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An Undergraduate Internship on

AI-Driven Logistics Planning

At

GETCO IT SERVICES LIMITED

By
Name: Kazi Tokir Ahmed Shawon
Student ID: 1821890

Summer, 2022

Supervisor:
Mr. Sanzar Adnan Alam
Lecturer,
Department of Computer Science & Engineering
Independent University, Bangladesh

September 14, 2022

Dissertation submitted in partial fulfillment for the degree of Bachelor of Science in Computer Science

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

I, Kazi Tokir Ahmed Shawon attest that this report is my work, based on responsibilities that I have been assigned to me during my internship period. In addition to that, I have acknowledged all material and sources used in this report.

I also certify that this report has not been submitted previously for any assessment in any other unit and that I have not forged the work of other students or persons. However, following the internationally accepted academic guideline using others' written works are accurately cited if used in any part of this work.



Signature 14 Sep 2022

Kazi Tokir Ahmed Shawon Date

Acknowledgment

First and foremost, I desire to express my sincerest sense of gratitude to Almighty Allah because of His mercy and blessing that I have come so far. It has been a great privilege to work for GETCO IT SERVICES LIMITED as an intern. I have received so much support and encouragement from the individuals of GETCO IT SERVICES LIMITED who have years of experience in Software Development. I also would like to thank the members of GETCO IT SERVICES LIMITED for spending their valuable time and knowledge which was essential for the completion of this Report.

I express my gratefulness to my internal supervisor, Mr. Sanzar Adnan Alam, Lecturer, Department of Computer Science and Engineering, Independent University, Bangladesh (IUB), for his invaluable instructions, continuous guidance, support, and motivation during my internship period and preparation of this report.

I also want to express my deepest gratitude to my external supervisor and my mentor Khandker M. Nur A Alom for his continuous support and guidance throughout the completion period of the project. His support and leading ability were the driving force of this project. I also want to thank my other project member Imtiaj Chowdhury for his work on the other part of the project.

Finally, I proudly acknowledge the great sacrifices, good wishes, moral support, fruitful advice, inspiration, and encouragement from my family members, relatives, and friends.

Kazi Tokir Ahmed Shawon
September 14, 2022

Letter of Transmittal

September 14, 2022

Mr. Sanzar Adnan Alam
Lecturer,
Department of Computer Science and Engineering
Independent University, Bangladesh

Subject: Letter of Transmittal for Internship Report, Summer 2022

Dear Sir,
This is to inform you that with due honor and respect, I, Kazi Tokir Ahmed Shawon, ID -1821890 from the internship course of Summer2022 Semester, Section 1, would like to submit my Internship report. This report is based on my internship program and the project I have worked on. I have completed my internship at GETCO IT SERVICES LIMITED which spanned from 24th May to 30th August.

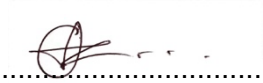
This report is based on my experience and the work I did at GETCO IT SERVICES LIMITED during my internship program. The primary goal for my internship was to gain knowledge by working in the software engineering industry and familiarize myself with all the different technology-related fields of the company, including research and development, documentation, and software development, and get acquainted with software development processes and practices. Throughout my internship at GETCO IT SERVICES LIMITED, I had to learn and adapt to the evolving technologies being used in different situations and requirements and to be able to apply them in real-life projects.

I shall be grateful if you are to receive this report and deliver your valuable judgment on this. I will be honored if you find this report useful and informative to have an idea on the regarded issue.

Sincerely,

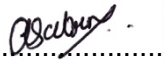
Kazi Tokir Ahmed Shawon
ID - 1821890
Email: 1821890@iub.edu.bd

Evaluation Committee



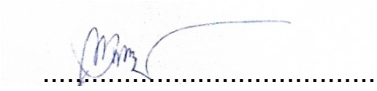
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Sanzar Adnan Alam
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Name
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Supervisor



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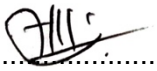
Ajmiri Sabrina Khan
.....
Name
.....
Internal Examiner-1 / Panel Member-1



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Signature

Khandker M. Nur-a-alam
.....
Name
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External Examiner / Organizational Supervisor / Panel Member-2



.....
Signature

Dr. Mahady Hasan
.....
Name
.....
Head of the Department / Convener

Abstract

The purpose of this report is to accumulate the details of my experience while working with the “AI-driven logistics planning” project at GETCO IT Services Limited. My work assignment included developing an automated system that supports AI-Driven intelligent mapping such logistics can provide ultimate cost resource savings, increasing the profitability and success of the business.
The tasks that I attended to this project pipeline consisted of designing and developing the core engine for the logistic planning/ route mapping functionality of the platform which will produce automatic route maps for the best possible route based on several criteria and business logic to be implemented by the customer.
Through all these experiences, I gained knowledge on how to develop and deploy Intelligent determination of the best route system in a product-oriented business where logistics plays a vital role in business success.
GETCO IT Services Limited provides cloud consulting, auditing, and advisory services focusing on implementing new ways of using the cloud to make systems highly scalable, available, and efficient. It can help and achieve companies transform their business using cloud technology on AWS.
Therefore, this experience was challenging yet crucial as well, to help me elevate my skills and confidence for me to be ready to pursue my career in this line of work. The report mainly has been documented solely based on my overall learning and experiences. The project will deliver performance after handling future scope in “AI-driven logistics planning” that will remove obstacle routes from the route list by determining the best possible inventory cost and distance route using satellite information. The whole idea of building this system with the latest routing technology will be to implement a highly scalable system.

Keywords— Logistics, B2B e-commerce, AWS, Route Planner, Intelligent Routing, Supply chain.

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Chapter 1

Introduction

1.1 Overview/Background of the Work

In any product-oriented business, logistics play a vital role in the success of the business. When supported by AI-driven intelligent mapping such logistics can provide ultimate cost resource savings, increasing the profitability and success of the business.

During my internship at GETCO IT SERVICES Limited, I was assigned with the developer team who were developing a B2B E-commerce solution for an agro and FMCG-oriented wholesale business organization name “Pallabi Business Services” and was assigned the responsibility to design and develop the core engine for the logistic planning/ route mapping functionality of the platform which will produce automatic route maps for the best possible route based on several criteria and business logics to be implemented by the customer.

1.2 Objectives

The main idea of "AI-driven logistics planning" is required to evaluate a proper and efficient logistics support system to make sure the B2B Business operation is profitable in its operation. While assessing the best possible routes between multiple points, most of the time the shortest possible path is not the best route. Several IT digital tools are available to figure out the best possible routes and we are to utilize those tools to enrich the function of the business.

Intelligent determination of the best route:
Intelligent Route Planner is a technology that can support the journey in less time, with less cost, and better route. We can set up our destination while searching for information like ratings and business hours, location, etc. it will gather real-time information to guide us on the best possible route until you reach your destination. It collects data such as the location of our vehicle, the distance to our destination, the location of our warehouse, and traffic conditions along the route. It will tell us which route we can use and how much it will cost. Additionally, the system automatically sets the destination, departure schedule, and more to get the best possible route. Not only navigation but intelligent route planners can increase overall business convenience and reduce costs.

Detection: Timely detection of a problem is the first step in observability. Ideally, this should be done before the problems affect the end-user. Detection should be proactive and multi-featured, including alarms when performance gateways are breached, synthetic
testing, and anomaly detection. A common performance metric is a mean time to detect (MTTD).
Monitoring: Monitoring tools keep a record of performance statistics over time so that usage patterns can be identified. Monitoring agents record selected metrics at set intervals and store the resulting data in a time-series format. Though the term “monitoring” is sometimes defined as different from observability, monitoring is an activity that makes a system observable, alongside other activities like tracing and logging. Monitoring along with tracing and logging are described as “three pillars of observability”.
Alerts: When something goes wrong, we can get timely alerts through the observability tool. However, too-sensitive detection can lead to alarm fatigue, so alert management is also key to fine observability.
Infrastructure monitoring: Infrastructure monitoring lets us correlate metrics and logs from an infrastructure stack to understand and resolve the root causes of performance issues.
Investigation: Investigation is the most time-expensive phase of an operational event. When things are going wrong, it can be difficult to understand what is most important to fix. Multiple observability sources together can help us investigate quickly to understand the root cause, but to do this effectively you need to correlate data across metrics, logs, and traces.
Cost Management: All the AWS services are charged in a pay-per-use scheme. That means we would only have to pay storage and server charges for the number of services we are using.

1.3 Scopes

After the development of the” AI-driven logistics planning”, the scope of the component is to produce a cost, time, and distance optimized route plan based on which several software and mobile applications will be developed for different business components. We are getting a system that gives us the route which we have to select for the best performance and cost-effective delivery. Based on which or assuming as core, our mobile application, and web application has been created. Our customers, retailers, and channel partners are different business components each of which will have some type or form of use of the module that is being built by the team in which I am participating. Also, we have one such application with Graphical and visual interfaces where the module has been implemented.

Chapter 2

Literature Review

2.1 Relationship with Undergraduate Studies

The **Software Requirement engineering (CSC453)** course has taught me about the elicitation, analysis, modeling and specification of software engineering requirements. It taught me about these topics: role of requirements in system development and maintenance, goals of the requirements phase, essential difficulties of specifying requirements, effective methods, tools and techniques, techniques for formally modeling and specifying software requirements, the process of identifying stakeholders, capturing, analyzing, reviewing, and verifying their requirements for new or extended software products, optimization of software requirements and business benefits, the role of prototyping in validating requirements; the process of requirements management, configuration management, change management, impact estimation due to requirements change. Also taught how to do UX /UI design. I learned from this course how to make prototypes using Figma.

In **System Analysis and Design (CSC 405)** I have learned how to manage the software development process from this course. This course also taught me about many aspects of software development like Software Development Life Cycle (SDLC), flow diagrams, activity diagrams, UMLs, Functional and Nonfunctional requirements, and various methodologies which helped me to design projects.

Special Topics in Computer Science (CSC 490) is the course where I was introduced to the AWS platform. From this course, I have learned about AWS as a Platform as a Service (PaaS) and its many services like AWS Lambda function, API Gateways, DynamoDB, SQS, SNS, CloudWatch, Serverless application model (SAM), and many more. The knowledge gathered from this course is directly connected to my whole internship journey and my final project.

