



ONLINE MARKET PLACE FOR ORGANIC FOODS USING BLOCKCHAIN

Project ID: 19_20-J 06

Software Requirement Specifications (SRS) for Online Market Place for Organic Foods

BSc Special (Hons) - Information Technology

(Specialization in Information Technology)

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

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DECLARATION

We hereby declare that the project work entitled “**ONLINE MARKET PLACE FOR ORGANIC FOODS**”, submitted to the Sri Lanka Institute of Information Technology is a record of an original work done by me, under the guidance of our supervisor **Dr. Dharshana Kasthurirathna**. This project work is submitted in the partial fulfillment of the requirement for the award of the degree of Bachelor of Science (Special Honors) in Information Technology. The Results embodied in this report have not been submitted to any other University or Institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

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Date

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1 Introduction

1.1 Purpose

The purpose of document is the to specify the requirements to the following component of the system “**Online Supermarket Place**” which will be implemented as a result of the research project “**Storing Supply chain Details using Blockchain Technology**”.

- **Storing Supply chain Details using Block chain Technology**
 - Identifying all the stake holders related to supply chain
 - Store all details of each product in the block chain.
- **Technique to find the Optimal Delivery Path**
 - Implement a technique which can find the best way to deliver the products.
 - That technique concerns the time, how long you should go to the destination and the cost like constants to calculate the efficiency of the way.
 - And finally, it displays the optimize way by using a map.
- **Identify and Detect the accuracy of Reviews Provided by the Consumers(Ontology)**
 - Through our system consumers can express their feelings, thoughts, and interest by implementing technology like ontology.
 - We are hoping to provide service to filter and analyze their comments that related to foods and give results as score for other consumers to predict and select best foods by looking score that we provided.
- **Sentiment Analysis for Product Reviews**
 - Sentiment analysis approach is going to be used in order to analysis of such huge data in our system automatically.
 - The main aim of using sentiment analysis approach in our system is to identifying the polarity of the data in our system and classifying them.

The document contains Identification of the problem in previous work based, statement of work, project plan or schedule, Research constraints, specified deliverables, technical approach of the component, assumptions, interfaces, etc. used to develop this system.

1.2 Scope

At present, most people tend to choose organic food either voluntarily or involuntarily. However, there is no clear way for the customers to identify organic foods in the existing market. This has led to deterioration of the health and lifestyle of customers. We are going to propose a system which aim is supporting to identify fresh and organic foods distinctly from other products.

Our solution is to develop a web application in order to record supply chain related details beginning from manufacturer to customer using blockchain technology and also, customers can visit the web application and place their orders according to their preferences while looking to the supply chain of related products. Furthermore, customers able to scan the QR codes stick on the products which redirect to a web page which holds product's supply chain details. Customers can comment on products which they like to consume & according to those comments, a review is provide on those comments by using "Sentiment Analysis". [1]

As the main objectives of this document is focus on identifying stakeholder engaged with the supply chain and store all details related products with ease by ensuring that all steps from food production to delivering it to the customer are transparent and reliable.

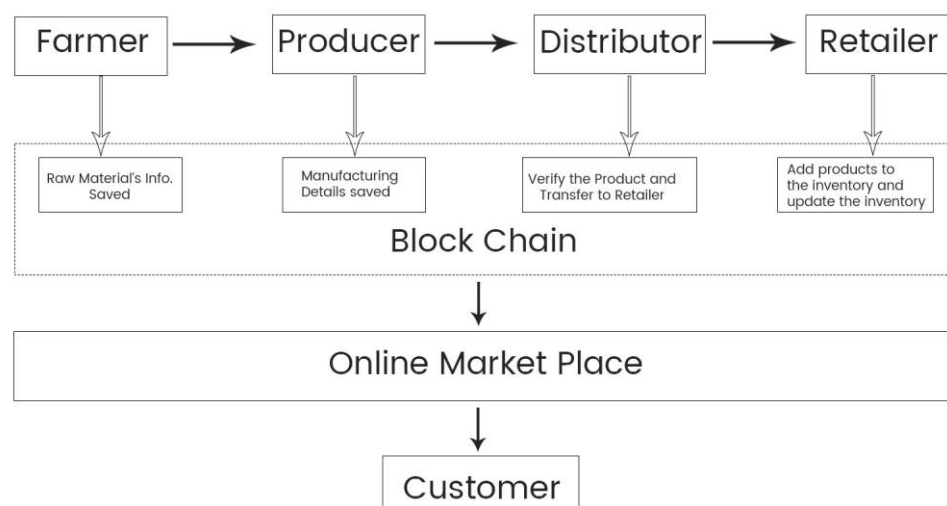


Figure 1: Overview of the System

1.3 Definitions, Acronyms, and Abbreviations

SRS	Software Requirement Specification
GUI	Graphical User Interface
PC	Personal Computer
AWS	Amazon Web Services
EC2	Elastic Compute Cloud
API	Application Programming Interface
NLP	Natural Language Processing
AI	Artificial Intelligence

Table 1: Definitions, Acronyms, and Abbreviations

1.4 Overview

The remainder of this document will illustrate the requirements of the “Storing supply chain details using Block Chain” overall description of them and their perspectives and functionalities. Furthermore, it will discuss functional requirements, non-functional requirements, performance requirements and design constraints.

The rest of the section of this document is organized as follow, product such as system interfaces, user interfaces and hardware interface etc. System review summary or major functionalities users and the characteristics of the system and the background of the general factors affected the functionality of the component in discuss in relation of the complete product.

2 Overall Descriptions

This section gives an overview of the components of the system. Basic functionalities of the components and how its behavior with other systems will be explained. Interaction with stakeholders and what are the functionalities available for each type of stakeholders will also be explained here as well as the constraints and assumptions.

2.1 Product perspective

When researching about existing systems and methodologies, which incorporates the idea of the system in discuss several commercially available functioning systems and reasonable research approaches were encountered. Actually, there are some existing projects that related to this. Some applications such as “Halal Traceability and Halal Tracking Systems” [1] and “”. These applications only identified and store supply chain details. According to our system, it is not only identifying the supply chain details but also track all steps from food production to delivering it to the customer are transparent and reliable and also our system can able to trace the source of illegal activities such as fake commodities and illegal labor.

There are some applications using Block chain technology that related to our system but they are having many issues when interacting with stakeholders. One research application is “Blockchain based Wine Supply Chain Traceability System” [2]. This research has used the block chain technology to trace the supply chain but they having drawbacks when providing user-friendly user interfaces to the stakeholders. According to our system, when stakeholders interacting with the application, they will have user friendly interfaces which will easy to use.

There are also some existing systems which are finding the optimal path. But those are different that our proposed system. Some of existing systems provide the optimum path but it doesn’t consider the real time traffic and it won’t give an another optimize path to deliver the product. And some of system has get third party vendor software to find the optimum path in this case the company which is used that software has to pay

lot of money in vain, in order to overcome this issue, we are planning to develop our software without using any third-party vendor application.

The research “A knowledge extraction system from online reviews using fuzzy logic” [8] is research on semantic analysis from hotel reviews using the ontology as a knowledge base for hotel information extraction and storing and using the parser to solve the semantic analysis problem. But the problem of the proposed system is it’s incapable of handling the ambiguity present in modern English grammar rules such as idioms, similes, etc. and not consider fake comments.

Above researchers they have not considered fake comments as well as spam comments in the same system. We are hoping to detect spam and fake comments in order to give customers to accuracy analysis for each product.

2.1.1 System interfaces

In our proposed system we have planned to develop web application. This web application contains the Blockchain, Sentiment Analysis and Ontology parts. In order to give our delivery service to our customer we have to implement mobile application as well. Further we intend to develop android application and IOS application.

2.1.2 User interfaces

- Interface for the Farmers.
- Interface for Producers/Manufactures.
- Interface for Distributors.
- Interface for Retailers.
- Interfaces for Administrators.
- Interface for Customers.
- Product Purchase Interface
- Interface to show the best Route
- Interface for Overall Aspect-based Sentiment Analysis Overview
- Product Overview Interfac

2.1.3 Hardware interfaces

The system to be developed does not require any special hardware integrations for functioning as it is a web-based application and mobile application. However, an electronic device such as a PC or a tablet device which can connect to the internet service will be needed to access the application.

2.1.4 Software interfaces

- AWS EC2
- Visual Studio Code
- WebStorm
- Python spaCy, NLTK and TextBlob libraries
- Django framework for python
- React
- OWL
- SOARQL query editor (Virtuoso SPARQL Query Editor)
- MongoDB

2.1.5 Communication interfaces

For site server should have over 100Mbps internet speed to because the system not only sending the data to client but to some external interfaces as well. For end user at least 1Mbs speed to use without any lag.

2.1.6 Memory constraints

Server should initially have 1GB size and according the usage it should be expandable.

2.1.7 Operations

- User will be needed to login to the web application using given authentication details.
- User can search any product through the web application which they willing to buy.
- User can view the product details which they like to buy after search through the web application.
- User should follow the declared procedure on the GUI to generate the Block chain reports through the web application
- Customers are allowed to comment on anything in the comment section.
- Customers are not allowed to post multiple comments at the same time.
- Identify and detect key words trained data set and choose each category.
- Analyze and filter Spam/fake/duplicate/and original comments etc.
- Retrieve filtered (spams/irrelevant) product reviews from ontology model.
- Aspect term extraction.
- Aspect term polarity detection.
- Aspect term categorization.
- Aspect category polarity detection
- Visualize the results to the user.
- Find the optimal route will be calculated by using some constrains and it will go through an algorithm. After that it shows an optimal route through the google maps.

2.1.8 Site adaptation requirements

- Elements in the Graphical user interface must contain self-descriptive and easily understandable names.
- Customers should post their comments in English only and symbols, picture comments are not allowed for the output.
- Comment section should not be limited and customer should exactly bring our products to take their comments to process.
- User interface must exist in two different languages English and Sinhala.
- Users will be able to see the aspect-based polarity of the reviews after the final production.

