Guya E-commerce & Guya Express

A Project Report

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Under the guidance of
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Signature

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APPROVAL OF ADVISER AND EXAMINERS

This project has been submited for examination with our approval as the project advisor.

Adviser Name _____ Signature _____

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DECLARATION

We do hereby declare that this report entitled ***"E-commerce and Express"***, submitted in partial fulfillment of the requirement for the award of degree of Bachelor of Science in Software Engineering & Engineering at School of Computing, Debere Makos University, Ethiopia is our own and has not been submitted to any other institute.

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ABSTRACT

In today's fast growing of internet users and fast-changing business environment in Ethiopia, it's extremely important to be able to respond to client needs in the most effective and timely manner.Online Shopping is a lifestyle e-commerce web application, which retails various fashion and lifestyle products.The primary goal of an e-commerce site is to sell goods online. This project with developing an e-commerce website and mobile application for Online Product Sale. It provides the user with a catalog of different product available for purchase in the store, viewing various products available enables registered users to purchase desired products process payment by using Cash on Delivery(Pay Later) or Mobile Banking. In order to facilitate online purchase a shopping cart is provided to the user and delivery which is fulfilled by the express system.

Nowadays, many different kinds of delivery companies in Ethiopia transport their own kinds of parcels and offer their own services, which have caused a lot waste of resource. In addition , the volume of parcels in all cities that need to be delivered has been grown dramatically. To cope with these problems, Guya-Express System in the country which can offer service to all kinds of customers in the city including manufactures, department stores, restaurants, individual people and so forth will be designed. This system use combining computer network technology, wireless communication and cloud computing. With this system. the whole package delivery process including classification of packages, vehicle scheduling, path planning, transportation monitoring can be intellectualized as well as managed automatically, and the use of both material resources and manpower resources can be reduced accordingly.

This document will discuss each of the underlying technologies to create and implement and e-commerce and express under the name Guya E-commerce and Guya Express respectively and for architectural implementation we will be using Microservices Architecture.

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Acronyms and Abbreviations

3NF	Third Normal Form
API	Application Programming Interface
ASCII	American Standard Code for Information
ATM	Automated Teller Machines
B2C	Business-to-Consumer
B2B	Business-to-Business
C2C	Consumer-to-Consumer
C.O.D	Cash On Delivery
CSS	Cascading Style Sheets
CDN	Content Management Network
DOM	Document Object Model
FAQ	Frequently Asked Questions
GOE	Government of Ethiopia
HTTP	Hypertext Transfer Protocol Secure
IDE	Integrated Development Environment
JSON	JavaScript Object Notation
JWT	JSON Web Token
PHP	Hypertext Preprocessor

SEO	Search Engine Optimization
SDK	Software Developer Kit
SMTP	Simple Mail Transfer Protocol
SSL	Secure Sockets Layer
URL	Uniform Resource Locator
WWW	World Wide Web
XHTML	Extensible Hypertext Markup Language
XML	Extensible Markup Language

Chapter 1

Introduction

Introduction to E-commerce E-commerce (electronic commerce) is the activity of electronically buying or selling of products on online services or over the Internet. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. E-commerce is in turn driven by the technological advances of the semiconductor industry, and is the largest sector of the electronics industry. Modern electronic commerce typically uses the WWW for at least one part of the transaction's life cycle although it may also use other technologies such as e-mail. Typical e-commerce transactions include the purchase of online books (such as Amazon) and music purchases (music download in the form of digital distribution such as iTunes Store), and to a less extent, customized/personalized online liquor store inventory services.There are three areas of e-commerce: online retailing, electronic markets, and online auctions. E-commerce is supported by electronic business.[1]

E-commerce is fast gaining ground as an accepted and used business paradigm. More and more business houses are implementing web sites providing functionality for performing commercial transactions over the web. It is reasonable to say that the process of shopping on the web is becoming commonplace. E-commerce businesses may also employ some or all of the followings types.

Types of E-commerce The e-commerce industry has made a significant way of selling and buying products.The e-commerce industry can be broken down into two major segments.

[1]Wikipedia contributors, *E-commerce*.

- Online stores
- e-commerce platforms

Online Stores An online store is a virtual store on the internet where customers can browse the catalog and select products of interest. The selected items may be collected in a shopping cart. At checkout time, the items in the shopping cart will be presented as an order. At that time, more information will be needed to complete the transaction. Usually the customer will be asked to fill or select a billing address, a shipping address, a shipping option i.e this options are retrieved for the express companies, and payment information. An e-mail or text message is sent to the customer as soon as the order is placed. After the completion of this steps the delivery process is done by the express.

Are websites that sell products online and are one of the most visible segments of e-commerce. One feature of online stores is that they allow smaller companies to build a large audience with less investment than a typical brick-and-mortar store. Because of this, small startups have gained significant traction online even before they had a physical footprint. To better understand online stores we will break them down into different categories based on how they are set up after that we will list the type of online shopping we will be using. The following are the major types of online shopping.

Business-to-Consumer(B2C) The business-to-consumer model of e-commerce represents any business that sells products designed for ordinary consumers on its website. Some of the stores are Amazon[2], Walmart sells[3]. These are all designed for everyday consumers.

Business-to-Business(B2B) The business-to-business model of e-commerce represents businesses that sell products to other businesses online. Good examples of this are wholesalers, suppliers, and companies selling office products.

Consumer-to-Consumer(C2C) The consumer-to-consumer e-commerce model consists of online stores that serve as intermediaries between consumers. This frequently occurs in the form of auctions or online listings. One prime example of this is eBay, but others include Craigslist[4] or Facebook's Marketplace.

[2] `https://www.amazon.com`
[3] `https://www.walmart.com`
[4] `https://www.craiglist.org`

Other A few types of e-commerce stores do not fall under the previously mentioned categories. These tend to be smaller and can include online healthcare exchanges or e-commerce involving the government.

E-commerce Platforms The e-commerce platform space covers businesses that offer products and software that support online stores. These companies help store owners run and manage their online business. Companies in this space may sell pre-designed shop templates, assist with inventory management, track customer data, and integrate with social media. This space has many facts and is constantly changing with customer preferences. Shopify[5] is a well-known example of an e-commerce platform that caters to small- and medium-sized businesses. Magento[6] and WooCommerce[7] also fall under this category. At the enterprise level, Oracle, SAP, and Salesforce are among the growing number of companies that offer e-commerce platforms. Many of these larger companies have made acquisitions in recent years to improve their platforms.

Introduction to Express The package delivery industry, which consists of small package and express letter shipments,[8] has changed dramatically over the years. Radical changes have occurred in the goods transported, the geographic scale of the marketplace, customers needs, the range of service options that carriers offer, and the transportation and communications technology that carriers employ. The market today bears little resemblance to the market of 30 years ago (at about the time of the Postal Reorganization Act). It bears even less resemblance to the market of 100 years ago (at about the time Parcel Post service began). It is therefore illogical to consider the package market from 30 years ago, or 100 or more years ago, and draw meaningful public policy conclusions for today and for the future. For example, which carrier entered the market first is irrelevant for evaluating the potential role of the Postal Service, or any of the carriers, in the modern package delivery market.

Couriers or Express delivery are distinguished from an ordinary mail services by features such as speed, security, tracking, signature, specialization and individualization of express services, and swift delivery times, which are optional for most everyday mail services. As a premium service, couriers are usually more expensive than standard mail services, and their use is normally limited to packages where one or more

[5] `https://www.shopify`

[6] `https://www.magento.com`

[7] `https:://woocommerce.com`

[8] For ease of reading, references hereafter to the package delivery industry encompass both the small package and express letter services, unless the context clearly indicates otherwise.

of these features are considered important enough to warrant the cost. Courier services operate on all scales, from within specific towns or cities, to regional, national and global services. Large courier companies include DHL, Postaplus, DTDC, FedEx, EMS International, TNT, UPS, India Post and Aramex. These offer services worldwide, typically via a hub and spoke model.Couriers services utilizing Courier Software provide electronic Proof of Delivery and electronic Tracking details.[9]

The following provides a brief overview of the various phases of the evolution of the package delivery industry and the key players. The history of the industry reveals a story of innovation, adaptation, risk-taking and customer demand driving development, with the private sector at the forefront.

The Goal of Guya E-commerce is to develop a general purpose e-commerce store, the type of the business we follow is Business-to-Customer (B2C) and Customer-to-Customer (C2C), where product like clothes can be bought from the comfort of home through the Internet. However, for implementation purpose, this paper will deal with an online shopping for various products (i.e. No media streaming store).

The Goal of Guya Express sub-project is it's capability of delivering a wide range of parcel for small objects like papers and documents to large objects like furniture and household appliances. On top of that, this system is also able to meet the demand for different parcels like priority and strict storage condition. And by regarding the city as a whole, this system can perform the delivery more efficiently and save both material resources and manpower resource. At last, Due to the difficulty of testing it in reality, our project is only a preliminary design and view of the picture of future.