From **Object-Oriented Programming (CSC 305)**, I have learned about classes and their objects in programming. From this course, I have also learned about how to write modular programs to make codes less redundant and more reusable. As the framework works the modular way it helps to code faster. **Web Application and Internet (CSC 455)** is the course where the development of web applications was taught. It covered very important technologies that are highly demanding in the industry, such as HTML, CSS, JavaScript, PHP, Laravel, MySQL, and API. The tools and technologies learned from this course immensely contributed to understanding the front end of the websites.

2.2 Related works

Among the tasks related to this, I had to work on the front-end of the web application of this project using react and javascript. And some backends have to generate JSON files and use different routing APIs. Also had to do software troubleshooting and manual testing.

Related Service Users

Mapbox: Mapbox is an open-source mapping platform for custom-designed maps that reaches more than 300 million people each month. Mapbox uses Amazon CloudWatch for ingestion of multiple data sources including native AWS metrics, custom metrics, and logs as well as monitoring and visualization of key workloads and resource optimization.

Google Map : Google Maps has a route planning capability. Where we can plan a route for many locations using Google Maps. It can serve a variety of purposes aside from driving, such as walking and biking. Google Route Planner allows users to add addresses, find directions, and even enter multiple addresses. For many businesses, this software can help cut down the time planning and optimizing routes for deliveries. This route planner can provide the most dynamic routing to boost your efficiency and customer satisfaction.

Openstreetview: OpenStreetMap (OSM) is an open, editable map of the world. For several years, Esri has provided access to OSM data as a base map. Routing services (in some countries called navigation services) help people get from one place to another. OpenStreetMap data includes information for routing by many modes including car, foot, bicycle and horse. There are many offline, embedded and web-based routing services using OpenStreetMap data.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

The Work Breakdown Structure (WBS) is a visual, hierarchical, and deliverable-oriented method that helps to complete complex, multi-step projects. It applies the divide-and-conquer paradigm to large projects, so tasks are completed faster and more efficiently. It is the hierar-

chical tree structure-property that outlines a project and breaks it down into more inadequate pieces. The goal of WBS is to make large projects more manageable by breaking down the complete project into smaller parts. Team members can work on different features at the same time, which ultimately leads to better productivity. We utilize the top-down approach to appear Work Breakdown Structure (WBS) to this extent. Using WBS will be effective for us to protect work quality and make it easy to synchronize the whole project. The WBS of ”AI driven logistics in a B2B E-commerce Business ” project is given below:

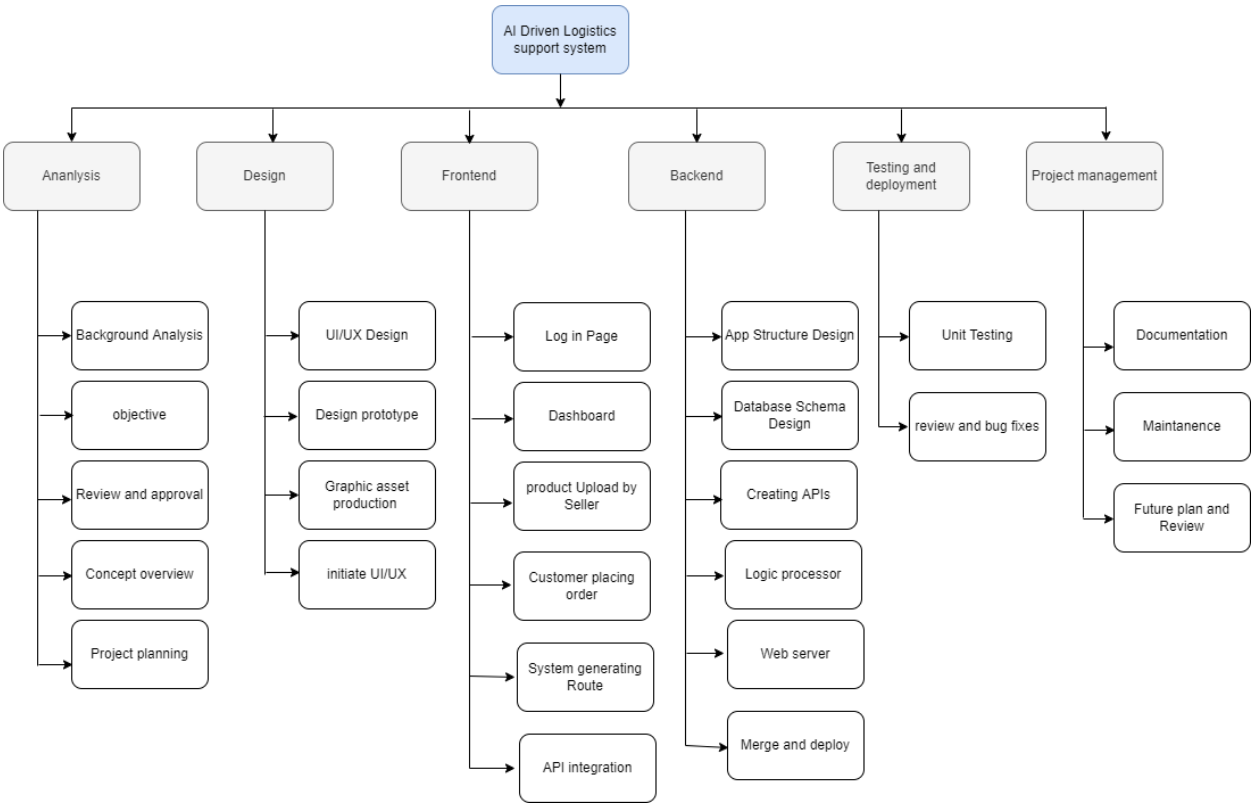


Fig: Work breakdown structure of AI-driven logistics planning

3.2 Process/Activity wise Time Distribution

All the activities related to this project are listed in the WBS. We as a team attempted to complete these tasks in a given time. The time for completing the project is estimated at 90 days.

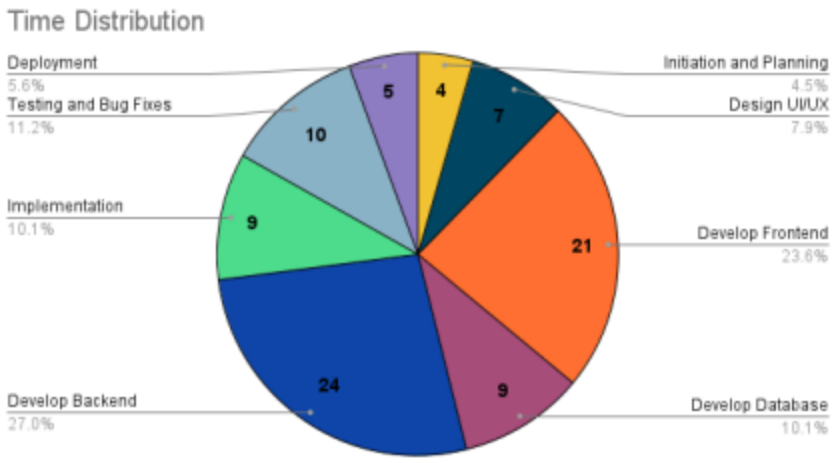


Figure: time distribution of the project activities

3.3 Gantt Chart

A Gantt Chart is a graphical presentation of a project schedule, commonly used in project management and is one of the most popular and beneficial techniques of showing activities (tasks or events) displayed against time. It helps to estimate how long the project should take, determine the resources needed and plan in the order in which tasks will be completed. Work breakdown structure appears as the sum of activities and to complete these activities certain time is required which is portrayed within the Gantt Chart. It is also useful to monitor the project's advancement once it has begun. It helps to have a more precise vision of what should have been delivered by a certain time frame and when the project falls behind schedule; proper actions are taken to bring it back to track.

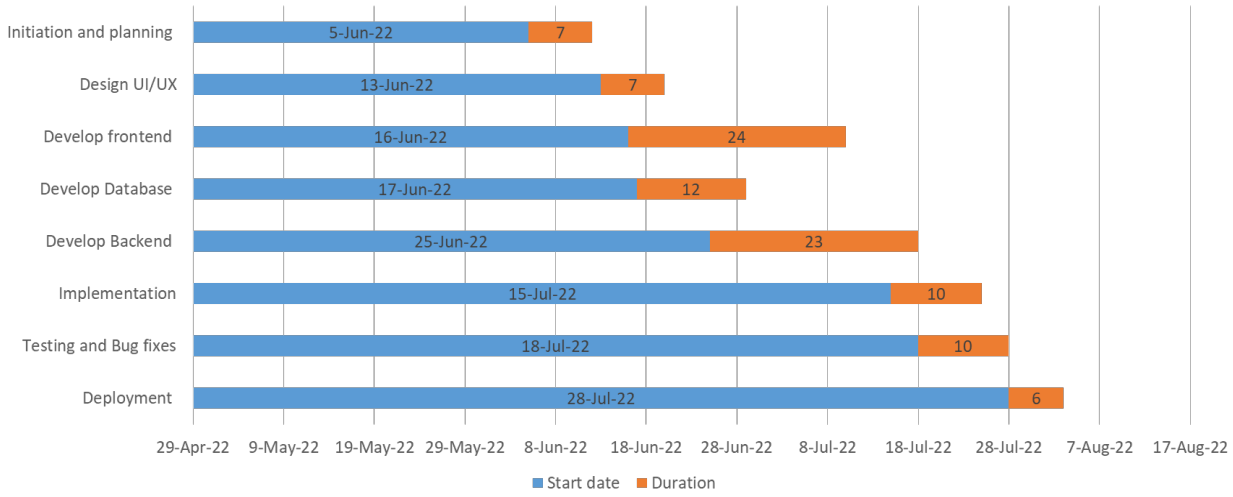


Figure: Gantt chart of AI-driven Logistics planning.

3.4 Estimated Costing

The cost is an estimate based on the company's requirements for the system.