2.2 Product functions

2.2.1 Use Case Diagram

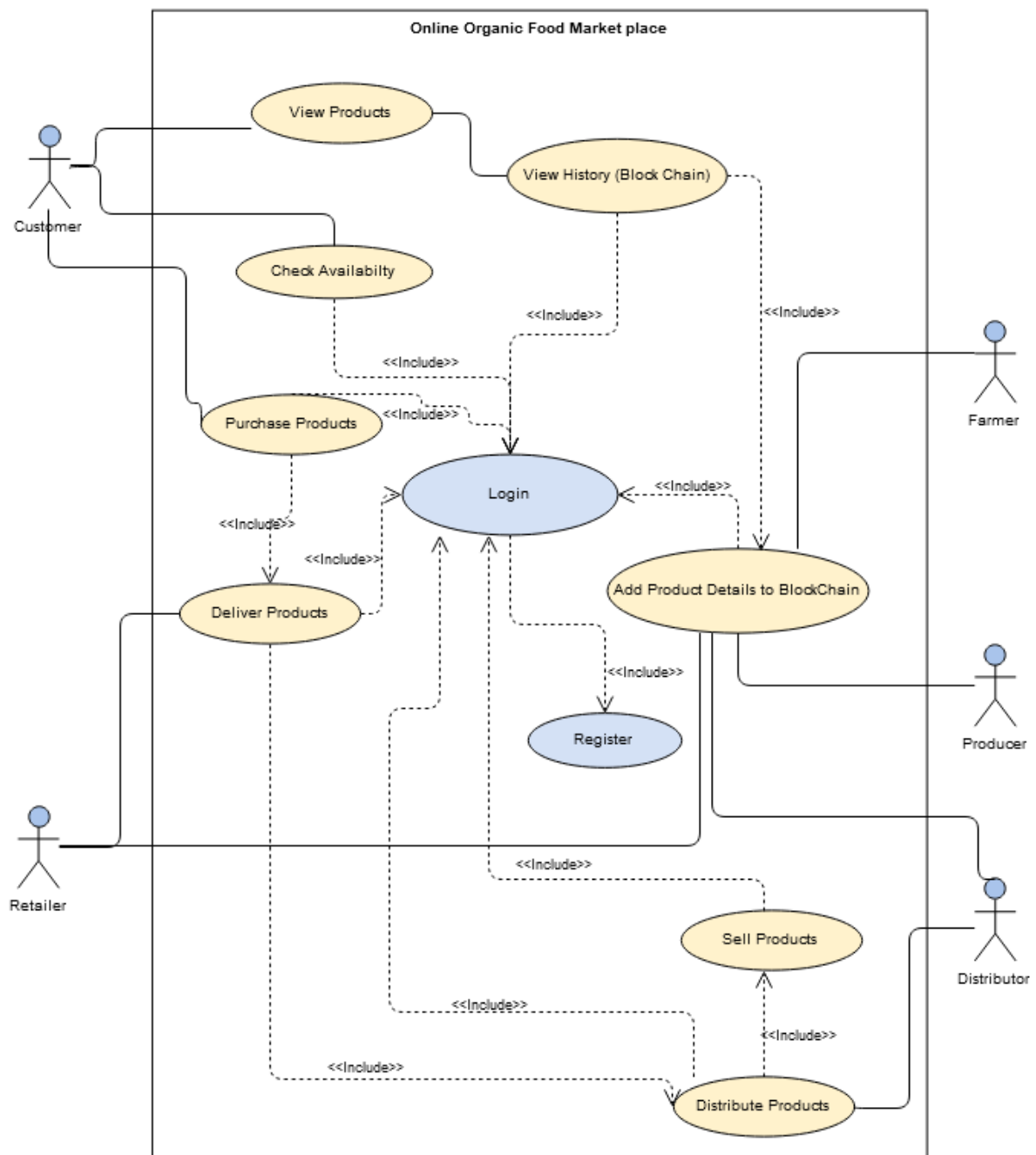


Figure 2:Use Case Diagram 1

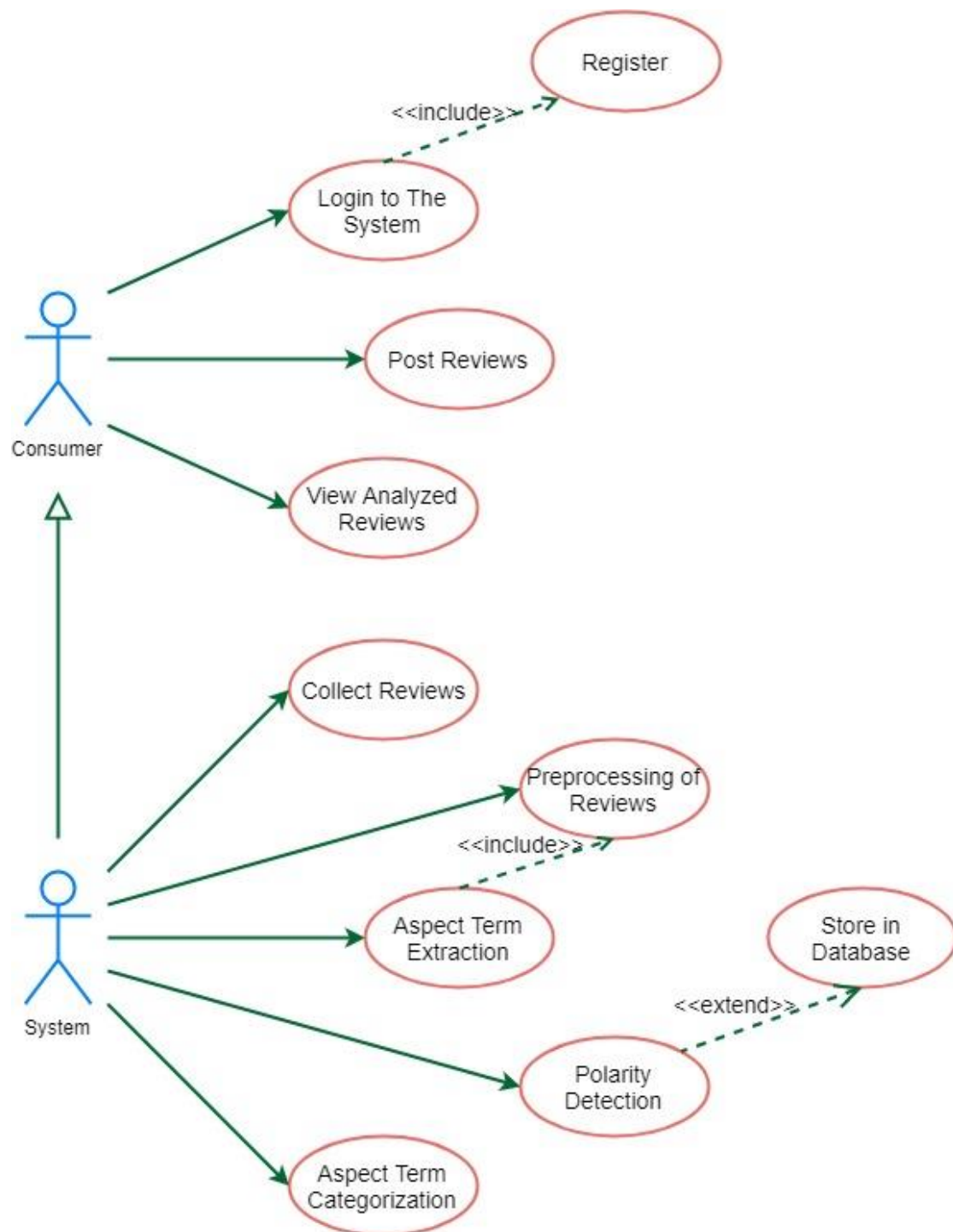


Figure 3: Use Case Diagram 2

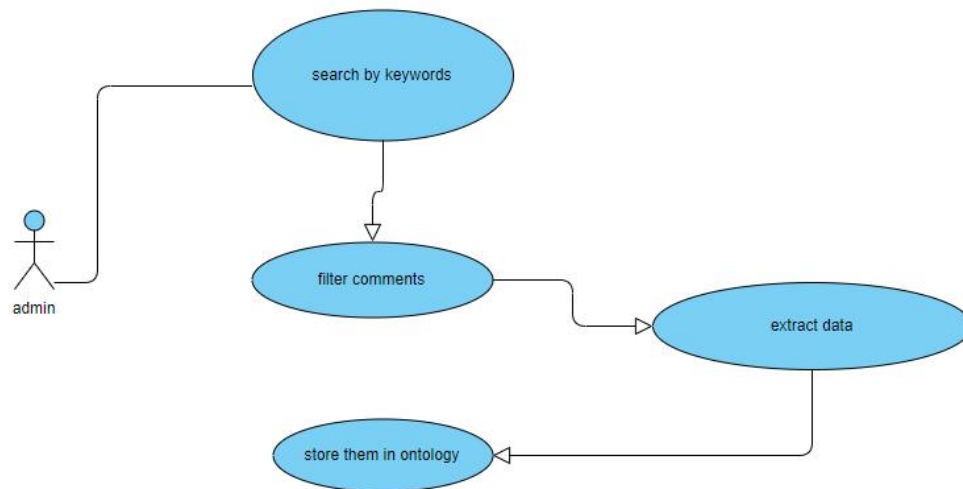


Figure 4: Use Case Diagram 3

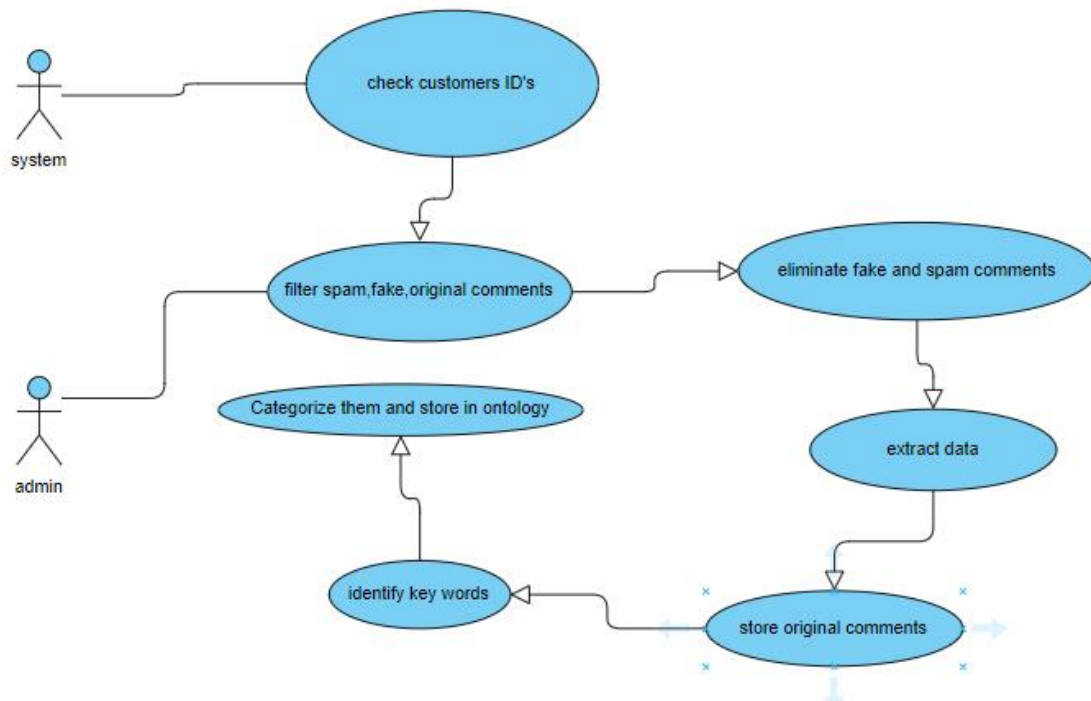


Figure 5: Use Case Diagram 4

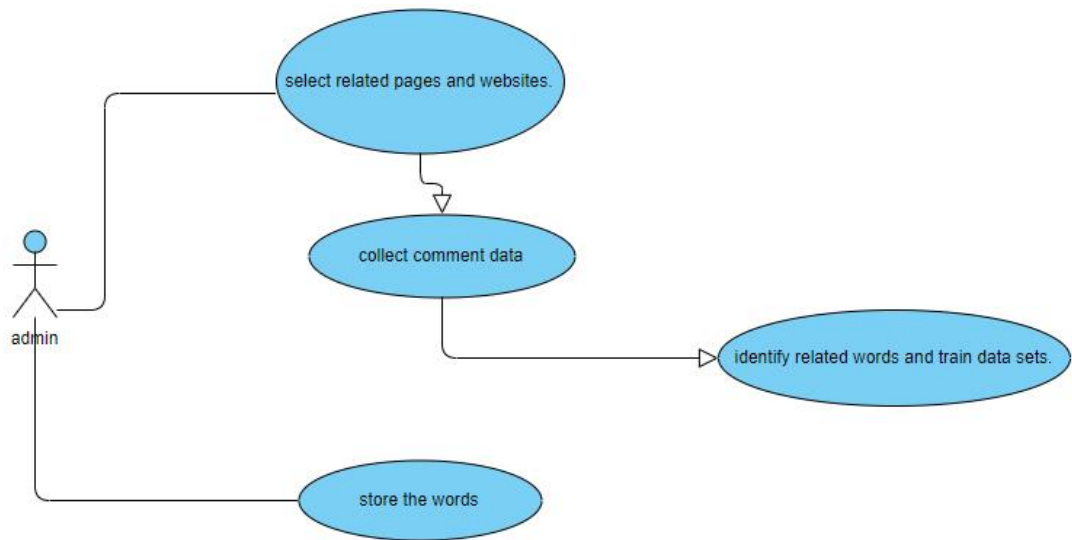


Figure 6: Use Case Diagram 5

2.2.2 Use Case Scenarios

Use Case Name	View Products
Actor	Customer
Pre-Condition	User Must Login to the System
Main Scenario	<ul style="list-style-type: none">○ Use case Starts when customer log into the system.○ System fills Product Details from the Database.○ User can view the Product Description.

Table 2: Use Case View Products

Use Case Name	Check Availability
Actor	Customer
Pre-Condition	User Must Login to the System
Main Scenario	<ul style="list-style-type: none">○ Use case Starts when customer log into the system.○ System fills Product Details from the Database.○ Using the check availability button user can view remain stock of the product.

Table 3: Use Case Check Availability

Use Case Name	Purchase Product
Actor	Customer
Pre-Condition	User Must Login to the System
Main Scenario	<ul style="list-style-type: none">○ Use case Starts when customer log into the system.○ User select the product to purchase.○ System Promote a Message before Finalize.○ User Confirms the Message.○ Use case ends when hash value is added to Block Chain and system prompts a successful message.

Table 4: Use Case Purchase Product

Use Case Name	View Product History
Actor	Customer
Pre-Condition	User Must Login to the System
Main Scenario	<ul style="list-style-type: none">○ Use case Starts when customer log into the system.○ System fills Product Details from the Database.○ User click the History Button.○ Use case ends when system Retrieve Product History from Blockchain.

Table 5: Use Case View Product History

Use Case Name	Add Details to Block Chain
Actor	Farmer, Producer, Retailer, Distributor
Pre-Condition	User Must Login to the System
Main Scenario	<ul style="list-style-type: none"> ○ Use case Starts when required Details Fills into the Text Fields. ○ User Clicks submit Button. ○ System Check for Validation. ○ System Promote a Message before Finalize. ○ User Confirms the Message. ○ System add the hash value in Block Chain.

Table 6: Use Case Add Details to Block Chain

Use Case Name	Distribute the Products
Actor	Distributor
Pre-Condition	User Must Login to the System
Main Scenario	<ul style="list-style-type: none"> ○ Use case Starts when click on Requested Products. ○ Fill the Text Fields with required Product Details to deliver. ○ User Clicks submit Button. ○ System Check for Validation. ○ System Promote a Message before Finalize. ○ User Confirms the Message. ○ Use case ends when hash value is added to Block Chain and system prompts a successful message.

Table 7: Use Case Distribute the Products

Use case	Collecting the reviews to be processed
Primary actor	System
Pre-condition	Reviews should be filtered using ontology model.
Post-condition	Provide filtered reviews for further analysis.