1.1 Background

Ethiopia is a developing country and Information Communication and technology are playing their important roles in the development of the country. By E-commerce and Express we mean buying, selling and delivery of any thing products or services over electronic systems such as the internet and other computer networks, with an active delivery system(which of course handled by the express).

The purpose of this document is to define the features of the E-commerce Website/Mobile Application. Here visitors can see the publicly available features such

[9]Wikipedia contributors, *Courier*.

as browse products, view details of products (Size, Color, Cost etc), and view other static contents of site. Registered User can view all publicly available features and in addition to this they can purchase the product by adding them into shopping cart. Website Administrator can mange all the contents and Orders from the Back-end (admin side).

Before attempting to evaluate any e-commerce solution it is necessary to exactly define what is understood as electronic commerce (section What is e-commerce 1.3.1). It is also important to take a look at history in order to comprehend what elements made e-commerce become what it is today (section History of e-commerce 1.3.2). With that knowledge in hand, we will get a glimpse of the future and decide whether the current e-ommerce solutions have a place in it (section Future of e-commerce 1.3.3).

1.1.1 What is E-commerce

As a general definition, commerce is the branch of business that includes all activities, which directly or indirectly are involved in exchanging goods or services. The trade can be held between businesses or individuals, eventually achieving the goal of transferring goods from producers to consumers. When information and communication technologies are applied to support these activities, we are referring to electronic commerce, also commonly known as e-commerce[10].

Currently there are four major types of e-commerce (berfily stated in the above section), classified based on the roles involved in the trade: business-to-business (B2B), business-to-consumer (B2C), consumer-to-business (C2B) and consumer-to-consumer (C2C). Other lesser types may involve roles such as government, employee or manager in order to define more specialized e-commerce business models. Though any of those types can be considered to be subtypes of the four major models[11].

Besides these four major forms of e-commerce, there are other interesting concepts that have gained popularity these last years: social and mobile commerce. Social commerce is the adoption of social networking features in the context of e-commerce. When it comes to offline shopping, it is a natural practice to gather information from oneselfs personal social networks before purchasing a product. People usually consult their family and friends for advice, and they often speak to the shopkeeper about suitable products. Joining social networks with online stores allows customers to have the same experience, with the advantage of reaching a largest range of people

[10]G. Akrani, *What is commerce? Meaning and importance of commerce.*
[11]Nemat, *Taking a look at different types of e-commerce.*

in a shorter time[12].

On the other hand m-commerce, an abbreviation for mobile commerce, is any kind of e-commerce activity that relies on the usage of wireless devices, such as cell phones, personal digital assistants (PDA) and smartphones. The range of devices enabled for m-commerce also includes general purpose wireless computers, like tablet and laptop computers[13], but are not usually part of research studies. The reason behind that is the existence of hybrid devices between mobile phones and computers, such as smartphones, that are more specifically designed for m-commerce.

1.1.2 History of E-commerce

E-commerce has been gaining more and more relevance in the business context since the moment it was introduced back in the mid-sixties, when the standard that became known as EDI was developed and started replacing traditional mailing and faxing documents. Later in 1979 the British inventor Michael Aldrich invented what he called teleshopping, an early version of online shopping[14].

The system consisted of a domestic television connected via telephone line to a real-time transaction processing system, with a shopping transaction program installed. It used a slightly modified television with capabilities to communicate via domestic telephone line thanks to a modem chip originally used in the Prestel system[15]. Aldrichs system was not properly using the Prestel system, but the Prestel data transmission protocol to communicate with computers via telephone line, and therefore to convert televisions into real-time terminals[16].

Redifon Computers[17], the company for which Michael Aldrich was working at that time, started selling this online shopping system (Figure 1.1) and installed the first operational application for Thomson Travel Group [18] in 1981. Aldrich initially designed his system for B2C online shopping: it worked from an inexpensive domestic television, with simple human interface and using domestic telephone line; despite of that, initial demand was B2B online shopping for holiday travel, vehicle and spare

[12]S. Guo and Leskovec, *The role of social networks in online shopping: information passing, price of trust, and customer choice*.

[13]P. Tarasewich and Warkentin, "Wireless/mobile e-commerce technologies, applications, and issues."

[14]Aldrich, "E-commerce, e-business and online shopping".

[15]System developed by the British public telephone system, whereby news and any text information were received by a television through a telephone line.

[16]Aldrich, "Online shopping in the 1980s".

[17]Company belonging to Rediffusion Group of Companies.

[18]Currently known as Thomson Holidays.

Figure 1.1: 1979 pre-production online shopping system by Redifon.

parts, sales, loan finance and credit ratings.

It was in 1984 when Aldrichs teleshopping system finally reached Jane Snowballs home, a seventy-two-year-old woman who became the first ever online home shopper when she ordered some groceries from the supermarket chain Tesco (Figure 1.2). The system she used was called GSS (Gateshead Shopping Service), and was part of a social service experiment project in the English city of Gateshead, aimed at elderly people who were not able to go shopping. Another larger project appeared two years later in another city of England, Bradford, for disadvantaged citizens. In both projects it was necessary to develop an early version of what we know today as a cart shopping system[19].

Figure 1.2: Mrs. Snowball ordering groceries from her home in 1984.

Elsewhere in Europe similar systems appeared which involved an interactive television using telephone line. Especially important was Minitel system invented in 1982

[19]M. Aldrich, *Finding Mrs. Snowball*.

by France Tlcom, that can be considered the most successful of all these early online services. But even in this case teleshopping was only successful in some B2B activities. B2C was not commercially viable due to the difficulty of common people to access the necessary technology. The only working systems were social experiments run by local governments in partnership with supermarkets to deliver groceries to senior and disabled citizens[20].

E-commerce needed a way to reach a wider variety of people to work, especially outside business-to-business context. Tim Berners-Lee offered that possibility in 1990 when he joined hypertext technology with the Internet creating the World Wide Web [Ber00]. Despite of having the technology, commercial use of Internet was not allowed [21] when the web appeared. In 1991 this restriction was lifted, but only under the condition of paying a fee according to the usage of the network, which was destined to fund the networking infrastructure. These limitations were also resolved in 1995 when commercial use of the Internet became completely free[22].

Before that, in 1994 Netscape launched the first commercial browser, with the cryptographic protocol SSL along with it. With the web being accessed by an increasingly amount of people and with a protocol to ensure secure online sales, companies finally had the chance to build a profitable business for B2C in an expanding environment. The first web-shops started to appear, as well as e-commerce solutions built to allow merchants sell online. Only one year later Amazon.com and eBay were born, both considered to be amongst the largest online store corporations nowadays.

Of course all these changes were accompanied by a revolution in payment systems. A series of innovations have been introduced to our daily life during the last thirty years, being the most significant to e-commerce: debit and prepaid cards, online banking and mobile payments via cell phone. All of them contributed to increase the number of payment service providers offered, thus facilitating online payments. Nowadays one of the most important e-commerce payment systems is PayPal, in charge of processing payments between the merchant and the acquirer bank, therefore allowing to send and receive payments securely over the Internet[23].

[20] Barlow and Breeze, *Teleshopping for older and disabled people: an evaluation of two pilot trials*.

[21] In 1990 most of Internet backbone networks belonged to the National Science Foundation Network. This network was destined to research and educational purposes and had an Acceptable Use Policy that prohibited purely commercial traffic from using it.

[22] *Office of Inspector of National Science Foundation. Review of NSFNET*.

[23] S. Koulayev and Stavins, *Explaining adoption and use of payment instruments by U.S. consumers*.

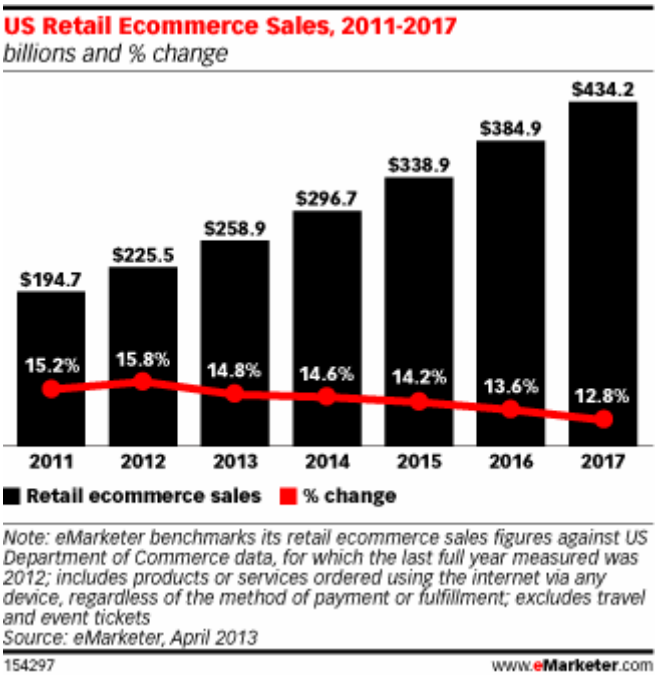

Figure 1.3: U.S. retail e-commerce sales from 2011 to 2017.