Sector	**Cost**
Deployment	1200000 Taka
Project manager	400000 Taka
Backend	300000 Taka
Result and analysis	200000 Taka
Testing	100000 Taka
Integration with the other part of the system	100000 Taka
Commissioning and post-commissioning costing	100000 Taka

Table: Cost Estimation

Chapter 4

Methodology

Agile methodology:

Agile methodology is a practice that promotes continue interaction of development and testing during the SDLC process of any project. Agile is the ability to create and respond to change. It is a way of dealing with, and ultimately succeeding in, an uncertain and turbulent environment. Agile is an iterative approach to project management and software development that helps teams deliver value to their customers faster and with fewer headaches. Instead of betting everything on a ”big bang” launch, an agile team delivers work in small, but consumable, increments. Requirements, plans, and results are evaluated continuously so teams have a natural mechanism for responding to change quickly. All of these builds are provided in iterations, and each iteration lasts from one to three weeks. The Agile SDLC model separates the product into cycles and delivers a working product very quickly. This methodology produces a succession of releases. Teams use the agile development methodology to minimize risk (such as bugs,cost

overruns, and changing requirements) when adding new functionality. In all agile methods, teams develop the software in iterations that contain mini-increments of the new functionality. Agile is an umbrella term for several methods and practices.

Chapter 5

Body of the Project

5.1 Work Description

During my internship, I worked as a team member of the team who is analyzing the business requirement, designed the solution for the requirement, developed necessary mobile and computer applications, and deployed them in a real-life business environment in Bangladesh. My specific functions each day are as follows-

1. In the system analysis part-

a) Explore different terrain.

b) Road, River, and Train transportation network in Bangladesh using different mapping platforms such as google maps, OpenLayers and Mapbox.

c)Visit some critical points where it was not possible to identify proper transportation networks using different mapping platforms.

d) Find a workable solution for transportation and create route maps using GPS devices.

2. In the system design part-

a) In a team of four who have developed around 4000 route plans and I have developed 300 route plans in that. These Route plans will be digitized in a specific format that will be used by the applications to be developed later to determine the best available and least expensive transport route between two districts in Bangladesh.

3. In the implementation part-

a) I have been working in a developing team to incorporate route maps into the application by producing JSON files for the system.

b) I took in coding some components of the application. Among which automatic route selection based on multiple input parameters, location identification component using GPS mapping system are part of.

c) I contributed to the frontend interface.

d) I took part in the rigorous testing of the complete application.

4. In the deployment part-

We have deployed our developed system for a new E-commerce company Name PALLABI BUSINESS SERVICES who will be operating in all 64 districts in Bangladesh for purchasing and selling, delivering agricultural FMCG and food items. I am involved throughout the whole deployment process and thereby have a complete understanding knowledge of the uses of digital technology, IoT devices, and IT infrastructures, from the design stage to the production stage.

5.2 Requirement Analysis

5.2.1 Rich Picture

A rich picture is a way to explore, acknowledge and define a situation and express it through diagrams to create a preliminary mental model. A rich picture helps to open discussion and come to a broad, shared understanding of a situation. It comprises pictures, content, images, and symbols, which are all utilized to graphically demonstrate the circumstance. A rich picture illustrates how the application works.

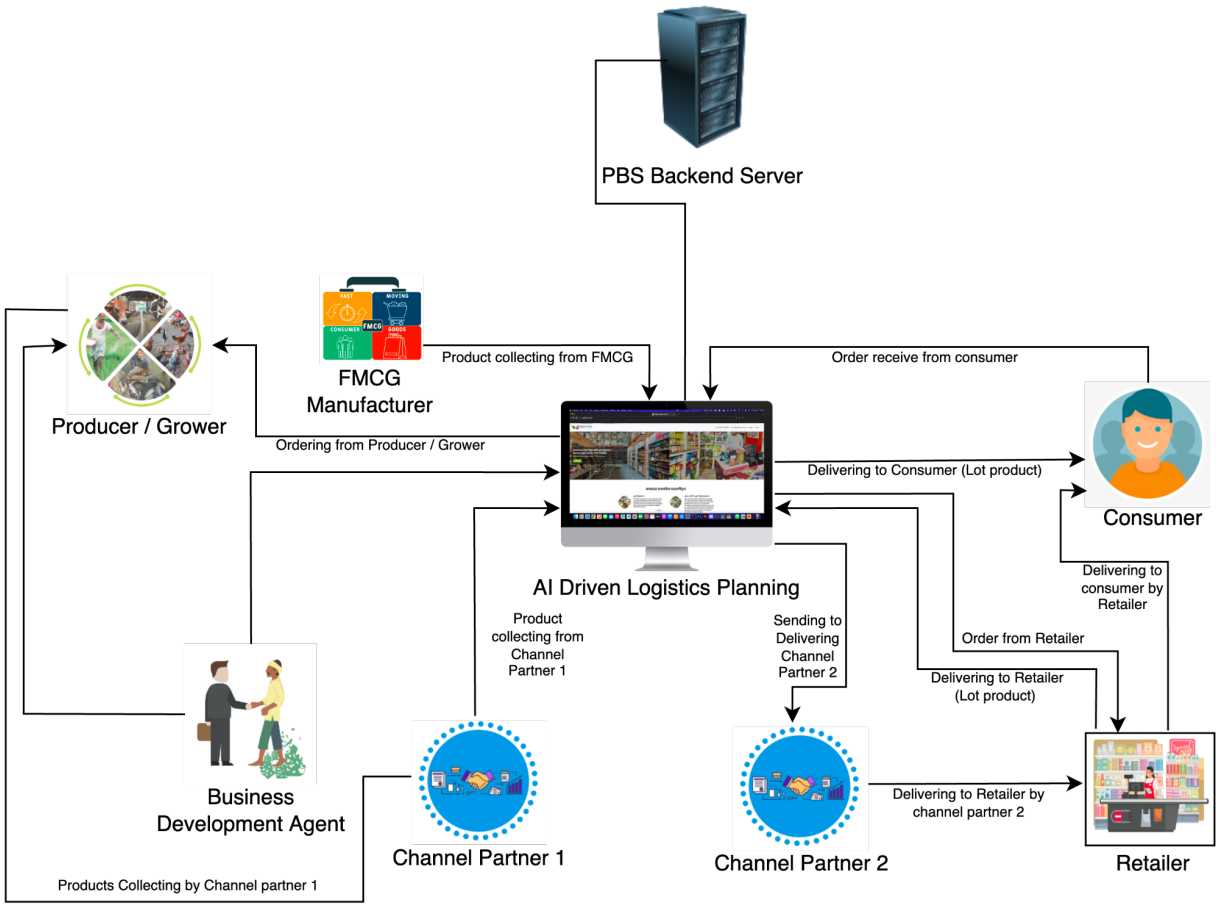


Figure: Rich picture of AI-driven logistics planning

5.2.2 Functional and Non-Functional Requirements

Requirement Analysis

Requirement analysis involves all the tasks that are conducted to identify the needs of different stakeholders. Therefore, requirement analysis means analyzing, documenting, validating, and managing software or system requirements. Great quality requirements are documented,

actionable, measurable, testable, traceable, helps to identify business opportunities, and are defined to facilitate system design as well.
The software requirements are descriptions of features and functionalities of the target system. Requirements convey the expectations of users from the software product. The requirements can be obvious or hidden, known or unknown, expected or unexpected from the client's point of view. Requirements can be divided into two types: functional and non-functional requirements.

Functional Requirements

The functional requirement typically specifies something a system should do. Functional requirements are features that must be included in an information system. Functional requirements help to satisfy the business requirement and it needs to be acceptable to the users. Functional requirements are the operations and activities that a system must be able to perform. Functional requirement defines applications nature and components as well as what these components are supposed to accomplish. The following functional requirements are assembled using requirements gathering methods. The inputs, process, output, precondition and postcondition for functional requirements are discussed below:

1. Origin location of the product.
2. Origin hub for the product.
3. Destination hub of the product.
4. Destination location of the product.
5. Routing the best possible route.

<table>
<tr><td colspan="3">Name of the Function: Must be Compatible with any kind of device</td></tr>
<tr><td>Input:
N/A</td><td>Process:
Application must be developed in a common development environment</td><td>Output:
Application will scale at any moment at any given number of requests at a time.</td></tr>
<tr><td colspan="3">Precondition:
Users should be familiar with this system.
Users must have a valid account in the system.
Users must have a valid date and time to log in the system.</td></tr>
<tr><td colspan="3">Post condition:
Proper database connection.
All details are recorded in the system.
The system should be able to extract the data in a logical or physical container [memory of the user, printing format].
The system should return to the main option.</td></tr>
<tr><td colspan="3">Alternate Options:
If the user ID is not valid the system gives a response to the user.
If the password is not valid the system generates an error message.
If the user forgets the password, the user system gives a new set up password option.
If there is no information and data then the system returns a message.</td></tr>
</table>

Side Effects: N/A

Name of the Function: Origin location of the product		
Input: N/A	**Process:** System will Automatically detect the origin location of the product. Then the system will calculate the price of the product .	**Output:** System will display the origin of the location and product price.
Precondition: Users should be familiar with this system. Users must have a valid account in the system. Users must have a valid date and time to log in the system.		
Post condition: Proper database connection. All details are recorded in the system. The system should be able to extract the data in a logical or physical container [memory of the user, printing format]. The system should return to the main option.		
Alternate Options: If there is no information and data then the system returns a message.		
Side Effects: N/A		

Name of the Function: Routing the best possible route.		
Input: N/A	**Process:** System will Automatically detect the origin location of the product. Then the system will calculate the price of the product .	**Output:** System will display the best possible route and product price.
Precondition: Users should be familiar with this system. Users must have a valid account in the system. Users must have a valid date and time to log in the system.		
Post condition: Proper database connection. All details are recorded in the system. The system should be able to extract the data in a logical or physical container [memory of the user, printing format]. The system should return to the main option.		
Alternate Options: If there is no information and data then the system returns a message.		
Side Effects: N/A		

Non-Functional Requirements

A non-functional requirement is a qualitative requirement for a project. It judges the software system based on responsiveness, usability, security, portability, etc. Non-functional requirements are described below:

- **Reliability:** The system is well-trusted. Admin and users can use this software very easily. The software is made so simple that users can understand the interface and procedure very clearly. The system is built with the latest web technologies, well maintained and scalable, so the application is reliable.

- **Performance:** The main purpose of building this simple website with complex frameworks is to gain extra performance. It is required to exhibit and to meet the user's needs. It describes the acceptable throughput rate and a satisfactory response time. Users tend to spend more time on the website when it loads faster, and this website should provide a smooth experience to all kinds of users.