Main success scenario	<ul style="list-style-type: none"> ○ User enter reviews to the system. ○ Retrieve those into ontology model by system. ○ Filter those reviews accordingly. ○ Provide those filtered reviews for cleansing.
Extension	1a. If the user review is not belonging to the defined aspects, that review will be categorized as miscellaneous

Table 8:Collecting the reviews to be analyzed

Use case	Data cleansing
Primary actor	System
Pre-condition	Gather user reviews from ontology model
Post-condition	Build corpus.
Main success scenario	<ul style="list-style-type: none"> ○ Removing duplicate rows and unnecessary columns. ○ Removal of punctuations, stop words, white spaces, special characters, converting text to lowercase etc. ○ Stemming and lemmatizing. ○ Store the cleaned data in the database.

Table 9: Data cleansing

Use case	Sentiment analysis of the reviews.
Primary actor	System
Pre-condition	Corpus of the collected data.
Post-condition	Give aspect-based sentiment score.
Main success scenario	<ul style="list-style-type: none"> ○ Get corpus that stored in the database. ○ Use rules-based sentiment scores using nltk libraries. ○ Identify the aspects of the review. ○ Give sentiment score as positive / negative.

Table 10: Sentiment analysis of the reviews

Use case	View analyzed results.
Primary actor	System
Pre-condition	User should visit to the product.
Post-condition	Analyzed results will be shown in graphically.
Main success scenario	<ul style="list-style-type: none"> ○ Analyze the polarity of reviews. ○ Generate aspect-based graphs. ○ Result will be shown in graphically.

Table 11: View analyzed results

Use case name	Store data
Actors	System
Pre-conditions	Build ontology
Post conditions	System can access to the data.
Steps	<ul style="list-style-type: none"> ○ Filter data. ○ Original comments weighted in ontology.

Table 12: Store Data

Use case name	Identifying key words.
Actors	System
Pre-conditions	System should have train data sets.
Post conditions	Store and weighted in ontology.
Steps	<ul style="list-style-type: none"> ○ Analyze the customer's comments. ○ Identify key words in the comments.

Table 13: Identifying key words

Use case name	Identifying spam, fake comments.
Actors	System
Pre-conditions	System should have customers IDs
Post conditions	Analyze and eliminate spam and fake comments.
Steps	<ul style="list-style-type: none"> ○ Analyze the customer's comments ○ Access user ID's and checks commented customer exactly brought products. ○ Check comments are related or not to the products. ○ Eliminate comments which are not related to product and comments that are posting without buying our products.

Table 14: Identifying spam, fake comments

Use case name	Identifying original comments.
Actors	System
Pre-conditions	System should detect spam and fake comments.
Post conditions	Store and weighted in the ontology.
Steps	<ul style="list-style-type: none"> ○ Identify fake and spam comments. ○ After eliminating all fake and spam other comments are store in the ontology.

Table 15: Identifying original comments.