1.1.3 Future of E-commerce

us-ecommerce-retail Despite of being only forty years old, e-commerce has become a very important area in the business environment. Looking back we see the way every technology has changed the e-commerce scenario and given more importance to it. From new protocols to innovative devices, including payment systems and social trends; all has been quickly adopted by companies in order to gain competitive advantage. The introduction rate of new elements in the e-commerce context seems to have grown exponentially over the last few years, as well as the worldwide population involved.

In North America the percentage of digital buyers is currently of 72% of each Internet user and is expected to grow up to 77.7% by 2017. A similar growth is expected in Western Europe, with a great difference between northern and southern countries: U.K. and Germany account 87% and 80% of e-commerce customers in 2013, respectively, and is expected to grow around 3%.On the other hand, in Spain the percentage is 54% and in Italy 44%, with a predicted growth of 10%. The highest penetration rate of Internet users in e-commerce will happen in China, where the amount of digital buyers is going to increase 20%[24].

In number of sales, all major studies foresee a continuous growth in U.S. e-tailing income in the next few years at a compound annual rate that goes from 10% to 14%,

[24] *B2C ecommerce climbs worldwide, as emerging markets drives sales higher*.

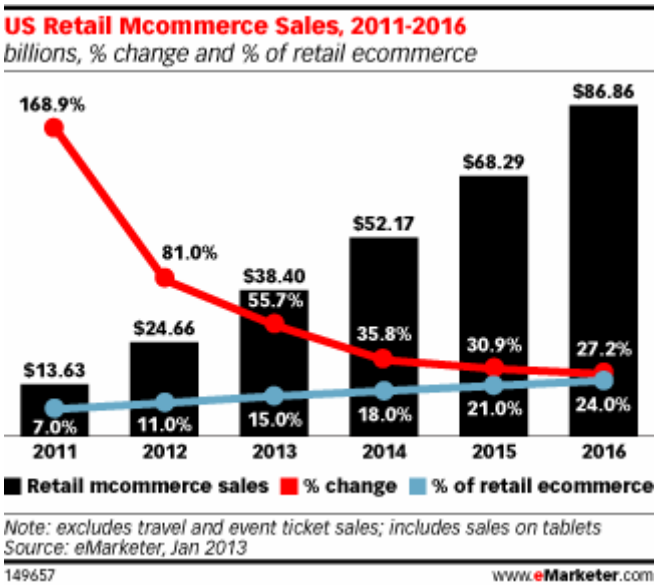

Figure 1.4: U.S. retail m-commerce sales from 2011 to 2016.

reaching between $370 and $434.2 billion from e-tailing sales in 2017 (Figure 1.3)[25]. When it comes to Western Europe obtained results are similar with a growth rate of 11%, reaching even 18% in southern European countries where the e-commerce market is not yet as mature as in North America [OG13]. Same reason applies to Asia and Latin America with the highest growth rates in the world, around 25% growth per year. Particularly high are the growthing rates in China and Indonesia, where a 65% and 71% is expected in 2013, respectively[26].

It is also a fact that mobile devices are being quickly adopted by both merchants and customers, due to all possibilities that they offer in the expanding e-commerce scenario. Some studies show how retail sales made on smartphones will grow from $8 billion in 2012 to $31 billion by 2017, becoming a 9% of e-commerce total sales[27]. When tablet computers are also included in the research, m-commerce sales grow from $24.66 to $86.86 billions in 2016, having 24% of retail e-commerce (see Figure 1.4)[28].

A look at the future of e-commerce reveals a continuous growth in sales and customers, as well as the fast adoption of new technologies such as mobile devices. Therefore it can be expected that new devices and different ways of commerce activities will appear in the near future. It will be therefore necessary for merchants to integrate all their existing e-commerce infrastructure in every context in order to

[25] *Retail ecommerce set to keep a strong pace through 2017.*
[26] *B2C ecommerce climbs worldwide, as emerging markets drives sales higher.*
[27] S. Mulpuru and Johnson, "US mobile retail forecast, 2012 to 2017".
[28] *Record retail sales on smartphones, tablets take greater ecommerce.*

gain advantage from the expected growth.

1.1.4 Current Alternatives

Are the current e-commerce solutions ready for bringing quick and affordable integration to future scenarios? Almost all shopping cart solutions offered for online shopping are designer-oriented built web-shops, with multiple plug-in components, customizable options and exchangeable templates. The merchant requires the e-commerce solution to offer a certain feature set in order to use it, otherwise the cost of implementing it may not be worthwhile or simply impossible.

With the raising of cloud computing, many licensed products have move to a more flexible software-as-a-service (SaaS) model, allowing merchants to easily scale their web-shops as their businesses grow. Despite of that, merchants are still very limited to what the software is offering, and depend on the product to evolve in order to expand their e-commerce infrastructure to different environments. Of course, they can also use an independent product to support the missing scenario, but with the high cost of having to maintain two or more different backend data, having to connect them all together.

A very interesting example of these models is Magento, a PHP open-source project that was initially launched in 2008 and nowadays enjoys great popularity. The first version offers a typical out-of-the-box web-shop, highly customizable and with a wide variety of plug-in and templates. The experience of building a web-shop with it was very comfortable, since all the changes were done directly with an administration interface, not requiring any technical knowledge.

Everything was comfortable until the moment the template was not offering a functionality or simply not the way it was needed (e.g. displaying the breadcrumb in a different way or place). In that moment finding the files where the logic that needed to be changed was located became a very hard task and changes were not easy to make either. This experience reflects exactly how developer-unfriendly these kind of models usually are.

Magento also offers a SaaS version of this product, called Magento Go. The experience is even worse, since any kind of customization is limited to what they offer in the administration page, impossibiliting any modification on the code. In 2010 Magento announced the release of the second version, Magento 2.0. This version promised to be more developer friendly, but so far the product has not been released.

1.1.5 What is Express

1.1.6 Early Package Movements

Mid-1800ś to Turn of the Century

Wells Fargo was founded in 1852. While not the only private express company at the time, Wells Fargo provided a central and colorful role in the early package delivery industry. They created a formidable enterprise for mail and package delivery and banking, especially in the West.[29] In addition to its banking and mail carriage role, it exemplified the early private package industry. One of the founders, Henry Wells, had been a partner in a mail and package delivery business[30] in the East (and even at one time considered acquiring the Post Office[31]).

At the time of its founding, the package and banking businesses were unregulated. Mail delivery, however, had been subject to the statutory monopoly of the Postal Service since 1792 and the enactment of the first Private Express Statutes.[32]

[29]In the West, "a private express service was safer, surer, and speedier than the federal postal service. 'No one in California mails an inland letter but sends by Express... The miners give their address & power of attorney to the Express agent who takes their letters out of the post office in San F. twice a month and delivers them to every town & camp in the placers...'" said Louis McLane, quoted in The American Mail: Enlarger of the Common Life, Chicago: University of Chicago Press, 1972, referenced at page 2 of Stagecoach, Wells Fargo and the American West, Philip L. Fradkin, Free Press, New York, 2002

[30]Wells defined his earlier company as being in "the business of carrying parcels and packages as fast as possible, with special care to their safety in transportation and their sure delivery." Id at page 4.

[31]"Supposedly a monopoly established by law, the Post Office charged high prices for poor service in 1840. It cost eighteen cents to send a letter from New York City to Troy, New York, but only twelve cents to ship a barrel of flour over the same route. (For longer distances, the letter rate was twenty-five cents.) As a result, private express services who employed messengers proliferated. They carried the mails at up to one-fifth the cost of the government service. The Post Office arrested messengers and brought suit against some of the express services. The harassment didnt bother the private concerns. Henry Wells, a partner in an upstate New York express company, proposed that his firm take over the entire postal business of the government and charge five cents for a letter. Zounds, sir, reportedly replied an assistant postmaster general to Wellss proposal, 'it would throw 16,000 postmasters out of office! The appointment of postmasters was a major source of political patronage. Congress did not wish to do away with this 'engine of patronage.' So the solution would have to be an adjustment to the marketplace realities and tightening the monopoly. The 1845 Postal Act reduced the cost of postage and made the government monopoly on letter mail virtually airtight. The law, however, was honored more in the breach than observed in the West, where expediency and selective enforcement were the informal laws of the land... Wells Fargo and other express companies became, in effect, opposition post offices." Id at page 3.

[32]"Despite the constant reiteration in the communications of the Postmasters General of the need to prevent private carryings of the mail, it was not until the Postal Act of 1827 that attempts to compete with the federal government in carrying the mail were made criminal." Page 1.27 Towards Postal Excellence, the Report of the Presidents Commission on Postal Reorganization, June 1968 Annex III. But even that did not quell the market forces that responded to the demand for expeditious and reliable service.