- **Security:** Security requirements are another leading type of non-functional requirement. The system must assure that all data inside the system or its part will be protected against malware attacks or unauthorized access. All the information from the client-side to the server-side is secured. The website deals with a limited number of data but the architecture follows all the latest security measurements. Only admins can perform administrative tasks and appointed developers have access to the core code. The back-end of this application is built with NodeJS, ReadyJS, Api GateWay, MongoDB, DocumentDB tools and frameworks; they have several levels of security. So the system is well secured.
- **Scalability:** The system will meet the performance requirements under the highest workload.
- **Portability:** Our system will support all operating systems Windows, Linux, Mac OS, Android, iOS and HarmonyOS. Users can access the system from any web browser.
- **Compatibility**: We will also design applications for mobile users. Application must support on android devices running on OS version > 5.0 and iPhone devices running on OS version > 7.0.
- **Availability:** The system must be accessible for a user at any given point in time.
- **Maintainability:** The system must define the time required for a solution or its component to be fixed, changed to increase performance or other qualities, or adapted to a changing environment.
- **Usability:** Users should be able to complete the main functions once they see the interface. The user interface must be user-friendly and exhibit conceptual integrity.

- **Localization:** The system or its element must fall well in line with the context of the local market-to-be. The context includes local languages, laws, currencies, cultures, spellings, and other aspects.

5.3 System Analysis

Systems development is a systematic process that includes phases such as planning, analysis, design, deployment, and maintenance. System analysis is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components. System analysis is conducted to study a system or its parts to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose. Analysis specifies what the system should do. This chapter contains parts of System Analysis that will help understand the project better. System analysis is important because it provides an avenue for solutions in the system through various tasks involved in doing the analysis.

5.3.1 Six Element Analysis

Process	**Human**	**Non Computing Hardware**	**Computing Hardware**	**Software**	**Database**	**Network & Communication**
Source area identification and input	Producer	N/A	PC, Laptop, Mobile	producer app modules Android Mobile Applications and PBS Website.	MongoDB, Redis	WAN, LAN and Internet
Destination area identification and input	Retailer	N/A	PC, Laptop, Mobile	Retailer app modules Android Mobile Applications and PBS	MongoDB, Redis	WAN, LAN and Internet

				Website.		
Identifying source hub and destination hub location	Producer, Retailer	N/A	PC, Laptop, Mobile	PBS, Any Browser, Android and IOS Mobile Applications	MongoDB, Redis	WAN, LAN and Internet
Identifying available routes between source and destination hubs.	N/A	N/A	PC, Laptop, Mobile	PBS, Any Browser, Android and IOS Mobile Applications	MongoDB, Redis	WAN, LAN and Internet
Identifying obstacles in the routes between the hubs	N/A	N/A	PC, Laptop, Mobile	Any Browser, Android and IOS Mobile Applications	Satellite information, Backend server, MongoDB, Redis	WAN, LAN and Internet
Determining the best possible list cost and distance route removing the obstacle route from the list of route	N/A	N/A	PC, Laptop, Mobile	Any Browser, Android and IOS Mobile Applications	Backend server,MongoDB, Redis, satellite information.	WAN, LAN and Internet
Delivering the best route found to the next process	N/A	N/A	PC, Laptop, Mobile	PBS, Any Browser, Android	Backend server, MongoDB, Redis	WAN, LAN and Internet

				and IOS Mobile Applications		

5.3.2 Feasibility Analysis

Feasibility analysis is a study to assess the feasibility of a proposed project or system. It is an introductory survey for the system's examination. It intends to provide information to help a later in-depth inquiry. It is a measurement process of the software product in terms of how useful the developed product will be for the business from a functional point of view. A feasibility study is conducted based on many purposes to examine whether software features will be right in terms of development, implantation, the contribution of the project to the organization, etc. The report produced at the end of the feasibility analysis includes suggestions and reasonable arguments. The report will be helpful for the management to decide whether they should commit further resources to the proposed project. There are various measures of feasibility that help to decide whether a particular project is feasible or not. Main parts of feasibility study:

- **Technical Feasibility:**
  In technical feasibility, present resources both hardware and software along with required technology are analyzed to develop the project. The technical feasibility analysis gives a report on whether there exist correct required resources and technologies which will be used for the project development. It also evaluates the technical skills and capabilities of the technical team and it also analyzes whether current technology can be used or not. The AI-driven logistic support system is built using these tools and frameworks **Front-End:** React.JS, JavaScrip **Back-End:** Next.JS, Node.JS **Database:** MongoDB, Redis. These are the tools and frameworks that are very popular in the modern software industry because the nature of the serverless platform is "highly scalable" and everyone involved in the making of this project had the skills to work with these technologies mentioned above. 'Getco IT services Limited' has skilled technical experts to complete and maintain this project and has the resources to deploy the application to the cloud. 'Getco IT Services Limited' also trained and guided me to complete this project with accuracy. Hence, it can be concluded that the project is technically feasible.

- **Operational Feasibility:** In operational feasibility degree of providing service to requirements is analyzed along with how easy the product will be to operate and maintain after development. An application must be user-friendly as well as it must work with no difficulties. Along with these, other operational scopes are

determining the usability of the product and determining whether a suggested solution by the software development team is acceptable or not.

- **Economic Feasibility:** ”Ai driven logistics support system” is a simple system built with complex technology. Users can easily navigate through the whole website as it is self-explanatory. Our project is developed from scratch using modern web development technologies, frameworks and it is highly scalable no matter how the user load is. It will also allow us to customize our project to our perception. As a result, the project can be called operationally feasible.

- **Feasibility analysis matrix:** In economic feasibility analysis, the cost and benefit of the project are analyzed. It is a detailed study where the cost of the project from all of the different spaces are combined. For example, the cost for required hardware and software resources, UI/UX design and development cost, operational cost, etc. And then it is calculated whether the project will be financially beneficial for the company or not. The only service that is needed for the development of ”Ai driven logistics support system” is just a cloud server, and our application is hosted on AWS Dedicated VPC server. The pricing scheme of which is ”pay-per-use”. That means the cost of our hosting depends on the usage of our application. So the proposed system is justifiable in terms of cost and benefit and it ensures that the investment in this system provides a reasonable return. In conclusion, the project can be called economically feasible.

5.3.3 Problem Solution Analysis

Problem	**Analysis**	**Solution**	**Constraints**
Data loss	Any time data can be lost for various reasons (Virus attack, attack by hackers, unfortunate system crash)	Database system is more secure and deleted, lost data easily can be restored	Internet Connectivity
Time Complexity	accessing a specific information requires a lot of time to find and compute	Database system is easily accessible and need less time	
Human Error	Invalid user inputs	Form validation	Internet

		from both client side and server side	Connectivity
Analysis the data	Some problem occurs due to fetching manually different information	Database system can collect all the data and it is very easy to analyses the data	Internet Connectivity
Steal Data	Data can be stolen	Authentication	Internet Connectivity

5.4 System Design

System design is the process of designing the elements of a system such as the architecture, modules, and components, the different interfaces of those components, and the data that goes through that system. System design is deriving a solution which satisfies software or system's requirement. We can define software design as translating requirements into software components and interactions among them. Any design may be modeled as a directed graph made up of entities with attributes that participate in relationships. A design represents the system, how it will work, and how it can be assessed for quality. Design is the way to translate a client's requirements into a system or software product accurately. Software architecture provides an abstract representation of the overall structure of software. This chapter contains numerous design-level diagrams to have a clearer understanding of the system and flow of data.

5.4.1 UML Diagrams

UML, which stands for Unified Modeling Language, is a way to visually represent the architecture, design, and implementation of complex software systems. When we are writing code, there are thousands of lines in an application, and it is difficult to keep track of the relationships and hierarchies within a software system. UML diagrams divide that software system into components and subcomponents. Use case diagram model shows how users, displayed as stick figures called "actors," interact with the system.

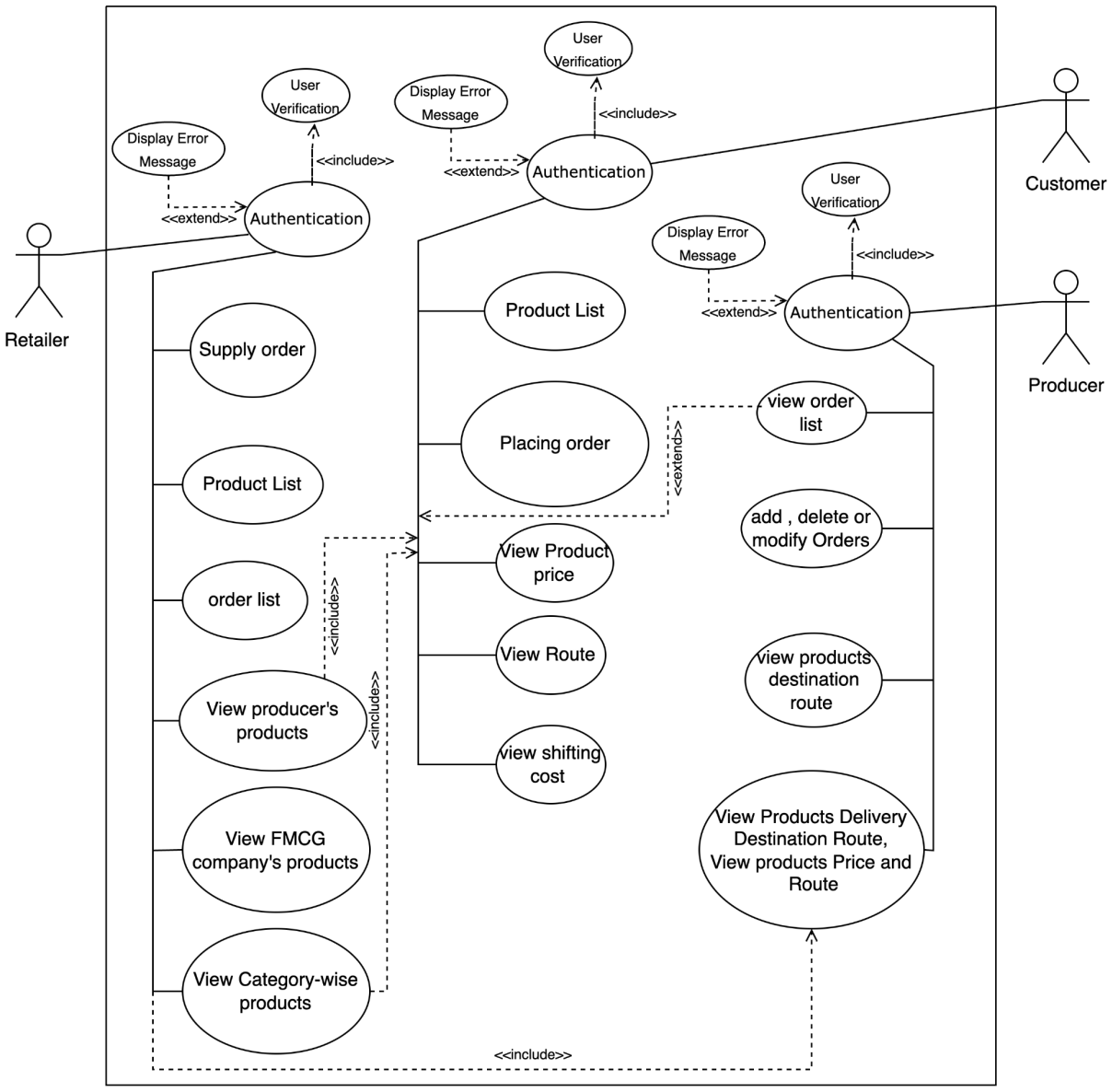


Figure: Use case diagram of AI-driven logistics planning.