2.2.3 Activity Diagram

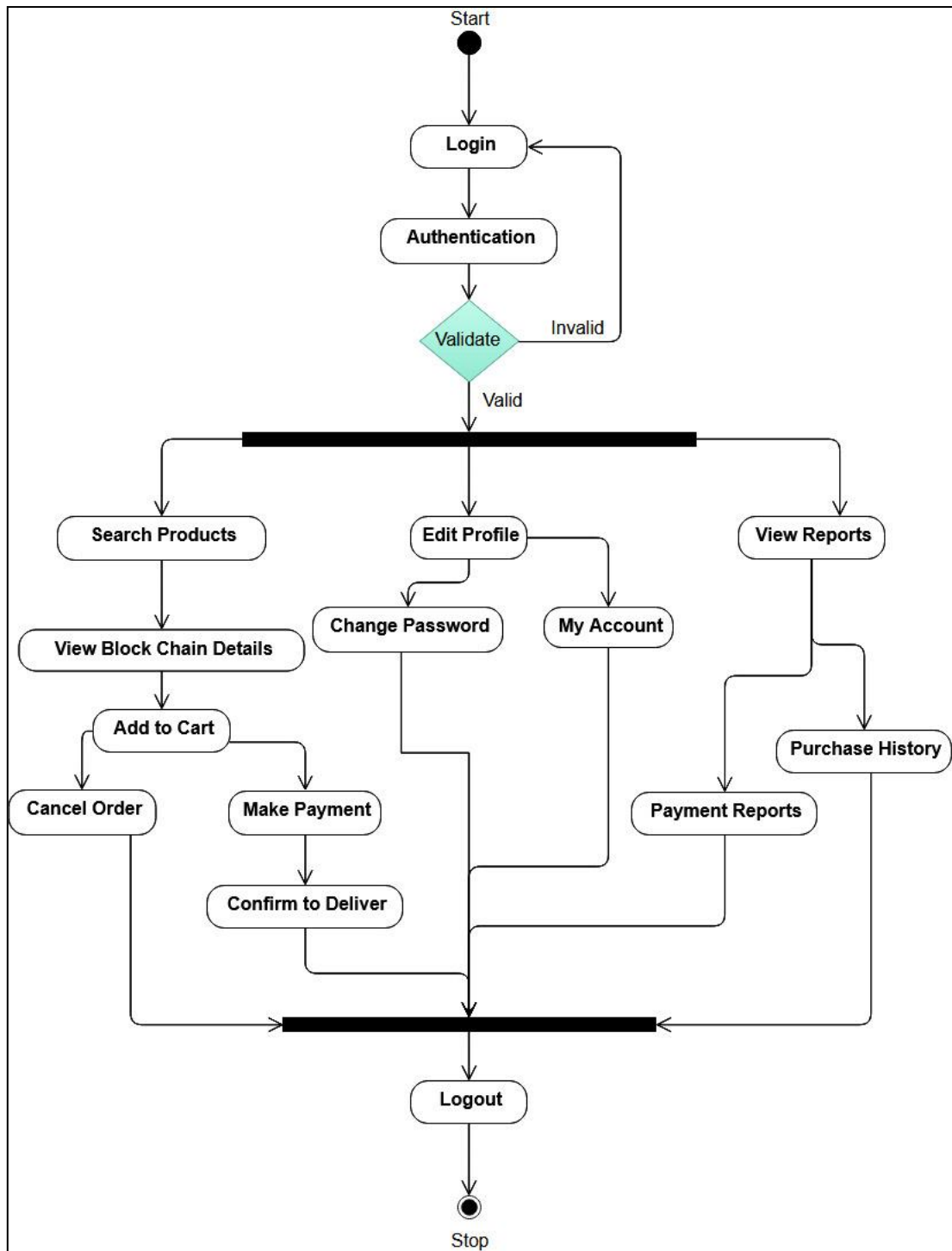


Figure 7: Activity Diagram

2.2.4 Sequence Diagram [3]

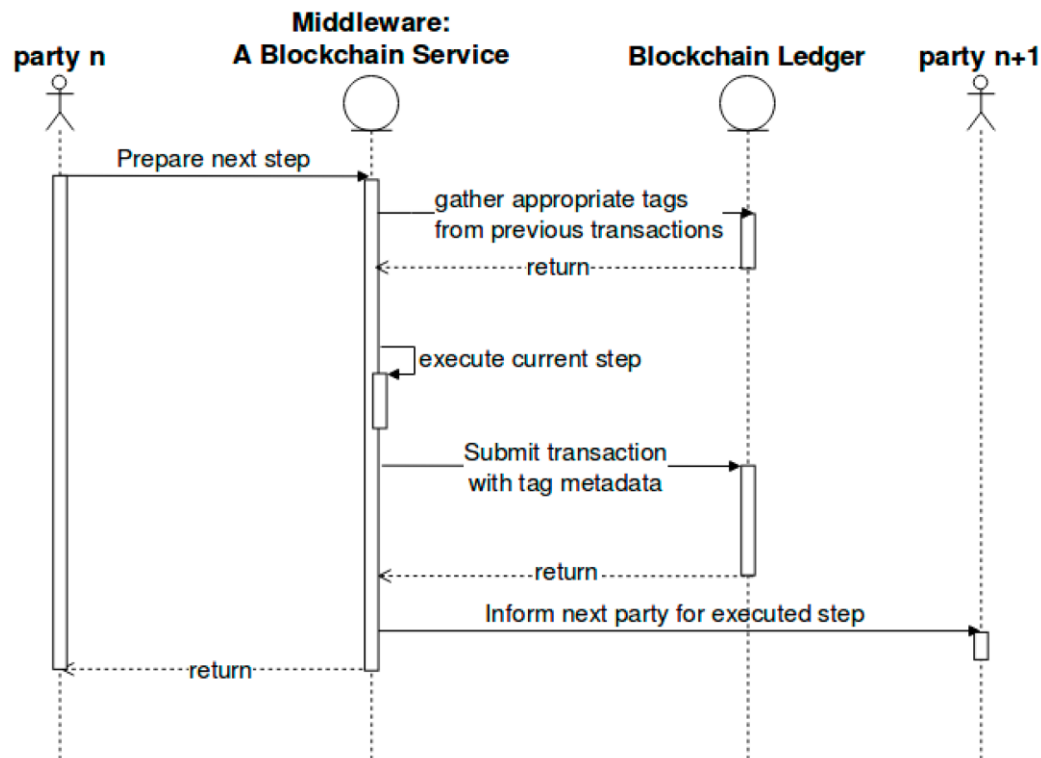


Figure 8: Sequence Diagram

Figure 4 - One supply chain freight stage (stage number $n+1$) as a blockchain transaction. Every stage's functionality is automated by the "Middleware", and thus, the parties that participate in each stage (a single one in the input and another one in the output) have a small interaction with it; for instance, the driver confirms that the transportation was completed by receiving the appropriate transaction hash, or the employee confirms that certain materials were kept refrigerated, as expected, by collecting the corresponding transaction hashes and others. Here, party n participates in stage $n+1$ input (and already in stage n output) while party $n+1$ participates on stage $n+1$ output (and stage $n+2$ input).

2.2.5 Overview of Function Flow

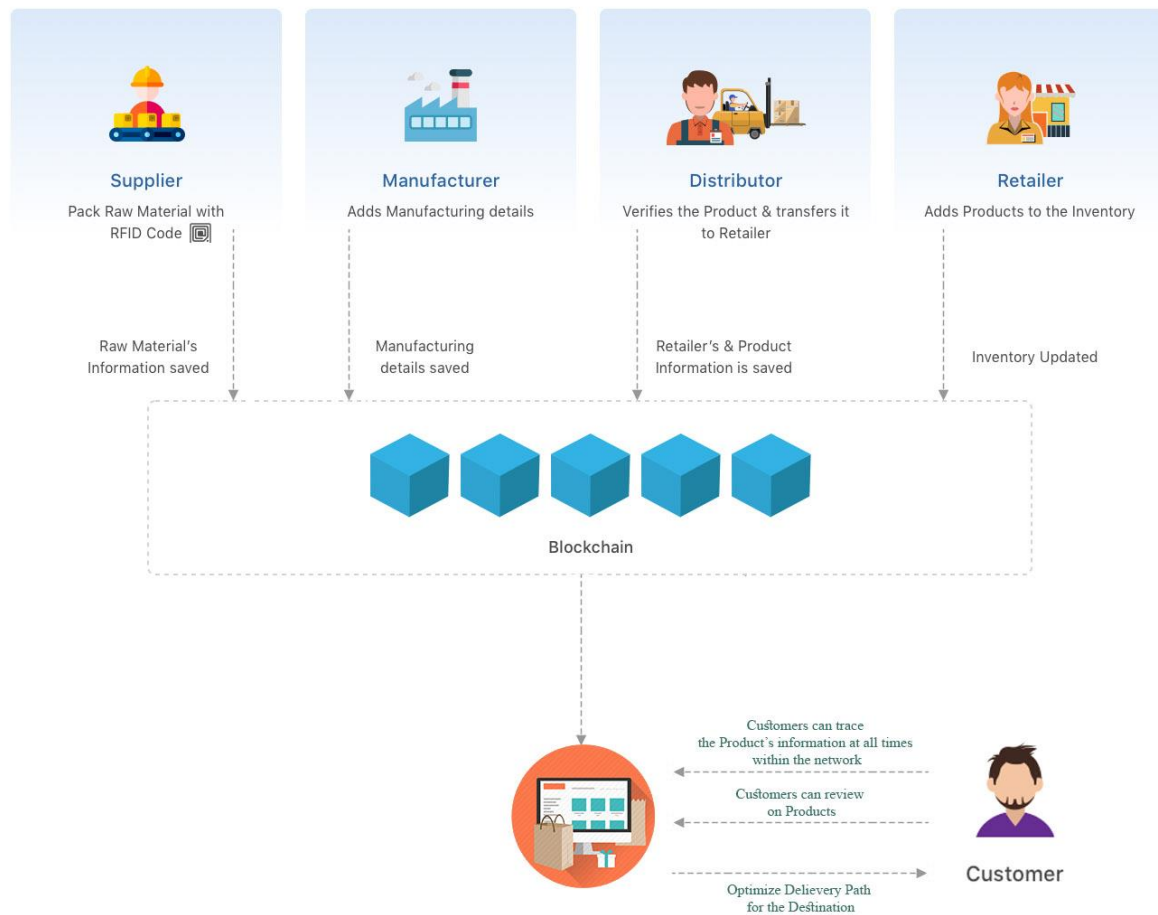


Figure 9: Overview of System Flow

2.2 User characteristics

Stakeholders who are interacting with the supply chain process with the basic knowledge in using a computer/Tablet device is intended to use this component

2.4 Constraints

- Lack of Documentation on Blockchain Development.
- To communicate within Application and the central server there should be proper web servers with high performing speed. Computer internet connection should be fast and should not be down to communicate with the web server.