Wells Fargo opened its 12 California offices in 1852 and, according to their promotional material, provided national service: A typical ad stated that Wells Fargo specialized in shipping gold dust, bullion, specie, packages, parcels, & freight of all kinds, to and from New-York, and San Francisco then to other locations throughout the West.[33] Included in their shipments were newspapers, which were carried for free so that other newspapers could reprint the stories, in that pre-wire service time.[34] This helped bind the nation together, and at the same time provided Wells Fargo with free promotion since they often were credited with delivering the news. Historian Carl I. Wheat wrote Wells, Fargo & Cos Express was at this period the most important agency for both express and mail service throughout California and particularly in the mining regions. By 1858, Wells, Fargo went everywhere, did almost anything for anybody, and was the nearest thing to a universal service company ever invented. Next to the whiskey counter and gambling table, Wells Fargos office was the first thing established in every new camp or diggins."[35] Wells Fargo was "the single most widespread institution in the early West, being even more omnipresent than the U.S. government."[36]

Mail and package transport technology was changing rapidly. Coast-to-coast commerce and travel had been provided predominantly by sea. From 1848 to 1858 (from when gold was discovered in California to when the Overland Mail Company inaugurated service[37]) most mail traveled across the continent by steamship with land carriage over the Isthmus of Panama. The travels of Henry Wells from New York to California in December 1852 by boat and then by mule over the Isthmus shows the difficult and perilous nature of that trip. By the time Wells reached San Francisco on February 5, 1853, fifteen fellow passengers had been buried along the way and a large number were ill when they disembarked."[38] 1858 marked a significant change to the sea routes with the Congressionally-sanctioned overland stage route that carried mail and parcels. "The first relay of stages, drivers, mules, and horses westward made the grueling, 2,700-mile journey in twenty-four days and nights in September and October of 1858. It carried the mail and one through passenger. This was the first true transcontinental mail and passenger service."[39]

Two years later the pony express was founded. As a service, it was heavy on romance and legend, but short-lived and uneconomic. However, it had to be offered if one

[33]Fradkin, "Wells Fargo and the American West".
[34]Ibid.
[35]"California Historical Society Quarterly".
[36]Fradkin,
[37]*Gold in Califorina.*
[38]Fradkin, "Wells Fargo and the American West".
[39]Ibid.

wanted the stage business. As a profit maker, the pony express was a loser; as a necessity in order to acquire the lucrative transcontinental mail and express business carried by stage coaches, it was a winner; as an indicator of how a new technology could replace an existing one and render the latter obsolete, it was a precursor to what would come later[the Pony Express] ran for nineteen months and carried light mail from near St. Louis to Placerville, California, at an eventual price of $1.00 for a half-ounce letter. At $23 in current dollars, it was not a service that was affordable for ordinary folks... First undertaken privately and then under government contract, the Pony Express lasted from April 3, 1860, to October 24, 1861.[40] The overland stage coach mode lasted slightly longer 11 years. The mail contract of $1,000,000 a year did not come close to covering the $2,425,000 annual expense of the line (1,913 miles, 153 stations, and 2,750 horses and mules). The shortfall was intended to be made up from express package business and passenger service (which cost between $225 to $500 for a one-way throughfare). One of the earliest passengers was Horace Greeley, editor of the New York Tribune and famous for Go West, young man, who apparently took the trip in order to promote the development of a transcontinental railroad,[41] which shortly became a reality.

On May 10, 1869, the Central and the Union Pacific Railroads were joined at Promontory Summit, Utah,[42] and it marked the transformation of U.S. goods movement. Wells Fargo continued for some time, adapting to the new mode of mail and package transport.[43][44]

In fact Wells Fargos ability to successfully adapt to the use of railroads became a threat to the Post Office that later caused Wells Fargo to withdraw from the express mail business. "...Wells Fargo continued to perform that function so essential to the smooth functioning of a democracy: delivering the bulk of the mail west of Salt Lake City and Albuquerque. The inevitable confrontation between Wells Fargo and the U.S. Post Office Department in 1880 was a classic example of a private business competing directly and successfully with a government agency... During the Gold Rush era and shortly afterward, Wells Fargos private mail system was tolerated because the government recognized that it did not have the same broad reach or the same degree of efficiency."[45] A temporary compromise was reached whereby mail carried by Wells Fargo directly would pay double postage: the stamp price,

[40]Fradkin, "Wells Fargo and the American West".

[41]Ibid.

[42]*Gold in Califorina.*

[43]Wells Fargo began having its messengers use the railroad. In fact, it advertised that the railroad permitted the country to be crossed in only 4 days, compared to 32 days by stage.

[44]Fradkin, "Wells Fargo and the American West".

[45]Ibid.

plus the Wells Fargo charge, and customers were willing to accept the higher cost because of the quality of the service. In this way, the government got its due and the customer got quicker service."[46] This arrangement held for a while, but the company ultimately had to abandon the mail business towards the end of the 19th Century.[47] "In the old days... [Wells Fargo] not only competed successfully with the Government, but we beat the postal system at every turn of the road, but now the Federal authorities have adopted all of our plans, and they do the work as well as we do."[48] [49]

Early 20th Century: Railway Express Agency (REA), UPS, and Parcel Post

UPS Ground Service In 1907 two Seattle teenagers (Jim Casey & Claude Ryan) started the American Messenger Company, whose messengers ran errands, delivered packages, and carried notes, baggage, and trays of food from restaurants. They made most deliveries on foot and used bicycles for longer trips. Only a few automobiles were in existence at that time and department stores of the day still used horses and wagons for merchandise delivery. The company was soon delivering small parcels for local department stores and changed its name to Merchants Parcel Delivery. The company expanded outside Seattle in 1919 with the acquisition of Oakland based Motor Parcel Delivery and was renamed United Parcel Service in 1930. In the early 50ś UPS began the process of expanding its services by acquiring "common carrier" rights for the entire country.

Parcel Post Parcel Post service became available on January 1, 1913, and constituted an expansion of a more limited package service of the Post Office.[50] Prior to 1913, farmers had to convey their produce to the nearest town large enough to support a [private] express office, which added to the price of transporting their goods to

[46] Fradkin, "Wells Fargo and the American West".

[47] "On May 24, 1895, Wells Fargo quietly removed all its collection boxes in San Francisco and on the next day announced it was ending its letter service."

[48] Fradkin, "Wells Fargo and the American West".

[49] Note that the withdrawal was from letter mail; the company remained in the express package business and in banking.

[50] www.postalmuseum.si.edu For example, in 1907, merchandise under four pounds could be sent by the Post Office for sixteen cents per pound. Even then, however, the discrepancies in sub-categories of service were irreconcilable: domestic shipments from any city in the U.S. to New York City would cost sixty-four cents, but if it were destined to one of the thirty-three countries then served, and by chance went through New York City, the rate was twenty-five percent cheaper – forty eight cents. (Address by Postmaster-General Meyer to the New England PostmastersÁssociation, Boston, October 1907, as referenced by Charles W. Burrows, Further Thoughts on Parcels Post, Selected Articles on the Parcels Post, Second and Revised Edition, compiled by Edith M. Phelps and published by The H.W. Wilson Company, Minneapolis, 1913)

the city. But with the combination of Rural Free Delivery (RFD) and Parcel Post, package service was provided from their mailbox. As discussed below, there is debate regarding Congress intention about how broad this competitive offering would be.

Parcel Post service expanded rapidly and, due to its pricing and availability, was widely used, and even sometimes abused. The Smithsonian Institutions Postal Museum notes two particular amusing instances: one in which an entire bank was shipped, brick by brick, and another case where a child was transported by Parcel Post because her parents found the rates cheaper than passenger service.[51]

The legislation establishing the Parcel Post service appears to have been intended as a narrow response to a perceived gap in service: The Congressional Record reveals that the purposes of Congress in establishing parcel post were:

- To provide a transportation service for small parcels (not over 11 pounds or 72 inches in length and girth) extending beyond that supplied by express companies and other carriers.
- To give the farmer an opportunity to sell his products direct to consumers.
- To enable residents of rural districts and small communities to receive small quantities of merchandise by mail from merchants in what were then distant cities.

In establishing parcel post for those purposes, Congress also made clear its intentions that:

- Rates should produce revenue adequate to cover costs.
- Government should not unnecessarily compete with private transportation.
- Parcel post should supplement not supersede private carriers.[52]

That view was reinforced later by several Congressional Committees. On October 19, 1951, Senate Report No. 1039, 82nd Congress stated that "the benefits of low-cost service are illusory if part of the total cost of transportation is borne by general

[51] "By far the largest object ever moved through the Parcel Post System was a bank. Not all at once, of course, but practically brick by brick. When W. H. Coltharp, in charge of building the Bank of Vernal, Utah... The bricks which Coltharp wanted were produced by the Salt Lake Pressed Brick Company, located 427 miles from Vernal. Instead of paying four times the cost of the bricks for them to be shipped by wagon freight, Coltharp arranged for the bricks to be shipped in 50-pound packages, through the Parcel Post Service, a ton at a time. The Salt Lake City and Vernal postmasters as well as the Uintah Railroad, all responsible for hauling the bricks became frantic as tons of bricks piled up... .In the end, all 40 tons of bricks were delivered for Coltharp's bank."