Process Flow Diagram

A process flow diagram shows us the overall overview and state of a process from its start to finish. It helps us to visualize the different states and decision points of a process and how the underlying logic of our process will be based on.

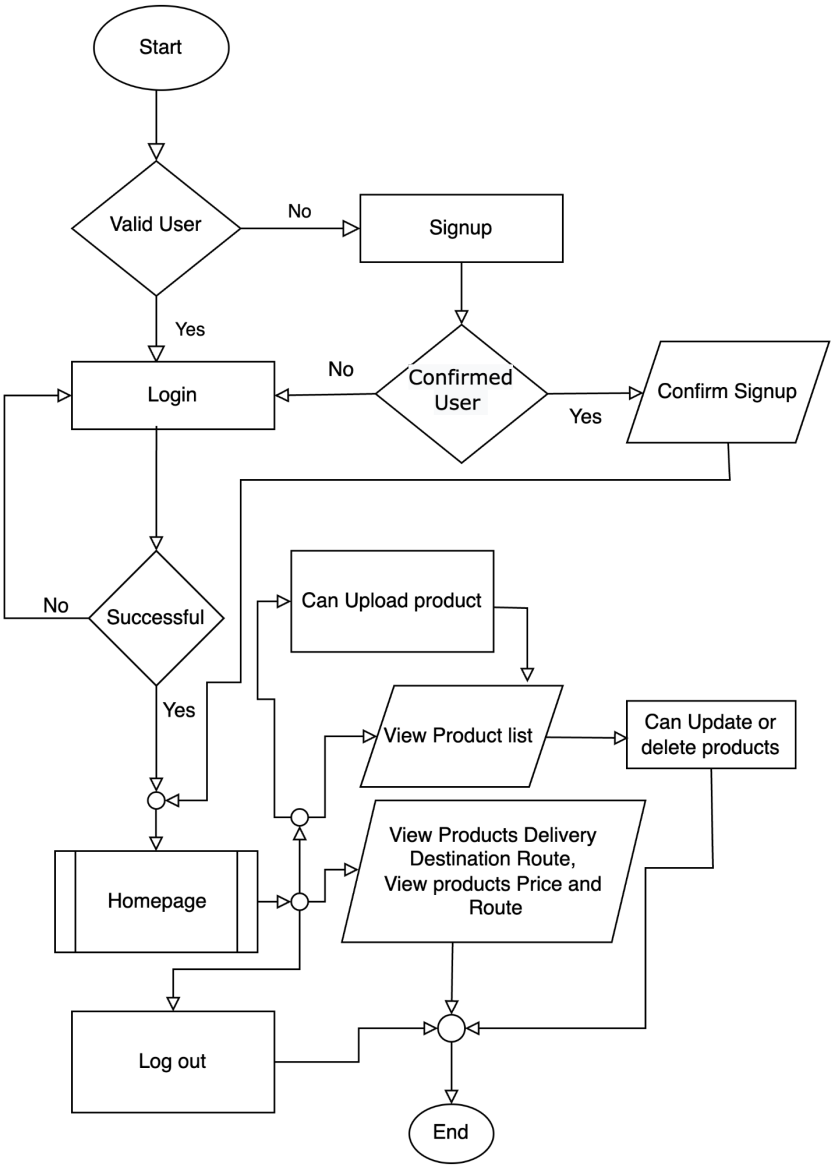


Figure: Process flow diagram for producer user.

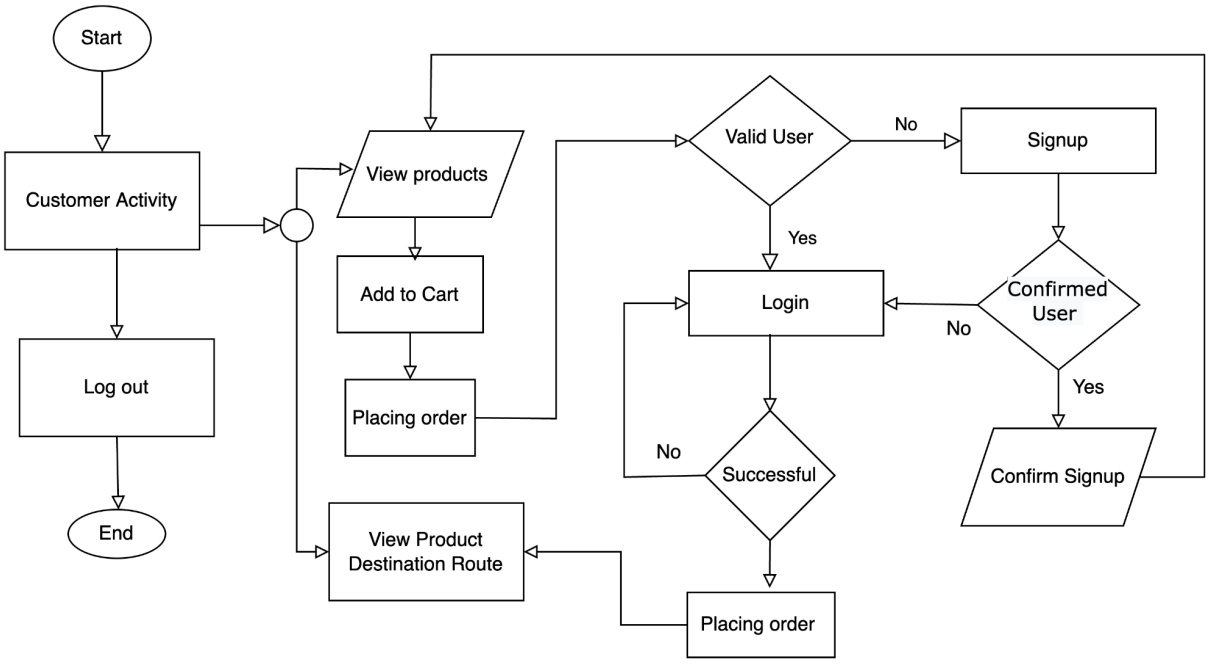


Figure: Process flow diagram for customer user.

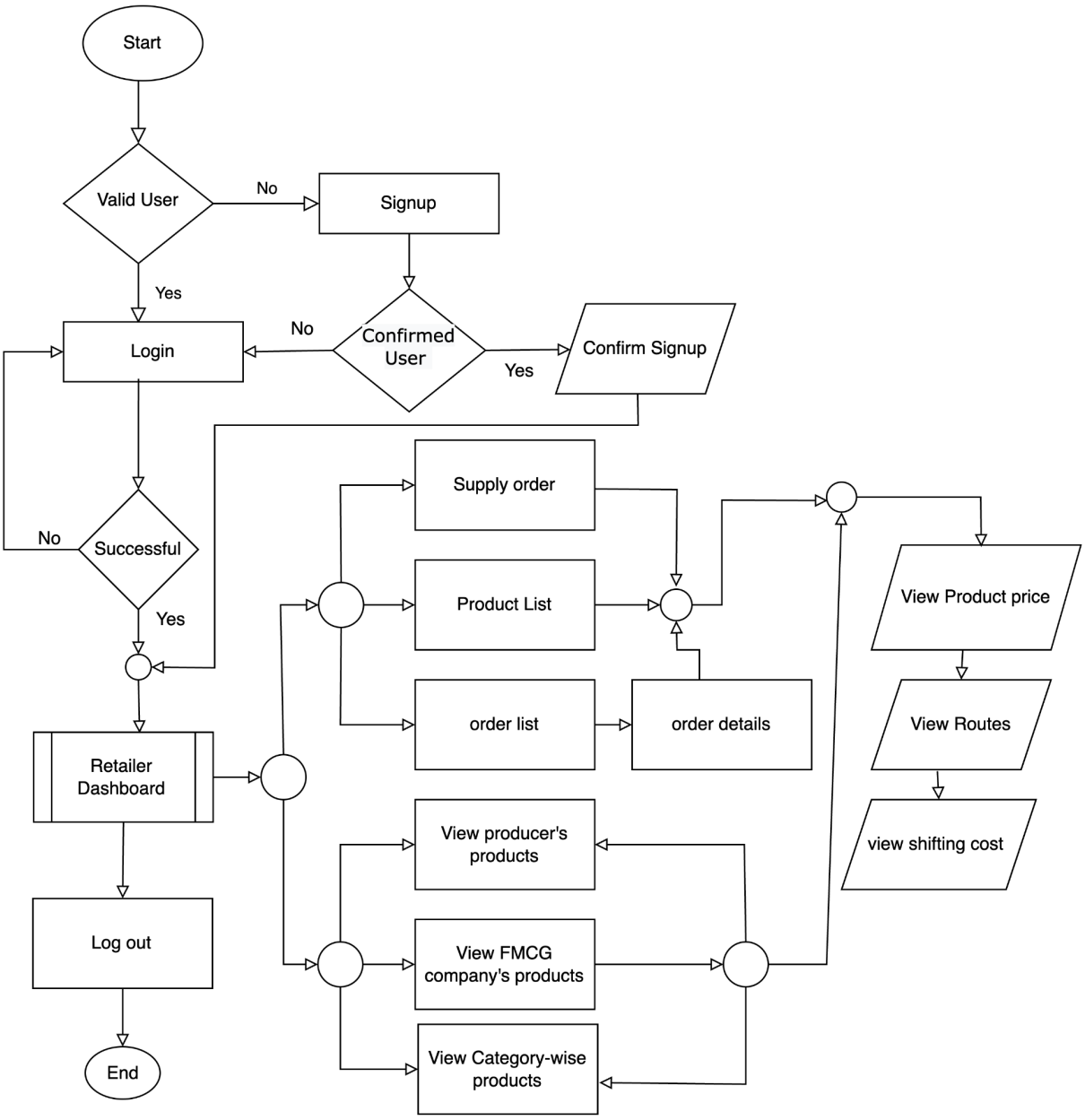


Figure: Process flow diagram for Retailer user.