Identifying key words:

- Data sets for train are taken from related pages and web sites similar to our product.
- Which are related to key words is identified as true comments to categorize.
- People have various kinds of typing methods and they use different letters for some words.

Identifying spam, fake comments:

- Without buying our products posting Comments which are not related to our products are consider as spam comments and customers who brought our products posting comments which are not related to our products are considered as fake comments.
- Same Customer is not allowed to posting several comments at the same time.
- Comment should match with key words that we have train.

2.5 Assumptions and dependencies

- Assuming user has a basic idea of handling operations in the Computer.
- Assume that more functionalities will be added to the application in future.
- Assuming the performance of the RAM and the processor of the computer will be sufficient for running the application.
- Training data sets are collect from related pages and web sites and think customers are always posting comments related to that comments.
- No data will be lost/corrupted during the communication between server and web application
- This domain-based sentiment analysis system consists with English language. So, every user should have the English language literacy. And also, they should have post reviews in English.
- AI should train around 3 months to get a good accuracy.
- People have various kind of typing methods and they use different letters for same words.

2.6 Apportioning of requirements

Primary requirements of this project are described in section 1 and 2. Requirements that are specified in the section 3 are referred to as functional requirements. All these requirements are intended to be consistent. If there are any inconsistencies present, they will be logged as defects. Requirements that are mentioned in both section 2 and section 3 will be implemented by referring to the section 3 because it is more detailed than section 2.

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3 Specific Requirements

3.1 External interface requirements

3.1.1 User interfaces

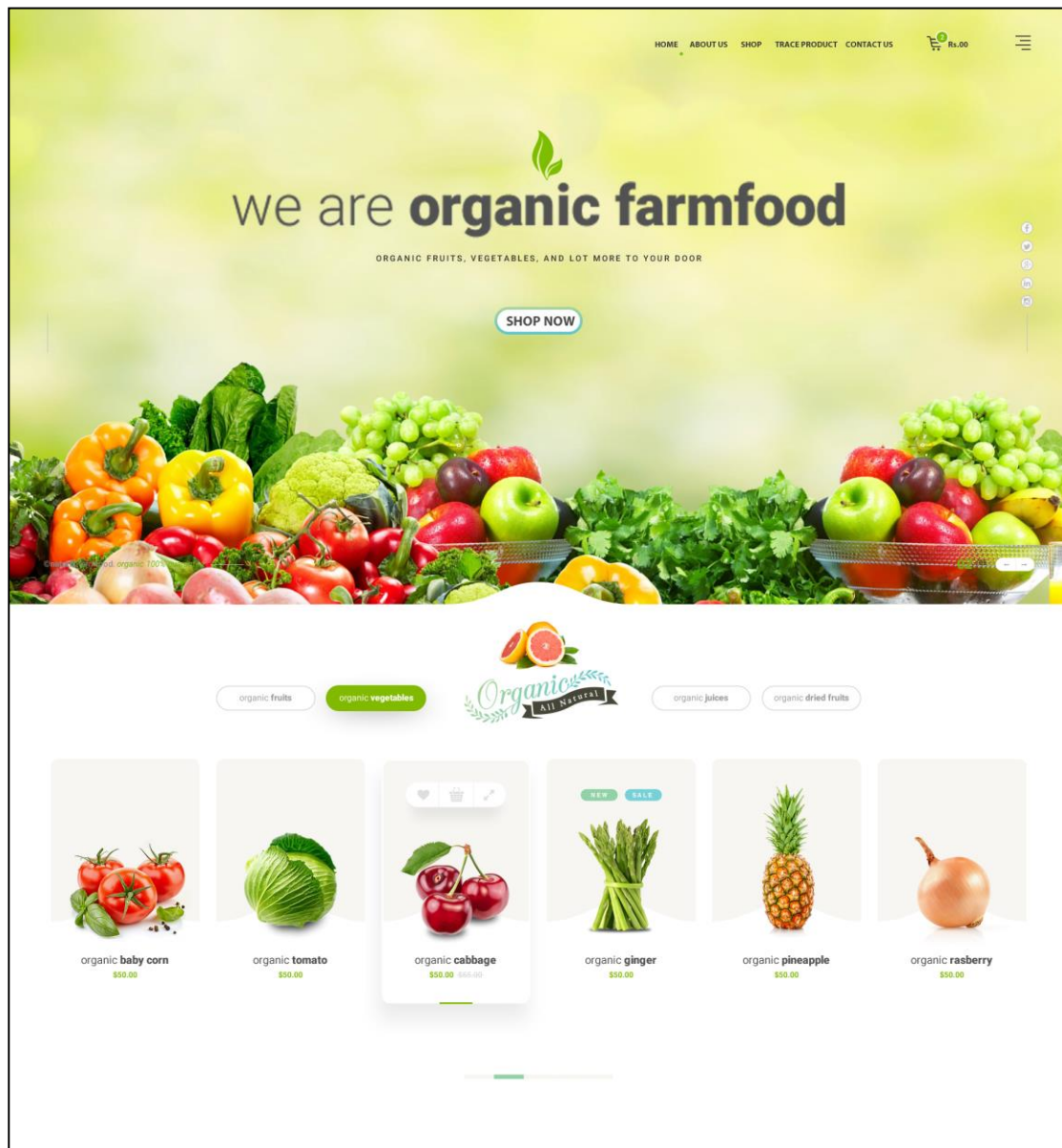


Figure 10: User Interface 1

User Interface 1 – Customer will have user-friendly GUI to search and choose products to Purchased.

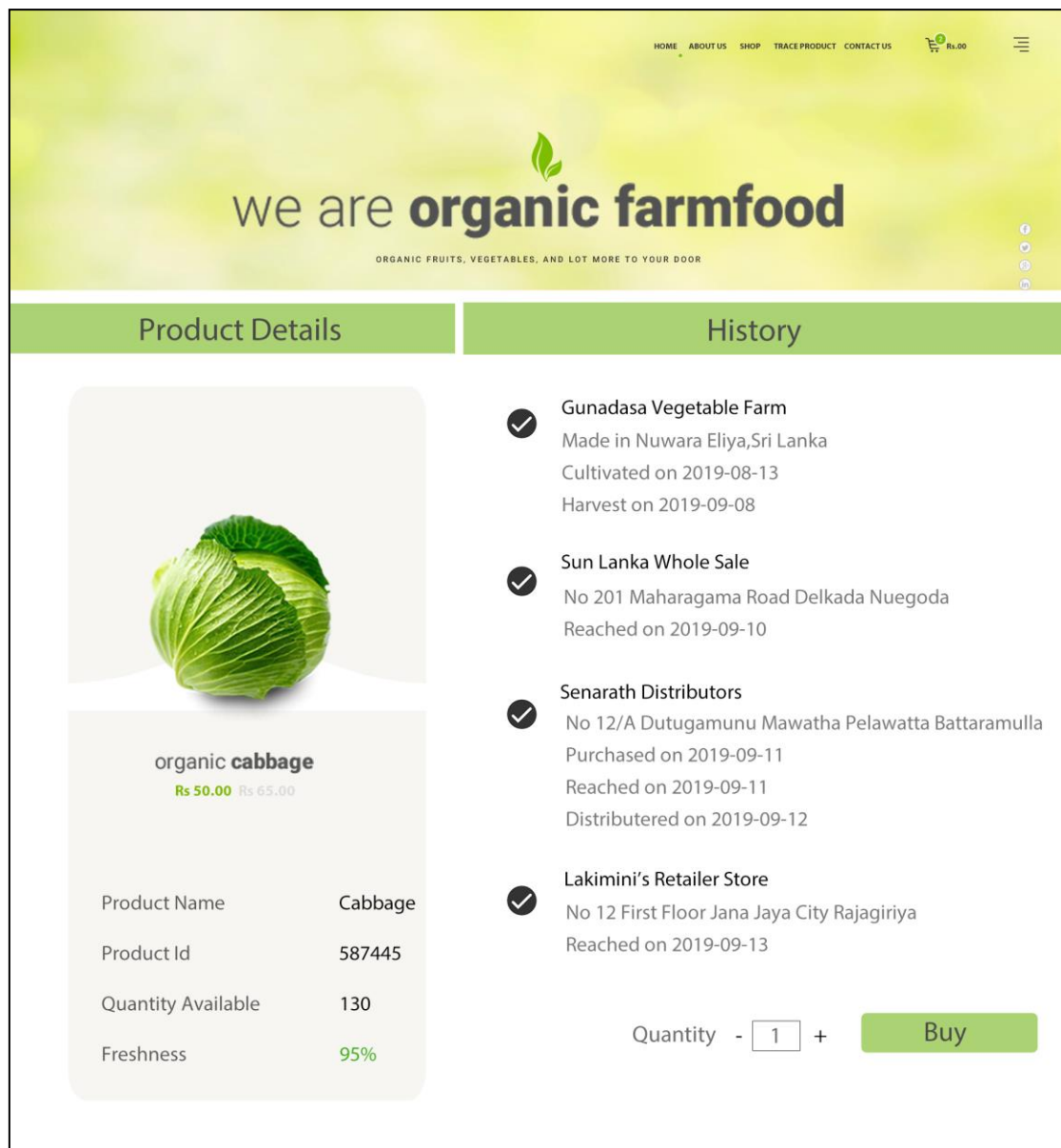


Figure 11 : User Interface 2

User Interface 2 – Customers who have logged into the system can view the products details Along with the details from farmer to retailer shop (block chain Details) and also freshness of the product according to number of days that the product in the market after the harvest.