[52] "The Economic Significance of the Express Package Industry".

taxpayers. If shippers do not pay the full cost of the transportation service they use, traffic generally is diverted from transportation media inherently better able to serve them. On a similar note, the House Committee on Post Office and Civil Service issued a report that [i]t is apparent that the problem of the Government agency competing with private business to the point that that private business, the Railway Express Agency, is being irreparably damaged cannot be met by rate increases alone however, it can be met by a return in part to the size and weight limits originally approved by Congress when parcel post was established to provide a small parcel delivery service to areas which are not serviced by other transportation facilities. "[53]

Railway Express Agency (REA) As World War I ended, "the reality of a declining business competing with the Post Office [for parcel shipments] and overseen by government regulators forced Wells Fargo and six other express companies to the bargaining table"[54] for the creation of the Railway Express Agency (REA).

For over 56 years, the REA moved the nation's packages and freight. Its green trucks and rail cars were a welcome sight to anyone expecting a package. It was the railroad equivalent of today's modern package delivery companies, such as UPS and FedEx. In 1929, the nation's railroads bought the express business. In return for a monopoly on the movement of traffic on passenger trains, the express company was obligated to accept any and all shipments destined anywhere in the U.S. In its peak of success, REA employed over 45,000 people in 23,000 offices and operated over 190,000 miles of railway lines. In addition, over 14,000 miles of shipping lines, 91,000 miles of air routings and 15,000 miles of trucking lines were traveled by REA shipments. Seventeen thousand trucks handled over 300,000 separate shipments daily, ranging from small packages to carload-sized lots. Despite REA's early successes, the railroads became less relevant to express delivery and REA did not change its business model to adapt. On February 21,1975, the Company filed for bankruptcy protection. REA stated several reasons for the bankruptcy petition, including losses created by years of railroad domination, a high rate of inflation, a recent decline in express shipments, and limited availability of credit.

[53]Fradkin, "Wells Fargo and the American West".
[54]Ibid.

Development of Modern Surface and Air Networks (Late 20th Century)

The establishment of the Interstate Highway System in 1956 to build a transcontinental network of superhighways, the enactment of airline deregulation in 1978, interstate trucking deregulation in 1980, and intrastate trucking deregulation in 1994 contributed to the significant shift to truck and air transport, especially during the latter part of this period, and marked the growth of the modern package delivery industry. The charts in attachment A show the rapid development of the industry, with more than a 36-fold increase between 1960 and 19981.[55] The development of modern surface and air networks in the U.S. is demonstrated by UPS and FedEx.

UPS Air Operations In 1929, UPS opened United Air Express, offering express package delivery via airplane to major West Coast cities, and as far inland as El Paso, Texas. Due to the 1929 stock market crash and a failing economy, the air service was discontinued after only eight months. In 1953, UPS resumed air service, offering two-day service to major cities on the East and West coasts. Packages flew in the cargo holds of regularly scheduled airlines. Called UPS Blue Label Air, the service grew until by 1978 the service was available in every state, including Alaska and Hawaii. In 1988 UPS received authorization from the FAA (Federal Aviation Administration) to operate its own aircraft, thus officially becoming an airline.[56]

Federal Express (FedEx) While the USPS was the first to deliver urgent letters, it has many current rivals because its monopoly power is not monolithic. The Postal Service is authorized to adopt suspensions to the Private Express Statutes for specific circumstances in which the public interest might be best served by a private carrier.1 It is under such authority that Federal Express, UPS, and other carriers conduct their express letter operations.

Federal Express was incorporated in June 1971, and officially began operations on April 17, 1973, with the launch of 14 small aircraft from Memphis International Airport. On that night, Federal Express delivered 186 packages to 25 U.S. cities - from Rochester, N.Y. to Miami, Fla. The company was named Federal Express because its founder, Fred Smith, was working on obtaining a contract with the Federal Reserve Bank and, although the proposal was denied, he believed the name was appropriate for express envelope and small package delivery. Profitable in the U.S.

[55] *The Parcel Service Industry in the U.S.: Its Size and Role in Commerce, Center for Human Resources.*

[56] *USPS Package Manuals.*

market by July 1975,[57][58] Federal Express grew rapidly in the international market when it acquired Tiger International, Inc. (also known as Flying Tigers) in February 1989. Two further acquisitions were of substantial significance: In 1995, Federal Express acquired Evergreen International Airlines, Inc.'s all-cargo route authority to serve China. The other was when the company acquired Caliber System, Inc., in January 1998 which gave FedEx ownership of RPS, a major ground package carrier (now designated as FedEx Ground).[59]

It was during this period that the industry saw the introduction of many new services and service enhancements. Package carriers began to offer multiple delivery options, including same day service, next day delivery, and a variety of deferred, time-specific delivery options. Delivery guarantees accompanied express movements. Private carriers then expanded these guarantees to more traditional "ground" movements in the late 1990ś.

As the scale of commerce progressed from local communities to national trade, then to global markets, the industry followed suit, with the heavy capital investments needed to expand. This period also produced intense competition as private carriers achieved 100% geographic coverage of the United States and to most points of commerce around the globe.

Significant investments in information technology enabled package carriers to provide to customers the ability to track a packages movement from origin to destination. Other advances included combining logistics, freight and financial services with traditional package delivery in order to offer customers full supply chain management solutions.

The development of the package industry has enabled others to innovate. Michael Dell (Dell Computers) and Jeff Bezos (Amazon.com) are but two of many innovators that have used just-in-time deliveries, coupled with the power of the e-commerce, to launch new business models. Those innovations helped contribute to the relative importance of the package delivery industry that carries, by some estimates, goods valued between 8.6% and 14.3% of the nations Gross Domestic Product.[60]

[57] *USPS Package Manuals.*
[58] *NALC Package Manuals.*
[59] *Fedex Express History.*
[60] *The Economic Significance of the Express Package Industry.*

1.2 Problem Statement

Most of our country people purchases and pickup items, documents, news paper and foods by going to store front, even-though there are some e-commerce site that partially provide online purchases. By doing some digging we found some major concerns about the site/mobile apps that provide this kind of services below well try to illustrate what we believed to be the factors affecting it.

One is that E-marketers not knowing the factors affecting online Ethiopian behavior, and the relationship between these factors and the type of online buyers, then they can further develop their marketing strategies to convert potential customers into active ones. we brief how we conduct the research and the methodology we will use more in the Tools and methodology section.

- Products listed in some of the already made e-commerce sites are not what they say or look like.
- Companies in Ethiopia that provide delivery service their calculation of cost of delivery is not fixed it is more of ranged by kilometers e.g 1-3 km 50 Birr 3-7 km 75 Birr and above 7 km 100 Birr this kind of cost analysis is not fair for customer with minim kilometers.
- Lack of website's Lowest Denomination Design :-The websites made doesnt consider old phones but instead trays to keep up with new phone, from the perspective of the rapid change(developing) of technology is a wonderful thing, but due to t majority of Ethiopian peoples use old phone/browser even those technologies are outdated.
- Live GPS Parcel Tracking :- No body knows where their parcel is and how much time it take to reach the destined place (No Live Tracking).
- No Return Policy/Service :- Once you bought you bought it, their is no returning it weather the parcel is damaged, it is not the item you expected, opened or have some cracking while delivering.
- No Customer Live Chat Support
- Drawback of the Inventory System
- Limited payment service :- Cash On Delivery (C.O.D)

1.3 Objective

1.3.1 General Objective

In this sub-project (i.e Guya E-commerce) is to reduce the labor-full way of shopping and delivery service to more enjoyable way, more rich experience of user interface, cut the time and cost of shopping and delivering method.

In this sub-project (Guya-Express), our aim is to design a uniform parcel delivery system in Ethiopia which can offer service to all kinds of customers in the city including manufactures, department stores, restaurants, individual people, and most importantly for Guya-E-commerce and so forth.

1.3.2 Specific Objective

Enhance customer service :- As the system is automated and online based customers will have less of problems and enjoy a hassle free shopping experience.

Advertising savings :- As the web platform provides greater reach it minimizes advertising and marketing cost.

Increase the level of customer service :- by avoiding under stocking of products so that the store never runs out of stock. Easy to determine products which are understock and restocking them.

Impose Data Security :- so that unauthorized individual cannot access sensitive data and cause mishaps which might disrupt the system.

Data loss is minimized :- as data is saved in database and periodic backup is done. So in case of any disaster data can instantly be restored.

Maximize customer reach : As the website is a global platform the potential customer base increases as more user access the website from anywhere around the world.

Localization :- Multiple language support, local Time and Date support (conversion).

GPS Tracking :- Live GPS tracking for Parcels.

Shop Comparison :- It's easy to do comparison shopping online and learn from product reviews written by other shoppers.