5.4.2 Architecture

Solid Design: The SOLID principles were first conceptualized by Robert C. Martin in his 2000 paper, Design Principles, and Design Patterns. These concepts were later built upon by Michael Feathers, who introduced us to the SOLID acronym. And in the last 20 years, these 5 principles

have revolutionized the world of object-oriented programming, changing the way that we write software. SOLID is a popular set of design principles that are used in object-oriented software development. SOLID is an acronym that stands for five key design principles: single responsibility principle, open-closed principle, Liskov substitution principle, interface segregation principle, and dependency inversion principle. All five are commonly used by software engineers and provide some important benefits for developers.

Clean code : The SOLID principles were first conceptualized by Robert C. Martin in his 2000 paper, Design Principles, and Design Patterns. These concepts were later built upon by Michael Feathers, who introduced us to the SOLID acronym. And in the last 20 years, these 5 principles have revolutionized the world of object-oriented programming, changing the way that we write software. SOLID is a popular set of design principles that are used in object-oriented software development. SOLID is an acronym that stands for five key design principles: single responsibility principle, open-closed principle, Liskov substitution principle, interface segregation principle, and dependency inversion principle. All five are commonly used by software engineers and provide some important benefits for developers. Clean architecture is a software design philosophy that separates the elements of a design into ring levels. An important goal of clean architecture is to provide developers with a way to organize code in such a way that it encapsulates the business logic but keeps it separate from the delivery mechanism.
The main rule of clean architecture is that code dependencies can only move from the outer levels inward. Code on the inner layers can have no knowledge of functions on the outer layers. The variables, functions, and classes (any entities) that exist in the outer layers can not be mentioned in the more inward levels. It is recommended that data formats also stay separate between levels.
The clean architecture was created by Robert C. Martin and promoted on his blog, Uncle Bob. Like other software design philosophies, clean architecture attempts to provide a cost-effective methodology that makes it easier to develop quality code that will perform better is easier to change and has fewer dependencies.
Visually, the levels of clean architecture are organized into an unspecified number of rings. The outer levels of the rings are lower-level mechanisms and the inner, higher levels contain policies and Entities.

AWS EC2 Service: Amazon Elastic Compute Cloud (Amazon EC2) provides scalable computing capacity in the Amazon Web Services (AWS) Cloud. Using Amazon EC2 eliminates your need to invest in hardware upfront, so you can develop and deploy applications faster. You can use Amazon EC2 to launch as many or as few virtual servers as you need, configure security and networking, and manage storage. Amazon EC2 enables you to scale up or down to handle changes in requirements or spikes in popularity, reducing your need to forecast traffic.

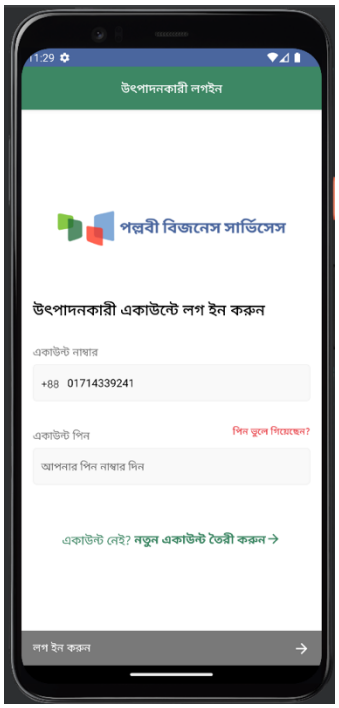
5.5 Implementation

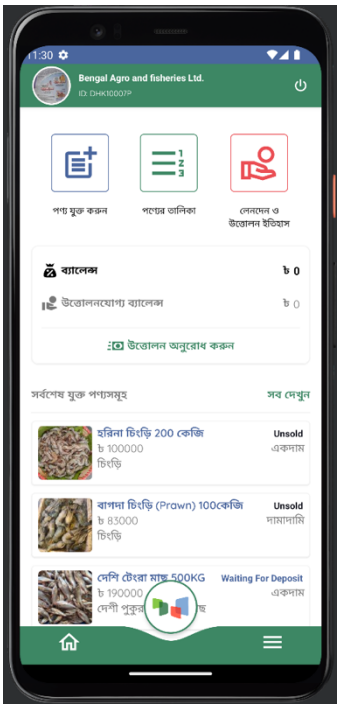
I am working on a development team to include route maps in the application by generating JSON files for the system. I have coded some components of the application. Which includes automatic route selection based on multiple input parameters, and location detection components using GPS mapping system. Where the order formatting has to be done and the function has to be developed to calculate the delivery charge by reading the data from the JSON file. I had to develop the order product pricing format. Also, I contributed to the frontend interface. And I've gone through a rigorous examination of the entire application.

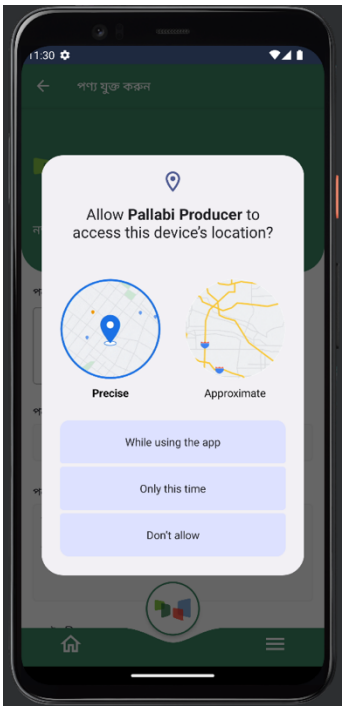
5.6 Testing

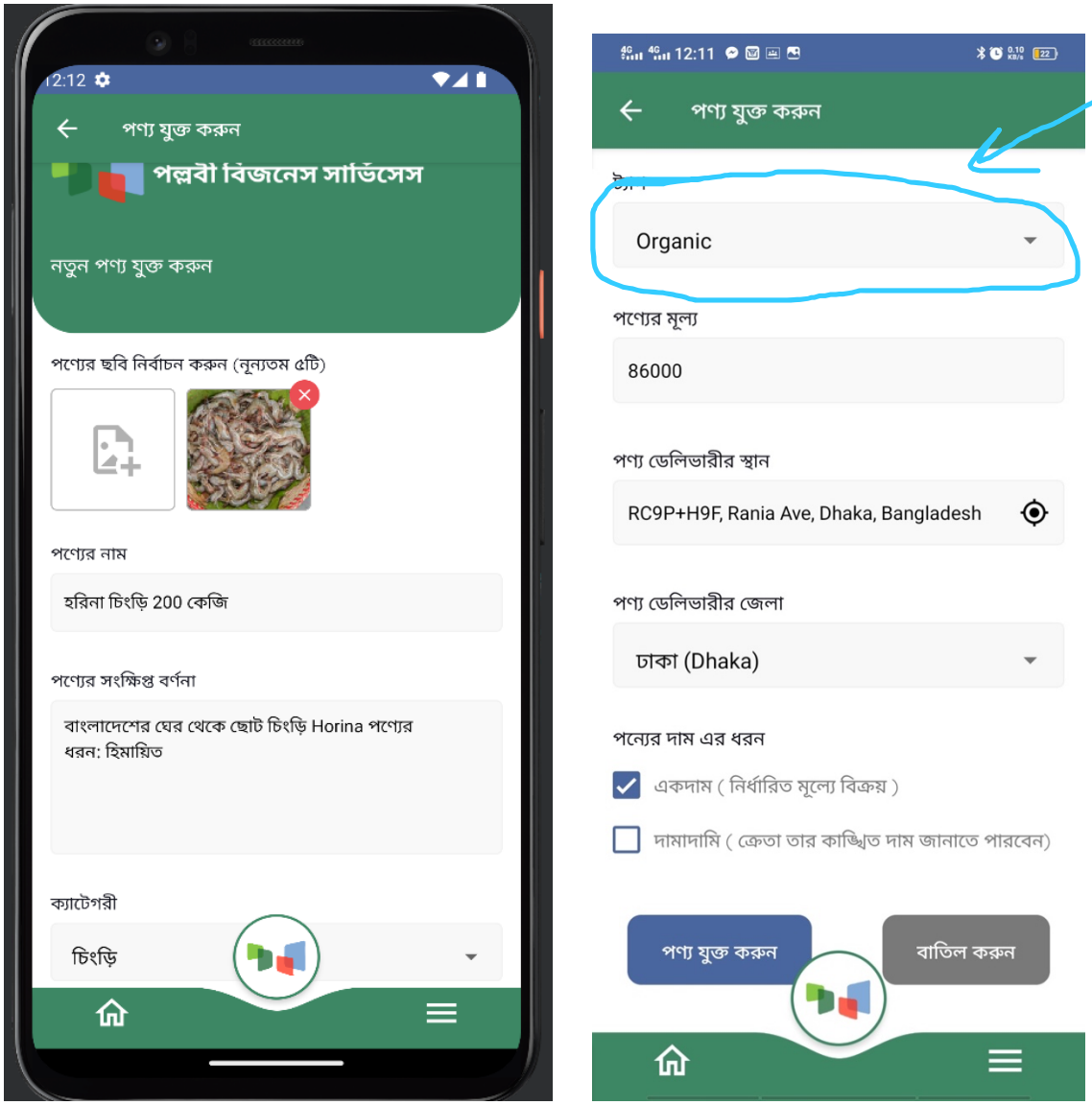
5.6.1 Input

In this section, I have added screenshots of scenarios of inputs.
With the help of my created component, the application automatically detects the source location read based on the location information of the Producer.







