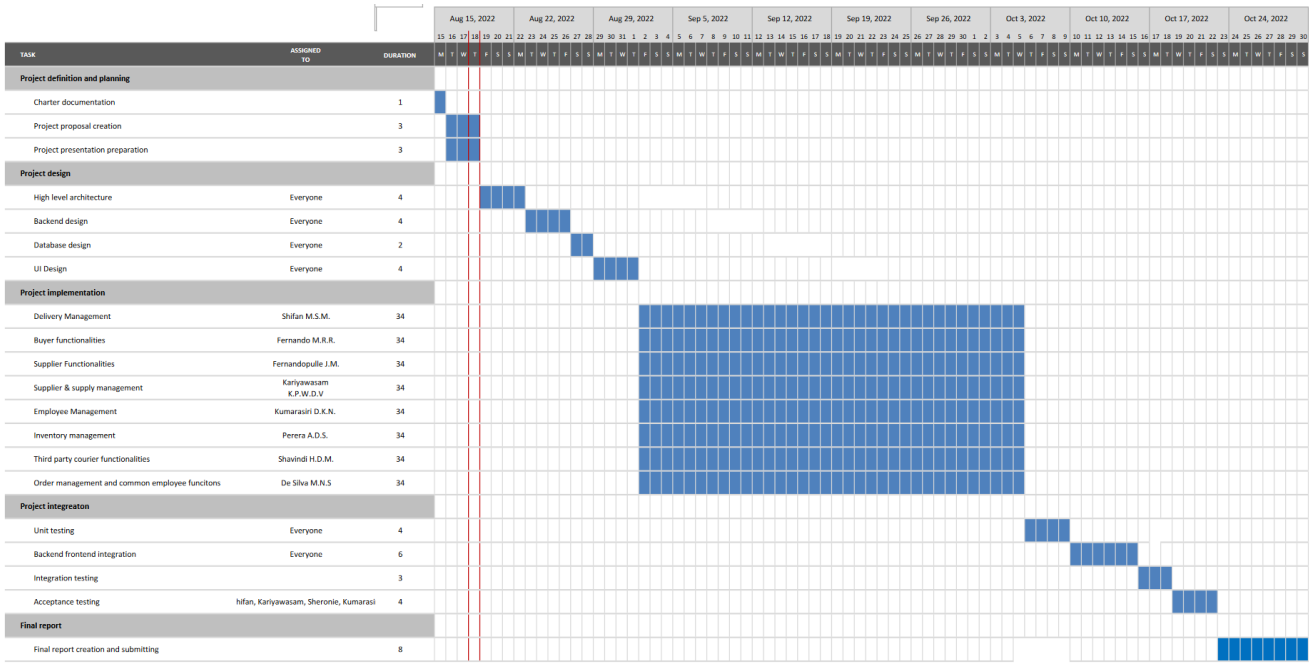

TASK	ASSIGNED TO	DURATION
Project definition and planning		
Charter documentation		1
Project proposal creation		3
Project presentation preparation		3
Project design		
High level architecture	Everyone	4
Backend design	Everyone	4
Database design	Everyone	2
UI Design	Everyone	4
Project implementation		
Delivery Management	Shifan M.S.M.	34
Buyer functionalities	Fernando M.R.R.	34
Supplier Functionalities	Fernandopulle J.M.	34
Supplier & supply management	Kariyawasam K.P.W.D.V	34
Employee Management	Kumarasiri D.K.N.	34
Inventory management	Perera A.D.S.	34
Third party courier functionalities	Shavindi H.D.M.	34
Order management and common employee funcitons	De Silva M.N.S	34
Project integreaton		
Unit testing	Everyone	4
Backend frontend integration	Everyone	6
Integration testing		3
Acceptance testing	hifan, Kariyawasam, Sheronie, Kumarasi	4
Final report		
Final report creation and submitting		8

c. Tools

Purpose	Tool
Version control	Git
Remote repository	GitHub
Project management	ClickUp
Designing and wireframing	Figma
Cloud database	MongoDB Atlas
CI/CD	GitLab CI
Collaboration and meeting	MS Teams
Code editors	VSCode, NeoVim

d. Other

We will be following Agile practices throughout the development of the product. We plan to iteratively develop, deploy and improve the product to meet the requirements and the standards.

7. References

[1] J. Walke, "React Documentation," Meta Platforms, Inc., 2013. [Online]. Available: https://reactjs.org/docs/getting-started.html. [Accessed 12 August 2022].

[2] M. Inc., "MongoDB," MongoDB Inc., 2021. [Online]. Available:

https://docs.mongodb.com/. [Accessed 13 August 2022].

[3] O. Foundation, "Node.js," OpenJS Foundation, [Online]. Available: https://nodejs.org/en/docs/. [Accessed 12 August 2022].

[4] I. StrongLoop, "Express," OpenJS Foundation, 2017. [Online]. Available: https://expressjs.com/. [Accessed 14 August 2022].