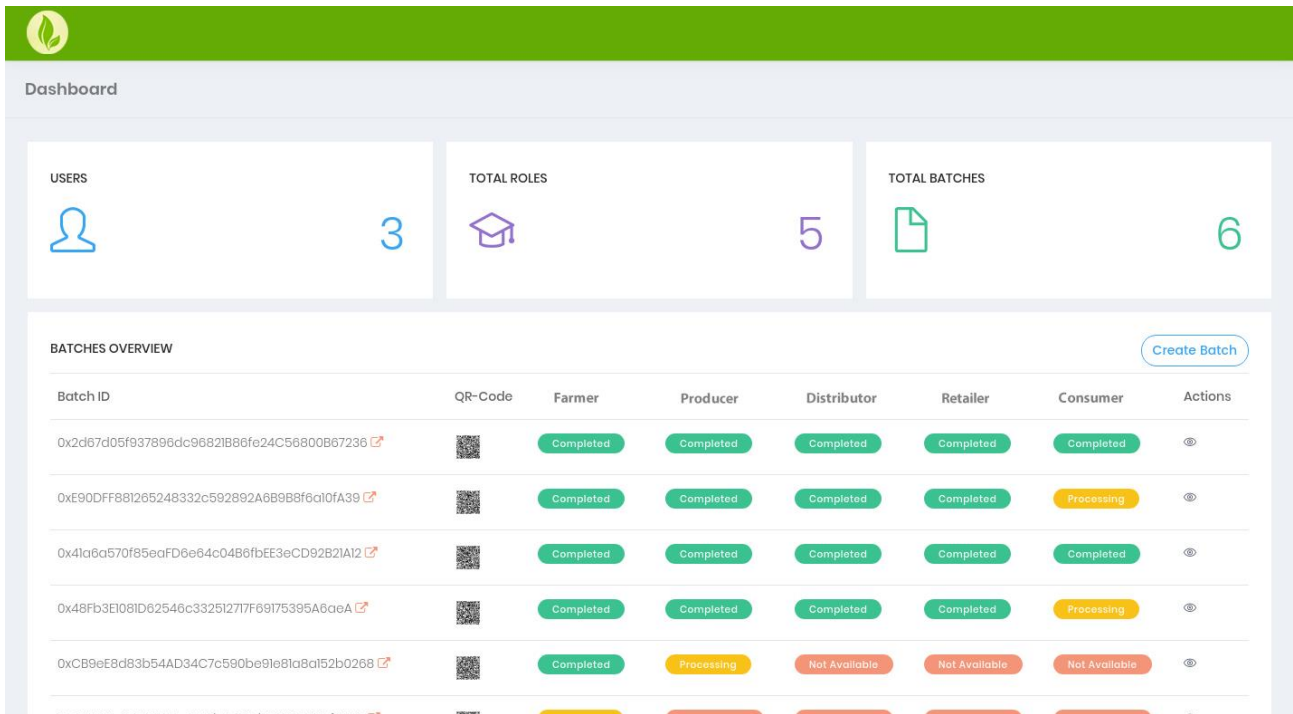



Figure 12 : Admin Panel Interface

The Distributor Interface shows a modal form for adding a distributor. The form includes the following fields:

- Product
- Quantity
- Transport Info
- Retailer Name
- Retailer Address
- Estimate Datetime
- Distributor ID

At the bottom of the form are 'Cancel' and 'Submit' buttons. The background shows a sidebar with 'ROLE_ID' (manu-0088e4), 'ROLE' (Producer), and 'SETTINGS' (Edit). The main content area displays a 'BATCHES OVERVIEW' table with columns for Batch ID, QR-Code, Farmer, Producer, Distributor, Retailer, Consumer, and Actions.

Figure 13: Distributor Interface



ROLE_ID

ret-0034e4





ROLE

Retailer

SETTINGS

Edit

BATCHES OVERVIEW

Batch ID
0x2d67d05f937896dc96821B86fe24C56800B67236 
0xE90DFF831265248332c592892A889B8f6a10fA39 
0x41a6a570f85eaFD6e04c04B6fbEE3eCD92B21A12 
0x48fb3E1081D62546c332512717f69175395A6aeA 

Retailer

Product

Quantity

Transport info

Customer Name


Customer Address

Estimate Datetime

Retailer ID

Cancel


Submit



premium quality

>Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy.

READ MORE



100% natural

>Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy.

READ MORE

Create Batch





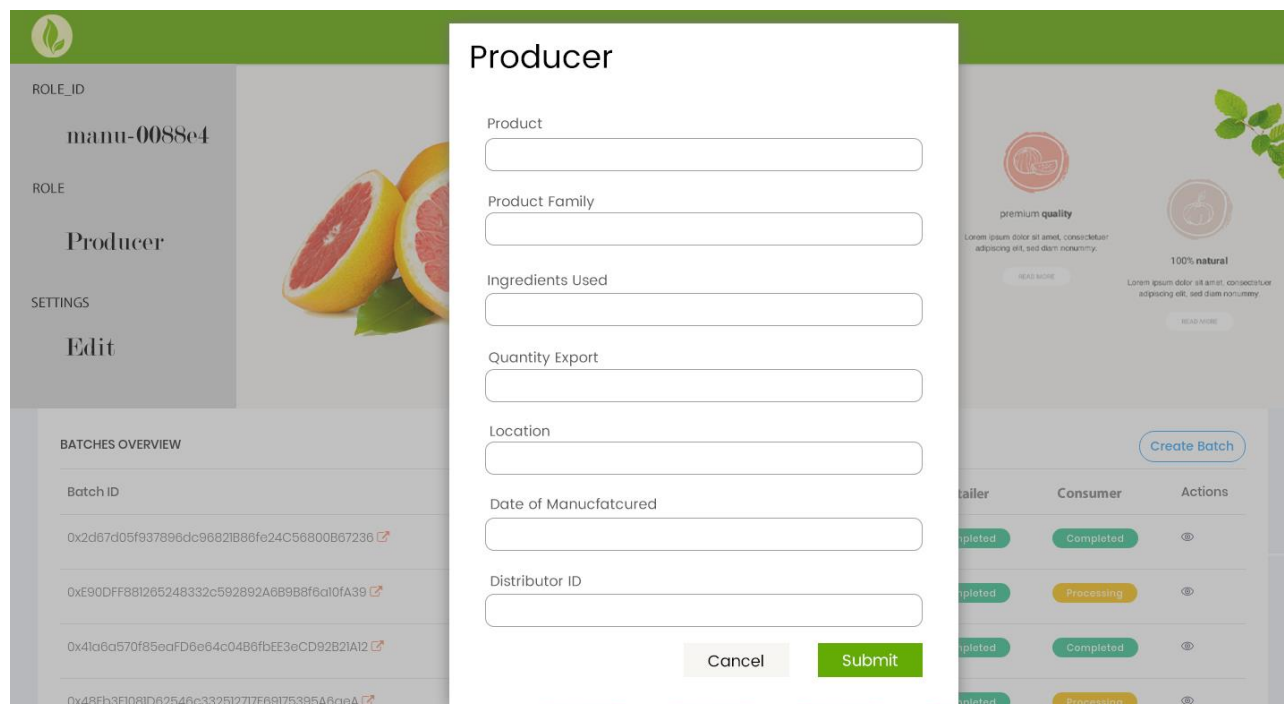
Retailer	Consumer	Actions
Completed	Completed	
Completed	Processing	
Completed	Completed	
Completed	Processing	

Figure 15: Retailer Interface



ROLE_ID


manu-0088e4

ROLE





Producer

SETTINGS

Edit



BATCHES OVERVIEW

Batch ID
0x2d67d05f937896dc96821B86fe24C56800B67236 
0xE90DFF881265248332c592892A6B9B8f6a10fA39 
0x41a6a570f85eafD6e64c0486fbEE3eCD92B21A12 
0x48Fb3F1081D82546c332512717f69175395A6aeA 

Producer

Product

Product Family

Ingredients Used

Quantity Export


Location

Date of Manufatcured

Distributor ID

Cancel


Submit



premium quality

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy.

READ MORE



100% natural

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy.

READ MORE

Create Batch

tailer	Consumer	Actions
<div>Completed</div>	<div>Completed</div>	<div></div>
<div>Completed</div>	<div>Processing</div>	<div></div>
<div>Completed</div>	<div>Completed</div>	<div></div>
<div>Completed</div>	<div>Processing</div>	<div></div>

Figure 14: Producer Interface

The screenshot displays the 'Farmer' role interface. A modal form titled 'Farmer' is open, allowing the user to add a new batch. The form includes the following fields:

- Type of the Product
- Product Family
- Fertilizer Used
- Quantity
- Location
- Date of Farming

At the bottom of the modal are 'Cancel' and 'Submit' buttons. The background interface shows the user's role as 'Farmer' and a 'BATCHES OVERVIEW' table with columns for Batch ID and status.