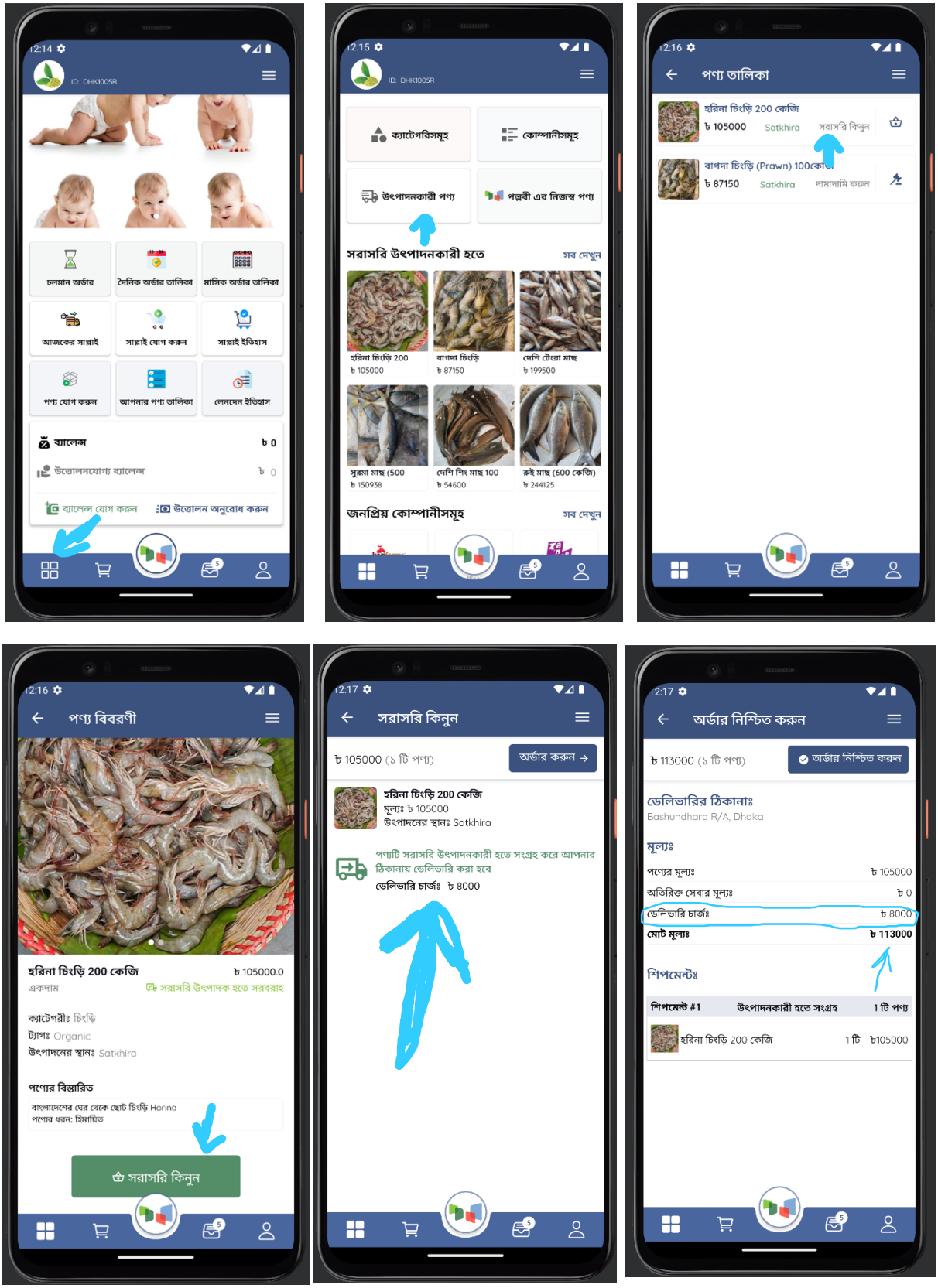


The screenshots above are taken from our producer app, where we can see a product being added. The system automatically fetches the source location while adding the product. And when a consumer orders a product, the system automatically identifies his destination location.

Multiple applications from which source location and destination are identified by the system automatically using my developed component.

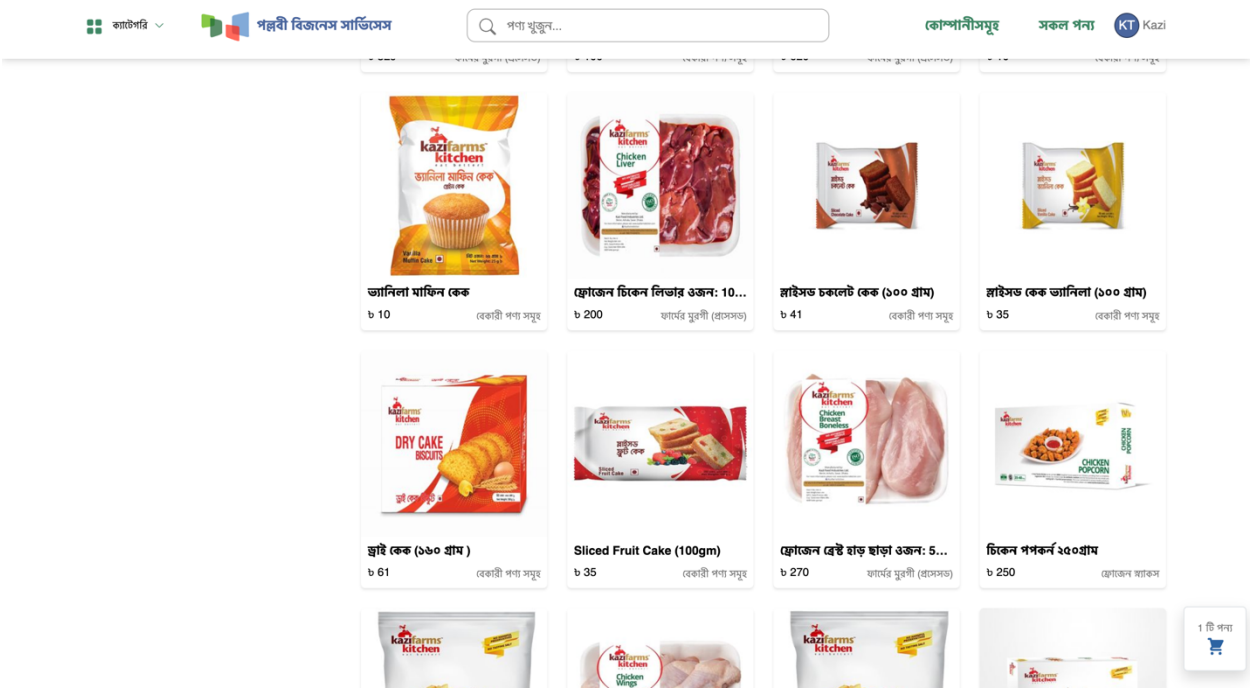
5.6.2 Output

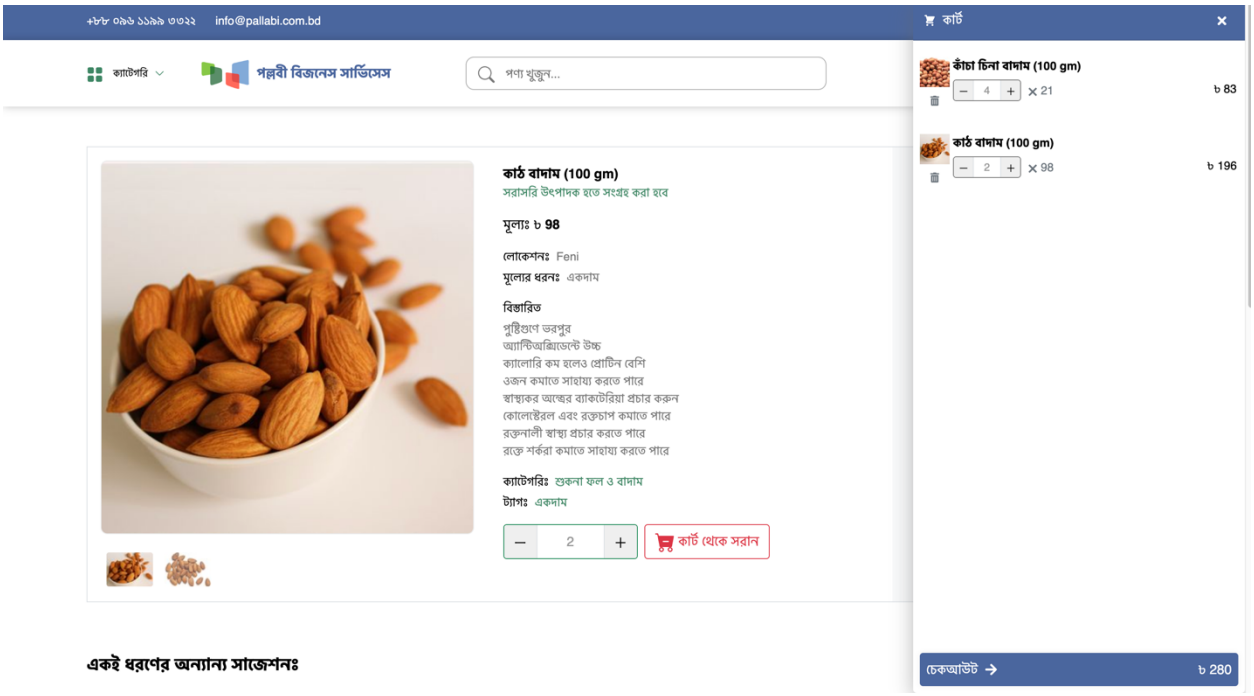
In this section, I have added screenshots of scenarios of outputs.
Below is the screenshot of ordering through the retailer app:

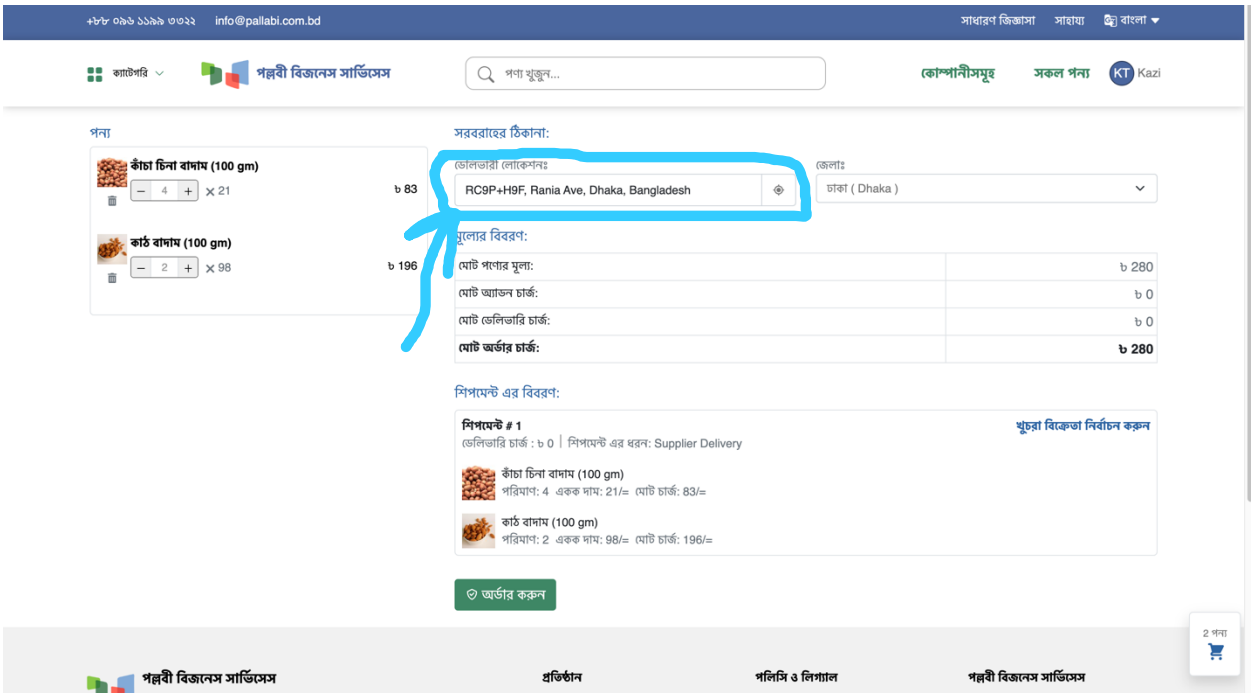


The marked locations in the above screenshots show that when a consumer or a retailer orders a producer's product, the system automatically detects the source location and destination location with the help of my developed "AI-Driven Logistics planning". Based on this the system is able to determine the product price and delivery charges.

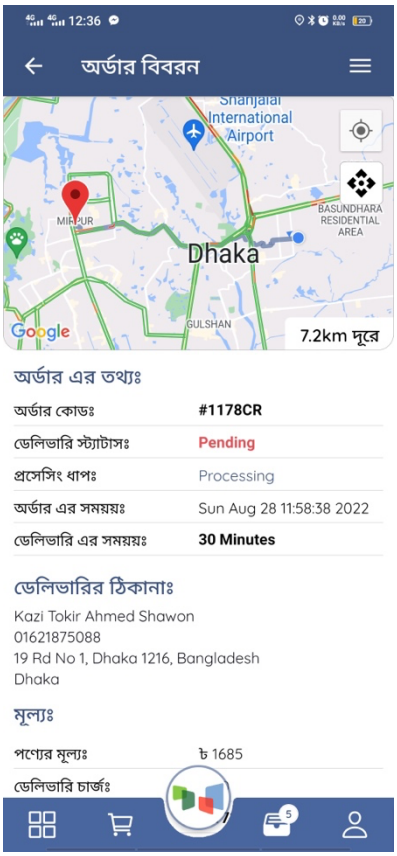








When a consumer orders a product from Pallabi e-dokaan from a retail shop the system automatically detects his destination location. and identifying the retailer's source location. Then the retailer will see the best possible route from its application to deliver the product.



Automatic calculation of price based on the best route available as calculated using AI-Driven Logistics planning.

5.6.3 Test Results

The result of this project is that it can successfully determine the best possible route and delivery charges accurately. I thoroughly check all the modules and capabilities to identify the issues that a user is facing while using it through manual testing. and document them in a shared Google sheet with a thorough explanation of the issue.

Chapter 6

Results & Analysis

While working on a project, we always try to do our best to get the best possible outcome.
If we don't get the desired result, all the hard work will go in vain. To get the best result, at First, we figured out the bugs and fixed them. Because without fixing it, we can't move on. This system was built to satisfy the users, save their time as well as solve their problems. The UI part was designed in a way so that people from all classes can use this software easily. They don't need much technical knowledge to use it. Users can easily find the products they are looking for and they can get their orders by staying at home. So, we tried to design interfaces that will attract customers. Users can easily view products from various categories. Moreover, users can provide their view on products, delivery systems, etc. if they are having any issues, they can also inform the organization.

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

The sustainability of the product refers to its ability to be managed and refreshed. In this modern world, new applications are released every day, and these applications need to be maintained and continuously updated for their user base. The use of smartphones and the internet have dramatically increased among all classes of people in Bangladesh. The growth suggests that it would increase even further in the future. Community sustainability means how much and how actively the users will support the project. Support comes in many forms, such as visiting the website, giving feedback, referring to other people, etc. "AI-driven logistics planning" is a system component that currently only has a web and mobile app version so the system is just an intelligent mapping such logistics can provide ultimate cost resource savings, increasing the profitability and success of the business. AI driven logistic support system is built using these tools and frameworks **Front-End:** React.JS, JavaScrip **Back-End:** Next.JS, Node.JS **Database:** MongoDB, Redis that is hosted in AWS platform. and for the mobile application we have use React-Native. So no matter the user load, the application is able to scale at any point. As the user of the app grows, all of them will be able to experience a smooth, effortless interaction with the app which will draw attraction. So, as the users will grow, it can be said that it is sustainable in terms of community. A project is financially sustainable when the project's running costs are maintained by the revenue generated by the product that the project sells. An application's

running cost includes - server cost, database storage cost, third-party API cost, etc. As "AI driven logistic support system" is built using these tools and frameworks Front-End: React.JS, JavaScrip Back-End: Next.JS, Node.JS Database: MongoDB, Redis. it will be used as a utility service of a company, adding this system only brings more users which will ultimately lead to more revenue generation. Thus, the project can be determined as financially sustainable. Organizational sustainability is related to how the organization will continue to operate the release of the application. The main goal of this project is to evaluate a proper and efficient logistics support system to make sure the B2B Business operation is profitable in its operation. Since AI Driven Logistics Planning is serverless, it can be said that the project on the system will only grow as more and more organizations realize the advantages of serverless applications.

7.2 Social and Environmental Effects and Analysis

Web Applications and Mobile applications are popular among people for the characteristics they offer to the users. They make interaction with people quite more straightforward. People experience a lot of advantages of using several IT digital tools in different forms of their everyday work. Some benefits of having a system are - increased customer base, increased accessibility, easy access to information, continuous fresh content, gaining clients, securing brand online, and much more. The aim of the "AI Driven Logistics Planning" is simple to reach more people, get them to know about the app, and also lower the boundary between the users and the app. As a burgeoning industry, serverless applications are clearly on the rise. From start-up companies to big companies, everyone is now moving their business to the cloud and welcoming the serverless framework for its many traits like scaling, sustainability, minimalist cost effectiveness etc.

7.3 Addressing Ethics and Ethical Issues

In today's world, there is an immense amount of data generated every day, which sometimes ends up with data collection, hacking, cybercrimes, etc. And some rules and ethics are needed to be followed when working on an application. Since "AI-Driven Logistics Planning" is currently the only informative website, we believe that the application does not breach any code of conduct of application release and development since they all have been taken into serious concern. In the" AI-Driven Logistics Planning", there is only a collection of limited and relevant user data. it collects the data strictly related to queries and requests for the menu item; other than that, no other data is neither collected nor stored, even the chat data are not being stored. it only collects limited amounts of data if the user interacts. it does not let any service, any application, or any third party have access to the collected data.

Chapter 8

Lesson Learned

During my internship at GETCO IT Services Limited, I got to know how the logistics support system of a B2B e-commerce business works. The business process of their business. Design and analysis of how to build a logistics support system for a B2B e-commerce business. Also, how to prepare UI/UX for mobile applications. And how to ensure mobile application quality through manual testing.

8.1 Problems Faced During this Period

Since this platform was completely new to me, I faced a lot of problems learning and practicing during the tasks that were assigned to me. Also, I had to learn many new libraries, APIs, and file formats to complete the project. While working on my routing feature of the project, I faced some problems because I had no prior knowledge of the mapping APIs. For the most part, I used JavaScript as the programming language to implement the functionality of my project and as the means to use all the services.

8.2 Solution of those Problems

To overcome the difficulties, I spent more and more time on research and fact-finding. Also, most of my time was spent reading the documentation of different libraries and blog posts published on the internet for different errors I have encountered.

Chapter 9

Future Work & Conclusion

9.1 Future Works

This project AI-Driven Logistics Planning is just the beginning and there are numerous mapped features that are to be added in the imminent future. In future development "AI-Driven Logistics Planning" will remove bottleneck routes from the route list by determining the best possible inventory cost and distance route using satellite information. The whole idea of making this system with the latest routing technologies is to implement a highly scalable system.

9.2 Conclusion

During my internship at GETCO IT SERVICES LIMITED, we will be deploying our developed system for a new E-commerce company Name PALLABI BUSINESS SERVICES who will be operating in all 64 districts in Bangladesh for purchasing and selling, delivering agricultural FMCG and food items. I am involved throughout the whole deployment process and thereby have a complete understanding of the uses of digital technology, IoT devices, and IT infrastructures, from the design stage to the production stage. Throughout this internship program, I discovered a developer's working life. Besides, the project obliquely assisted me to discover individually, lead a more managed lifestyle and make the mindset to solve problems. This internship program created a way for me to get to know the software engineering industry of Bangladesh.

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An Undergraduate Internship on

AI-Driven Logistics Planning

By
Name: Kazi Tokir Ahmed Shawon
Student ID: 1821890

Summer, 2022

Consent Form

The student modified the internship final report as per the recommendations made by his/her academic supervisor and/or panel members during final viva, and the department can use this version for archiving.



Mr. Sanzar Adnan Alam

Department of Computer Science & Engineering

Independent University, Bangladesh