Variety of payment methods :- Payment can be initiated by Cash On Delivery (C.O.D), Mobile Wallet, or Bank Transaction.

After-sales Service :- E-shopping also provide after-sales service in which customer problem is solved.

Data security :- Data security is maintained to a relatively high level by implementing it at the Database level, so as to ensure that only authorized users have access to confidential client information.

Enhance customer service :- As the system is automated and online based customers will have less of problems and enjoy a hassle free shopping experience.

Advertising savings :- As the web platform provides greater reach it minimizes advertising and marketing cost.

Suspicious activity detection :- If a certain user/computer try to guess password and username more than the limited state, the computer's IP address will be captured for further analysis.

Banning items :- Banning items that may contain copyrighted item, sexual items, abnormal posts through either manual or Natural Language Processing.

Text Message Integration

Cookie based suggestion

Inventory Forecasting :- Automatic Warehouse product stocking identification

AI based recommendation engines

1.4 Scope

The scope of the project will be based on the features and functionalities of the website. The Project website and mobile application functionalities are listed below :-

- Advanced Search :- Search suggestion with multiple language, from specific category search.
- Search Engine Optimized :- is the process of increasing the quality and quantity of website traffic by increasing the visibility of website or web page to users of a web search engine.

- Product Filter :- Filtering products by price, brand, model, rate, review, most viewed, popular, deal of the day
- Control Panel for different actors
  - Website Administrator
  - Customer
  - Customer service etc...
- Inventory System :- is for tracking inventory levels, orders sales and deliveries.
- Shopping Cart :- Buying multiple items once
- Check out :- For selecting billing method, shipping address
- Email Service :- Account Verification, Password Reset, Notification, Receipt, News Subscription, Marketing Promotion)
- Phone Number Integrated Service :- Account Verification, Password Reset, Notification, Semi Receipt, Semi News Subscription, Order Placement Notification
- Delivery(Parcel) Tracking :- Seeing the location the parcel is now
- Frequently Asked Question (FAQ)
- How to use the site :- Suggest on how to use the site on first visit of the site
- Delivery between two parties :- document, gift, money from one to person to another.
- 3rd party Delivery for any E-commerce platforms (i.e. cross site API calls)
- Feedback services for customers :- Customer feedback is the process or specific instance of providing information to businesses about products, services and customer service.
- Different Payment methods

1.5 Limitation

- Lack of touch and feel of merchandise in online shopping. Lack of touch-feeltry creates concerns over the quality of the product on offer. Online shopping is not quite suitable for clothes as the customers cannot try them on.

- Lack of close examination in online shopping.
- Limitation of to use online payment. Ethiopia banks use debit card and automated teller machines (ATM) but have not begun to issue credit cards.
- Most Ethiopians do not have credit card, Mobile Wallet.
- Slow internet connections
- Expensive and unreliable internet connection.
- Limited Bank-to-Bank integration.
- Tax Calculation :- Since there is no rules on E-commerce that governs tax calculation we will make tax calculation by the same taxation rate as retail store.
- Cost of buying equipment, principally the hardware like barcode reader, GPS tracker

1.6 Assumptions and Dependencies

These factors are not design constraints on the software, but rather assumptions on which the requirements have been based. Any changes to these assumptions affect the requirements stated herein. If these assumptions are not true, these requirements cannot be considered valid. For this reason, the requirements are said to be dependent on these assumptions

The following assumptions have been made about the system.

The project focus on providing Shop and Deliver through the internet. So our assumption is the followings

- Internet facility
- Any retailer have a printer or have access to one for printing labels
- Any retailer have measuring equipment or have access to one for weighting and measuring parcels

1.7 Significance Of The Project

Since the proposed system is hosted in the internet it will allow customer from all over the world to access the system. The customers will face hassle free shopping as they do not need to be physically in the shop to buy a certain item. Since the payment is done online or cash on delivery it is more convenient for the consumers. The management and maintenance of the information in the system will be more efficient and effective as a result will be much more time effective. The proposed system will help system users to get desired information within a short period of time. Administrative authorities can efficiently get desired report about Clients, products, orders, payment and delivery.

1.8 Tools and Methodology

1.8.1 Data Collection Methodology

Our front-end design principle is lowest denomination design so we will be conducting data collection for our project through some of the methods listed below with pros and cons for the project.

In-person Interview

- Pros :In-depth and a high degree of confidence on the data
- Cons : Expensive, time

Mail Surveys We will be using main surveys for reducing cost of paper and printing, and for those that we can not reach physical.

- Pros : Can reach anyone and everyone no barrier
- Cons : Expensive, data collection errors, lag time

Phone Surveys Same as the Mail surveys we will be using main surveys for reducing cost of paper and printing, and for those that we can not reach physical.

- Pros :High degree of confidence on the data collected, reach almost anyone
- Cons : Expensive

Web/Online Surveys As to our knowledge the is not sufficient data.

- Pros : Cheap, can self-administer, very low probability of data errors
- Cons :Not all your customers might have an email address/be on the internet, customers may be wary of divulging information online

Questionnaire Surveys Is a research instrument that consists a set of questions or other types of prompts that aims to collect information form a respondent.

- Pros : Relatively fast, Responses are gathered in a standardized way, information can be collected form a large portion of a group
- Cons :Low response, Respondents may not be able to read the question or potentially not understand, answers may be incomplete or irrelevant

Observation Observation, as the name implies, is a way of collecting data through observing. Observation data collection method is classified as a participatory study, because the researcher has to immerse herself in the setting where her respondents are, while taking notes and/or recording.

- Pros : Very Cheap, flexibility, direct access to data
- Cons : Time consuming, impact of observer on primary data[61]

Questionnaire, Phone Surveys, Mail Surveys, In-person Interview are administered in order to inquire form general populace. In total 100 to 200 will be administered using some of the methods listed above based on the cost analysis made.

1.8.2 Programming Language And Database Tools

Front End: For designing the structure of the project following technologies are used:

HTML5 : Is a markup language. HTML5 is used to create electronic documents (called pages) that are displayed on the World Wide web (WWW). Each page contains a series of connections to other pages called hyperlinks.

[61] In a way that presence of observer may influence the behavior of sample group elements.

NODEJS : Node.js is cross-platform, javaScript runtime environment that executes JavaScript code outside of browser. It lets used of JavaScript to write command line tools and for Server-side scripting[62]

JAVA : Mainly for android application development.

XHTML : XHTML[63] is markup language used to create webpages.It issimilar to HTML but uses more strict XML-based syntax.

CSS3 : CSS3 provides the paint, templates, glitter, buttons, tassel, lights, and many other things that can be used to improve the presentation of a web page.

Sass :

JAVASCRIPT : Javascript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side script to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities.

ReactJs :

Back End: Back End technologies used in the website are:

PHP : PHP[64] is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML

PYTHON : Python is an interpreted, high-level, general-purpose programming language

Ruby :

R :

Database Management:

[62] running scripts server-side to produce dynamic web page content before the page is sent to the user's web browser

[63] Stands for Extensible Hypertext Markup Language

[64] recursive acronym for PHP: Hypertext Preprocessor

SQL : SQL[65] is a universal database query language. It is used to interact with databases. And we will be using abstraction instead of writing plan SQL Query, to interact with the database.

MySQL :

ANDROID SQLite : Android SQLite is the mostly preferred way to store data for android applications. SQLite is the apps backbone for the application.

POSTGRESS : Also known as PostgreSQL. Is a relational database managment system emphasizing extensibility and technical standards compliance. It is designed to handle a range of workloads, form single machines to data warehouses or Web services with many concurrent users.

MongoDB :

Redis :

Data Formatting Language:

JSON : JSON is an open standard file format or data interchange format that uses human-readable text to transmit data objects consisting of attribute-value pairs and array data types (or any other serializable[66] value). It is a very common data format, with a diverse range of applications such as serving as replacement for XML in AJAX systems.

XML : XML is a markup language that defines a set of rules for encoding documents in a format that is both human-readable[67] and machine-readable[68]. It is a textual data format with strong support via Unicode for different human languages, we will be using it for the representation of arbitrary data structures such as those used in web services.

YAML : YAML is a human-readable data-serialization language.

1.8.3 System Requirements

We are trying to adapt a more agile project development method, so we will be using a Microservices Architecture the programming language, database type, hardware

[65] Structured Query Language

[66] is the process of translating data structures or object state into a format that can be stored

[67] is representation of data or information that can be naturally read by humans, it is often encoded as ASCII or Unicode

[68] is data or metadata in a format that can be easily processed by a computer

requirement, software requirement will be decided as we go along build the project. The Final Hosting part is done on a cloud server or home hosting for the APIs, and the front-end will live on either Nginx or Apache server but the cost of hosting and other limitation on using Ngix Server forced us to use Apache Server, but as we go along developing the application if this limitation a chance of being resolved we will be using Nginx server, this is because Nginx specialize in fast retrieval of static files and non-blocking I/O operations. So for our projects front-end Nginx is more preferable that Apache Server. But we will try to list the general system requirements.