Figure 16: Farmer Interface



Figure 17: Buy Now page

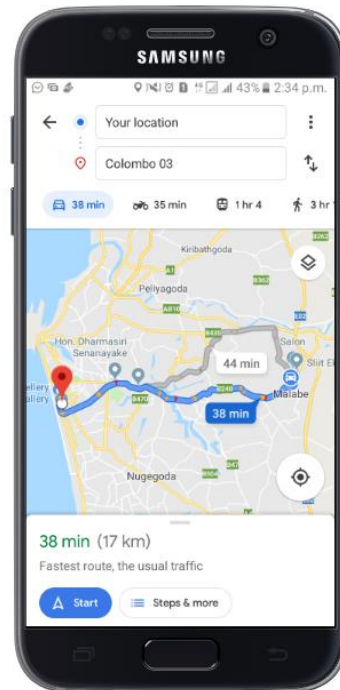


Figure 18: Show the best route

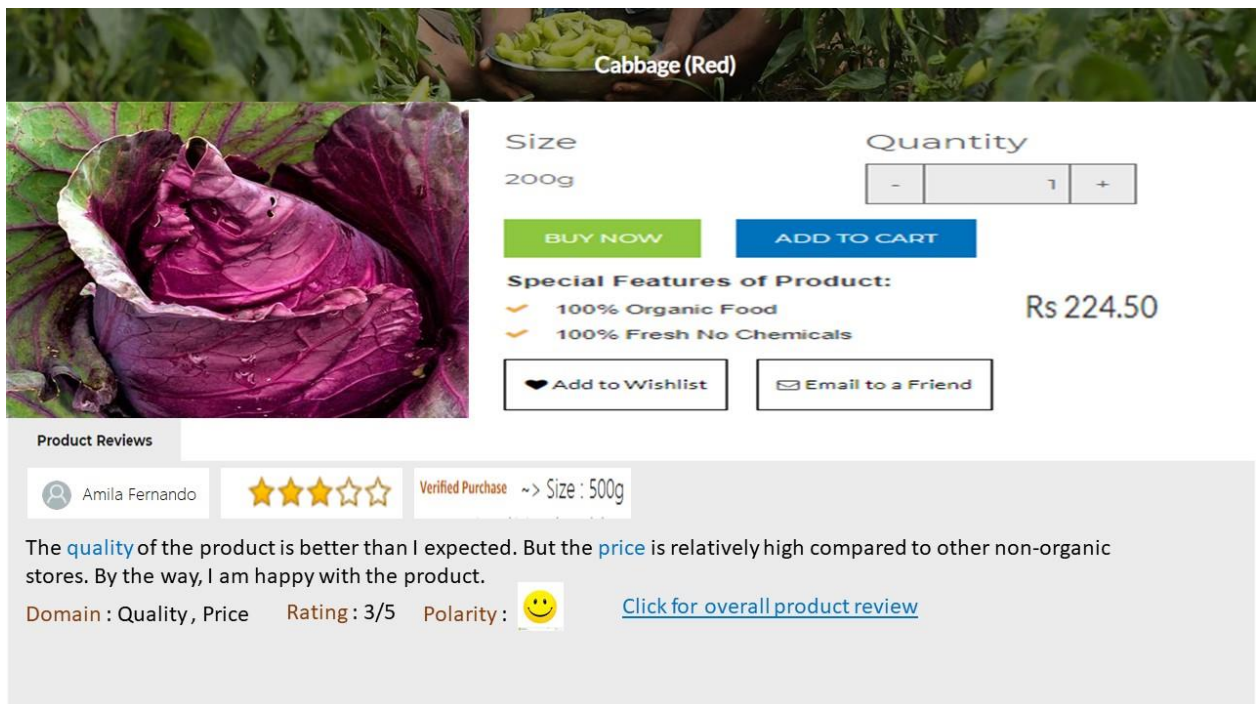


Figure 19: Product Overview Page

Figure 19 - Customers who purchased organic products only can be able to make feedbacks/reviews and can rate through stars on them. To do so, customers should have a verified purchase towards that particular product. According to their feedbacks, corresponding aspects like quality, price, service will be identified. Individual review rating and polarity (positive, negative, neutral) for that individual feedback will also be identified and those data is shown through this interface.



Figure 20: Overall Aspect-based Sentiment Analysis Overview

Figure 20 - Aspect-based polarity for overall reviews/feedbacks will be graphically shown through this interface for consumers. Considering into these graphical data, consumers can be able to make decisions on particular organic products. Main aim of this research area is to provide more reliable service to consumers. That purpose is achieved through this interface.

3.1.2 Hardware interfaces

Hardware items which the system deals with are mentioned below:

- Computer or Smart with internet Connection.

3.1.3 Software interfaces

Software which the component deals with are mentioned below:

- AWS EC2
- WebStorm
- React
- OWL
- SOARQL query editor (Virtuoso SPARQL Query Editor)
- Python spaCy – Library for advanced Natural Language Processing(NLP).
- NLTK 3.4.1 - Will be used to build the lexicon library building system.
- POS-Tagger - Get pos tags for the sentence.
- Stanford Parser – Extract relationships among different words of a sentence.
- TextBlob library - Identify the polarity of the aspect terms
- Wordnet – A lexical database for the English language.
- Django - framework for python.
- React – Will be used for frontend development.
- MongoDB – Will be used for backed development.
- Visual Studio Code – IDE
- Edraw Max – To draw diagrams
- Any web browser.
- GitHub – To integrate the whole system.

3.1.4 Communication interfaces

For site server should have over 100Mbps internet speed to because the system not only sending the data to client but to some external interfaces as well. For end user at least 1Mbps speed to use without any lag.

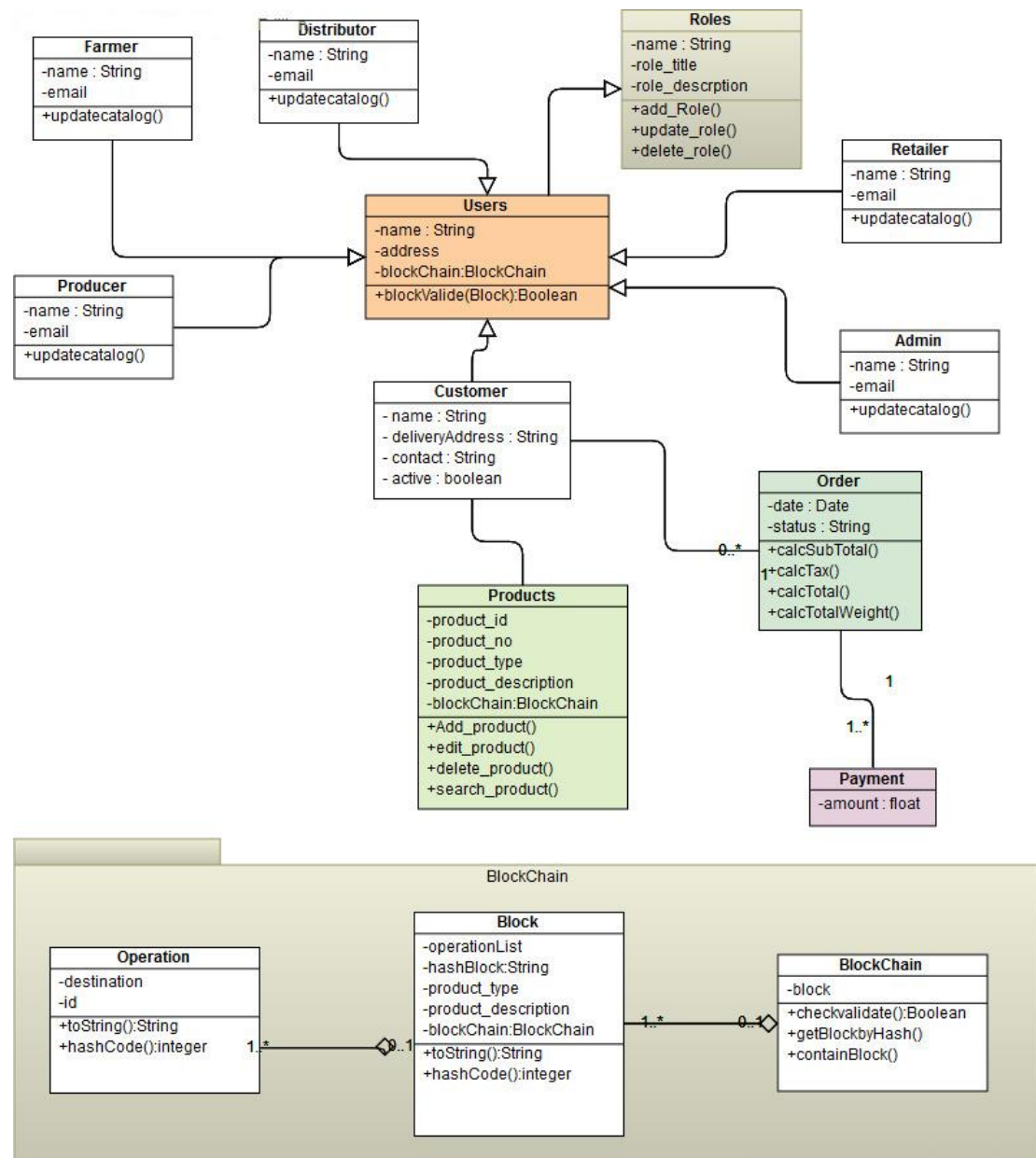


Figure 21: Class Diagram 1

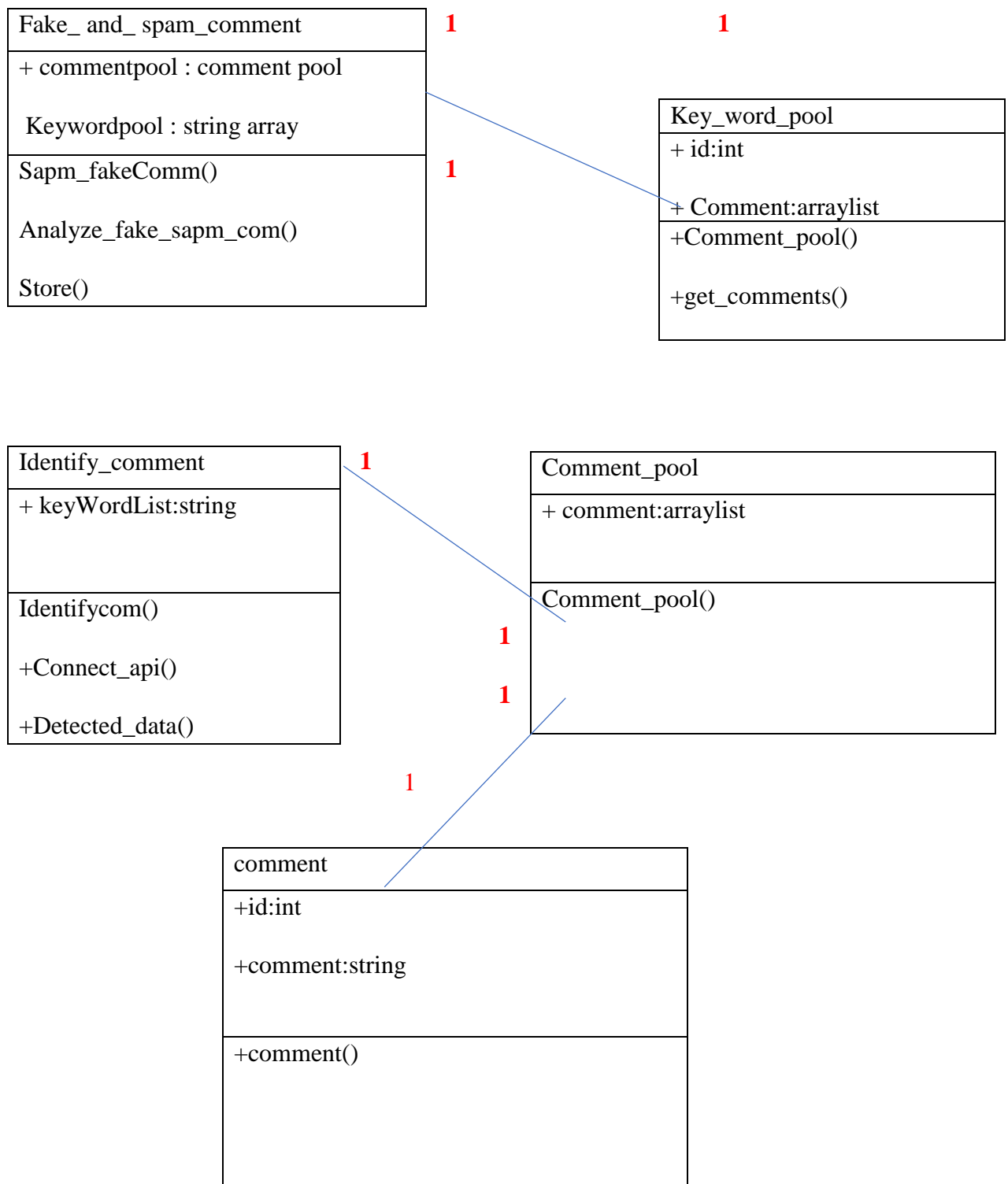


Figure 22: Class Diagram 2

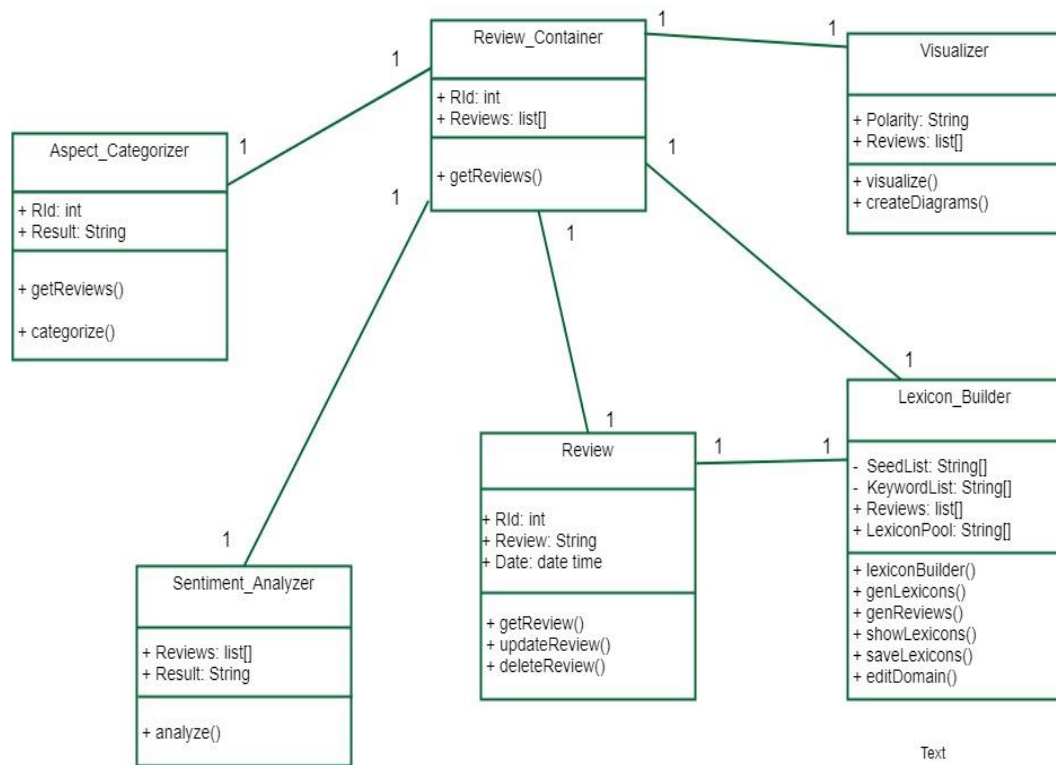


Figure 23: Class Diagram 3

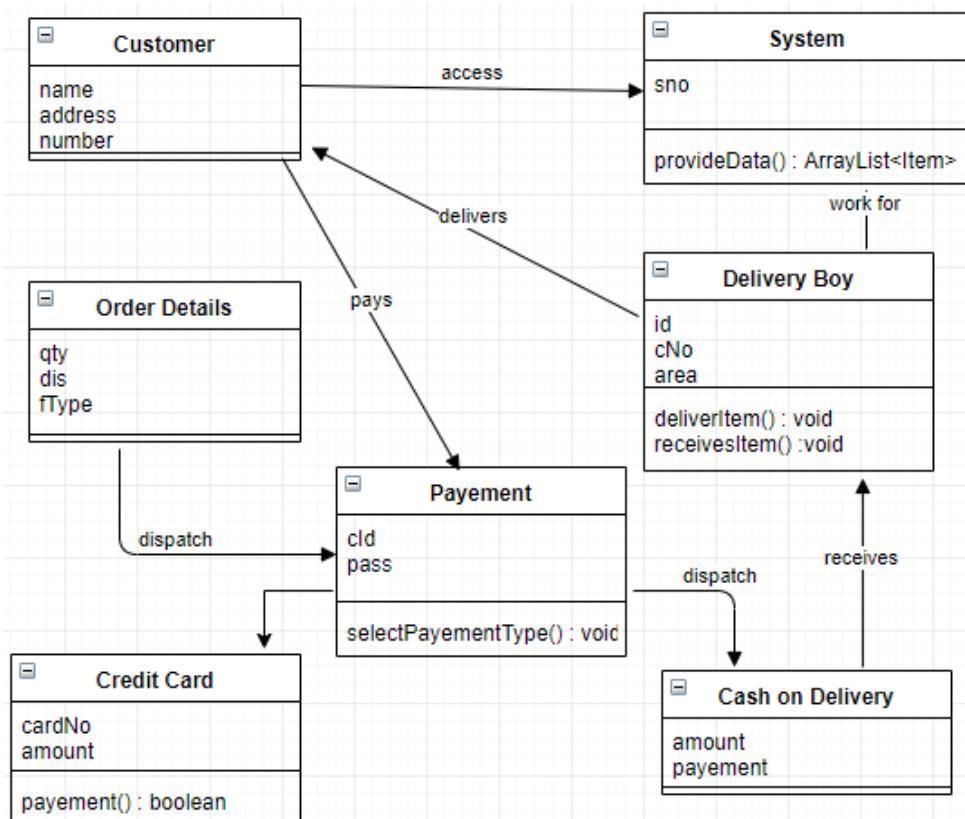


Figure 24: Class Diagram 4

3.3 Performance requirements

Initiate when a user clicks the any button the system will be provided the result within 2 – 3 seconds. Processing speed may change according to the Net connection speed of the mobile phone, processing speed of the mobile device and the Ram of the mobile device.

- Computer/tablet with at least 1.0GHz processing power with 1 core and 50MB of RAM. Approximate Internal memory space of 100MB is recommended for the application and cache.
- Internet access with more than 512kbps Internet bandwidth.
- Resolution 720x1280 pixels (Optional)

Following performance requirements will be handling by the system.

- Response time
- Scalability
- Accuracy of the system.

3.4 Design constraints

- Design has to be compatible with existing centralized Internet.
- Speed of detecting spam, fake and original comments and other data should be less than 2S.
- Use data sets to detect related category of comment.
- Load time of the results should be less than 4 seconds.
- All data should be stored in a well-organized way
- New reviews for products should be analyzed once every two weeks.
- Accuracy of domain-based polarity should be greater than 80%.

3.5 Software system attributes

3.5.1 Reliability

Reliability is the quality of being trustworthy or of performing consistently well of the application. Basically, that is how much a user can depend on the application. The propose application is developing to provide a reliable and efficient service to the users. All the latest configurations and technology is used to provide the service accurate and, in less time.

3.5.2 Availability

Actually, any user who wishes to try the application will be satisfied without any failure. The propose web application work on any operating system.

3.5.3 Security

The customers can get all the details about the products without any configurations. All they have to do is visit the application by agreeing to the policies. There will be authentication and authorization techniques use by the application to prevent unauthorized access. Authentication will be done using Login Password and there will be access privilege application for the authenticated users.

3.5.4 Maintainability

Maintainability is defined as the probability of performing a successful repair action within a given time. In other words, maintainability measures the ease and speed with which a system can be restored to operational status after a failure occurs. Application code will be well commented and documented for any further development.

3.6 Other requirements

3.6.1 Modifiability

This component should be modified or update without affecting other components of the system.

3.6.2 Accessibility

User interfaces of our market Place is user-friendly and easily accessible by any user of the system.

5 References

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