Hardware Requirements

- A computer for development :- for speed of development and testing recomanded computer with higher specs that are above 4 GB RAM, 1.3 GHZ CPU, 256 GB Hard disk.
- Mobile with android 6.0 version :- Or if mobile application is not affordable or not found with and android os 6.0, we can use an emulator but this will force us to use more specs for computer from the above one.
- A wireless router :- For simulating a real hosted application

Software Requirements

Pencil: Is a free and open source GUI prototyping tool that is used to create mock-ups

Texmarker: Is a cross-platform open-source LaTeX editor with an integrated PDF viewer the system integrates many tools needed to develop documents with LaTeX

Barcode studio: Is a GUI for generating high-quality barcode images, used for the creation of standardized barcodes we use it to demonstrate a sample printable label.

Swagger: It aides in development across the entire API lifecycle, from design class diagram to documentation

Docker: Is a set of platform as a service products that use Os-level virtualization to deliver software in packages.

Docker-compose:

Git: Is a distributed version-control system for tracking changes in source code during software development

NGINX: Is open source software for web serving, reverse proxying, caching, load balancing

Android Studio: Is the official integrated development environment for Google's Android operating system, designed for Android development

Draw.io: Is free diagram drawing software form making use case diagram, activity diagram, sequence diagram

1.8.4 System Development Tools

The three main system development tools are :-

1. Modeling
2. Prototyping
3. CASE (Computer Aided System Engineering)

Modeling

E-R Diagram The E-R Diagram constitutes a technique for representing the logical structure of a database in a pictorial manner. This analysis is then used to organize data as a relation, normalizing relation and finally obtaining a relation database.

Entities: Which specify distinct real-world item in an application.

Properties/Attributes: Which specify properties of an entity and relationships.

Relationships: Which connect entities and represent meaningful dependencies between them.

1.9 Feasibility

1.9.1 Technical Feasibility

Since the application is Client-Server based our feasibility study focuses on the server side because we flow lowest denomination design for client's side(user interface) with works with minimal requirements it is that relevant. For server there are many local hosting company that provide reliable server, many programming including python, nodejs, some free Secure Sockets Layer(SSL) with an affordable price. Below are some hosting companies with their price comparision.

Name	Website Language	Platform	Price Range
Yegara	en-us	Linux	ETB 580 - 1,480 /Year
Hahu Cloud	en-us	Linux	ETB 600 - 1,000 /Year
Techno bros	en-us	Linux	$72 -192 /Year
Webaddis	en-us		
Ethio Webhost	en-us		
Cloud Ethiopia	en-us		ETB 779 /Year
Ahaduweb	en-us	Linux	$ 50 - 160 /Year
Ethiopia web hosting	en-us	Linux	ETB 1,500 /Year
Real Web Hosting	en-us		ETB 50 - 133.33 /Month
Hosthabesha	en-gb	Linux/Windows	$85 -170 /Year

Table 1.1: Hosting companies in Ethiopia

1.9.2 Operational Feasibility

The present system is easily understandable. The users are presented with friendly user interface that help them to understand the flow of the system more easily. Maximum transparency has been provided. The new system is very much user friendly and operational cost is bearable. The maintenance and working of the new system needs less human efforts. The proposed project is beneficial to the organizational and is user friendly.

The system will have easy to understand interface for different modules. It does not require and programming skill to the system. After a little training, the users/Employees will be able to work with it at ease.

1.9.3 Economic Feasibility

The only economical feasibility's are the coast of external materials like paper printing and hosting, as tabulated the annually cost of different hosting companies it is more than affordable.The customers economical feasibility is not our concern since it is decided by Internet provider(ISP) i.e ethio-telecome.

1.9.4 Legal Feasibility

Electronic commerce is in its infancy in Ethiopia and is rarely used. The Government of Ethiopia (GOE) is preparing a draft national law to govern e-Commerce.

Chapter 2

System Analysis

System analysis is the performance management and documentation activities related to the life cycle phases of any software namely:

- The Study Phase
- The Design Phase
- The Development Phase
- The implementation Phase
- The Testing Phase

In this stage, we gather information form the different sources for project development, we study about the existing system and its users, identifying system requirements, identifying actors, use cases and describing and illustrating them using use case diagram, identifying business rules and describing sequence of message exchange, and sequence of activities,The methods of collecting information are :

- Interviewing
- Observations
- Viewing of documents and manuals from different sites

2.1 Overview Of the Existing System

The existing system of buying goods has several disadvantages. It requires lots of time to travel to the particular shop to buy the goods. It is having lots of manual

work. Since everyone is leading busy life now a days, time means a lot to everyone. Also there are expenses for traveling from house to shop. It is less user-friendly. In current system user must go to shop and order products. It is difficult to identify the required product. More over the shop from where we would like to buy some thing may not be open all day and time. Hence we have to adjust our time with the shopkeeper's time or vendor's time. In current e-commerce system user have to go shop to view the description of the product. It is unable to generate different kinds of report.

The existing systems of e-commerce in Ethiopia sites lack many mandatory service that are expected from an e-commerce company plus there are very few companies that are organized(dedicated) only for e-commerce. For express we haven't seen express companies have online integrated delivery, ordering and live tracking mobile application.

Lets take one local companies' that relates to our project's title deliveryaddis[1] how it works is you place your order through their website or mobile app any food you like and on the place order page you are asked to enter your location through either GPS or street name as-far it a good service but there are a couple of problems we found some of them listed below :-

- Cost of delivery :- their coasting system is fixed with kilometers e.g 1-3 km 50 Birr ...
- Not realistic picture for the food
- No Live GPS tracking

The existing system of express companies (Delivery services) in Ethiopia is a manual one in which users are maintaing ledgers, books etc.. until recently to store the information like goods booking details, loading particulars, deliveries particulars, details of receivers of items at all branches, and customers details as well as employee details. It is very difficult to maintain historical data. Also regular investments need to purchase stationary every year.

General problems of existing systems found in Ethiopia are below.

- Data may be lost or damage
- Any unauthorized person can access confidential data

[1]Is and online food ordering and delivery companies, https://www.deliveryaddis.com/

- Any information cannot be easily searched
- Very little attention is given to forum
- Products listed in some of the already made e-commerce sites are not what they say
- Companies that provide delivery service cost of delivery is not fixed it more of ranged by kilometers e.g 1-3 km 50 Birr 3-7 km 75 Birr and above 7km 100 Birr this kind of cost analysis is not fair for customer with minim kilometers
- Lack of websites' Lowest Denomination Design :-The websites made doesn't consider old phones but instead trays to keep up with new phone, from the perspective of the rapid change(developing) of technology is wonderful thing, but majority of Ethiopian peoples use old phone/browser even those technologies are outdated.
- Live GPS Parcel Tracking :- No body knows where their parcel is and how much time it take to reach the destined place (No Live Tracking).
- No Return Policy/Service :- Once you bought you bought it, their is no returning it weather the parcel is damaged or the item you expected, opened or have some cracking while delivering.
- No Customer Live Chat Support
- Drawback of the Inventory System
- Limited payment service :- cash on delivery
- It is difficult to maintain important delivery booking information in ledger
- More manual hour need to generate required reports form previous delivery history
- It is tedious to manage historical data which needs much space to keep all previous year's ledgers, books etc
- Daily transactions are to be entering into different books immediately to avoid conflicts which are very difficult
- No co-ordination between different branches because we are not storing the data at centralized location

2.1.1 How existing system work

Description of the event-flow present system is pointed out below:

1. Client go to the nearest courier branch office and collect information about the destination branch office.
2. The client calculate the cost for sending courier.
3. Now client fill the form. The Details include in the form are
    - Full name of sender
    - Sender Mobile no
    - sender full address/Return address
    - Mention the destination branch office
    - Mention this courier for home delivery or not.
    - Full name of Receiver
    - Receiver mobile no
    - Receiver full address
4. Now Customer will hand over his or her good to the branch.
5. If everything is okay way bill is printed out. it contains all the information to identify the delivery.
6. Then the data for a particular courier maintained in proper file.

2.1.2 Users Of The Existing System

- Manufacturer
- Vendor
- Buyer
- Truck driver
- Mail sorters

2.2 Overview Of The Developed System

According to capitalethiopia[2] website Ethiopia shows that annual growth for Internet users is at 37 percent and the number of active social media users is growing by 20 percent this growing use of Internet in Ethiopia provides a developing prospect for online shopping.

As we are well aware, most of our country people purchases products, exchange documents, buy foods, news papers by by going to store front, and it very tedious, tiring and takes lots of time finding the right product with an affordable(best) price range. In order to reduce this boring factors and make shopping, document exchange, food ordering, news paper ordering... fun, time saving and within our price range we introduce.

Guya E-commerce and Guya Express is an awesome application that empowers retailers large and small with their easy-to-use, easy-to-manage, customizable online store, secure checkout and live GPS tracking of their parcel. Guya E-commerce give you control over your look and feel and allows any-one/any-seller to add products, manage your inventory, track sales, and more. As we go along building the project/application we'll focus on maximizing features to help improve customer experience. we'll include powerful search, product suggestion based on their product browsing history and categorization so customers can easily and quickly find what they're looking for. we use best practices so that product pages convert users to add more items to their shopping cart. And then most importantly, we guide people down the conversion funnel to complete the checkout process

Guya Express is vehicle based courier service in Ethiopia that specialize in safe delivery of any kind of parcels and their safe delivery in good condition and Guya E-commerce as the name suggests it is an online store for selling and buying products over the internet. Guya Express tracking system is web and mobile based system that helps customers to track the progress of their consignments online. It allows customers to visit the Guya Express's site or mobile application and enter their consignment number. The status of their consignment is displayed to the customer. The customer also have the provision to receive their consignment status by e-mail or SMS. The web-based online tracking system also allows branches to share information regarding the status of consignments among themselves. To summarize, the online courier tracking system offers the following advantages:

- It offers real-time Parcel statuses to its customers

[2]See https://www.capitalethiopia.com

- It decreases wrongly routed consignment
- Information sharing between branches which allows the client to improve their operation

The design an layout of the application will be Search Engine Optimization(SEO) friendly constructed using css XHTML, DHTML alogn with use of AJAX and non-blocking I/O this is because of makeing the user wait for all thing be made in server an sending it all together why not load the web page static files like logos, buttons... send the database query when it is done this way we'll rich user interface experience i.e asynchronous static file retrieval and keeping in mind the latest web trends.

There basically two way of selling on Guya E-commerce Guy Vendor Central and Guya Seller Central

Guya Vendor Central Vendor Central is an invite-only program. Guya Vendor Central grants Guya ownership of your inventory, which will market and sell to shoppers on the website.

How It Works : Merchants or manufactures sell their inventory (e.g hats) on Guya at wholesale rates. Once those items have been sent to Guya, the seller is done with the products. Guya pays for the inventory directly to the seller and maintains ownership of the products. Guya sells those products on the Marketplace (as Guya) i.e choosing their own price and shipping options.

Benefits of using Guya Vendor Central Selling to Guya is an available option for manufactures and virtually eliminates direct seller work including marketing, advertising, and even pricing.

Other benefits of Selling to Guya include:

- Avoid the hassle of handling pricing, shipping and other logistics for product sales
- Bulk purchases
- Display and detail page functionality only available to Guya (e.g subscribe and save)
- Manufacturer Central inventory projection tools not available in Seller Central

Guya Seller Central Unlike Guya Vendor Central, sellers on Guya Seller Central maintain ownership of their inventory and sell under their own brand name.

How It Works: Sellers list their products on the Guya Marketplace, and sell items as 3rd party sellers.

Selling through Guya Seller Central is generally more work than selling through Guya Vendor Central, but it also comes with greater levels of control and the potential for higher margins. Sellers on the Marketplace control shipping, price and optionally fulfillment. Sellers who sell on the Guya Marketplace have different fulfillment options to choose from. Sellers can choose whether they want to handle fulfillment or let Guya sort, package and ship products through their own fulfillment centers.

As a third party seller selling on the Guya Marketplace you have the option to use Guya's fulfillment services:

- Fulfilment by Guya (FBG) - Sellers leverage Guya's fulfilment for products sold on the Guya Marketplace
- Sell Using your own fulfillment (FBV) - Sellers handle fulfillment for their products sold on the Guya Marketplace

Benfits of using Guya Marketplace

- Increase Exposure - Leverage millions of unique monthly visitors to get more people to your online store.
- Leverage Marketplace Benefits - Guya's Marketplace is a hopping destination that is known for reliability, ease of online shopping and selection. Listing on the Marketplace allows sellers to capitalize on that branding
- Find New Customers - The Guya Marketplace is huge. Sellers gain exposure to new and varied shoppers through the Marketplace - man of which would never encounter your online store otherwise.
- Increase Sales - Shoppers on Guya have come to the Marketplace with the explicit intent to purchase, or at the very least are looking to browse. Online search, advertising and other forms of online exposure do not guarantee that same bottom of the funnel-audience. Bottom Line - people on Guya are more likely to buy.

Here is an overview of the features for each way we can sell on Guya:

Name	Sell to Guya	Sell on Guya (FBG)	Sell on Guya (FBV)
Product Placement	Guya Marketplace	Guya Marketplace	Guya Marketplace
Product Seller	Guya	Seller	Seller
Product Price Controlled by	Guya	Seller	Seller
Product Shipping handled by	Guya	Guya	Seller
Product Returns Handled by	Guya	Guya	Seller

Table 2.1: Overview of selling on Guya E-commerce

Advantages of Proposed System: The following are the advantages of proposed systems

Convenience : This is one of the main reasons that online shopping has become so popular, as it allows you to switch stores and products by clicking a button rather than traveling to a new store.

Selection : Of course, a large selection means that your decision making process may be a bit more difficult, but is also makes it more likely that you will find a high quality product that truly pleases you.

Immediacy : When you purchase a new product, whether for yourself or for another person, it is always nice to have that product in your possession immediately.

Quality : Needless to say, the quality of a product is also very important. And, while most online shopping offers you the ability to return faculty or imperfect product.

Saving Money : Another very important aspect of any shopping experience is trying to save as much money as possible. One reason that people enjoy online shopping is that you can often find a product more cheaply online that you can in stores.

Discounts and offers : Yes online shopping is better than offline because we can shop at any of our favorite shop and can get the delivery on same day itself.

Less time consuming : Work carried out by the staff at various stages will be less time consuming.

Safety : The system will be accessible by only the authorized users. As information, being the most crucial for the organization, then the safety of information is important.

Routing Information : A Sender can see the all routing information and estimated date of delivery.

Be update : Client get all update via Email or SMS about courier e.., whether packet is delivered, pending or returned the courier.

Online chat room : User can chat with company through online chat room.

Online tracking system : A customer can track the parcel and identify the location.

2.3 Overview Of The Microservices

2.3.1 User Service

2.3.2 Order Service

2.3.3 Catalog Service

2.3.4 Inventory Service

2.3.5 Gatekeeper Service

2.3.6 Payment Service

2.3.7 Pricing Service

2.3.8 Logging Service

2.3.9 Xpress Service

2.3.10 Storybook Repository

2.3.11 Bits Repository

2.3.12 Guya's Cascading Style Sheets (GCSS)

2.3.13 Python Logstash

2.3.14 Alfa-Geez Node Repository

2.3.15 Tracking Service

Tracking is the technology used to determine the location of a vehicle using different methods like GPS and other navigation system operating via satellite and ground based stations.

Active and passive tracking

Several types of vehicle tracking devices exist. Typically they are classified as "passive" and "active". "Passive" devices store GPS location, speed, heading and sometimes a trigger event such as key on or off, door open or closed. Once the vehicle returns to a predetermined point, the device is removed and the data downloaded to a computer for evaluation. Passive systems include auto download type that transfer data via wireless download. "Active" devices also collect the same information but usually transmit the data in real-time via cellular or satellite networks to a computer or data center for evaluation.

Passive trackers do not monitor movement in real-time. When using a passive GPS tracker, you will not be able to follow every last move that a tracked person or object makes. Instead, information that is stored inside of a passive tracker must be downloaded to a computer. Once tracking details have been downloaded, it is then possible to view tracking details.

After we have gathered all of the information we need from a passive tracker, we can place the tracker back on the same (or different) vehicle. Aside from the fact that a passive tracking device is entirely reliable, the main reason people choose passive trackers is that these devices are less expensive than active trackers. Most passive GPS tracking devices are not attached to a monthly fee, which makes these trackers affordable.

In contrast to passive devices, active GPS trackers will allow one to view tracking data in real- time. As soon as we place an active tracker on a vehicle, we will be able to view location, stop duration, speed, and other tracking details from the comfort of your home or office. Active GPS trackers are ideal when it comes to monitoring vehicle that need to be tracked at regular time interval.

While active tracking devices are more expensive than passive devices (most come with monthly fees), this expensive is usually justified. An active GPS tracker that comes with a reliable interface (and excellent tracking software), and you will be able to track anything or anyone quickly and efficiently.

When most people picture a GPS tracking device, they are picture a real-time tracker. These trackers can be attached to any object while a person monitors all activity from a home computer. For example, if you were to place a real-time tracker on a vehicle, you could then watch as the vehicle makes stops, takes alternate routes, and sits idling all in real-time. GPS trackers that work on a real-time basis are usually considered "active" trackers, while those that do not include real-time

tracking are considered "passive" trackers.

There are many advantages associated with a real time tracker. The most important advantage is that the GPS locater is convenience. Rather than waiting to download data to a computer (as is the case with most passive trackers), a tracker that works in real-time does not require any waiting. Since real-time trackers come with software that allows a user to track an object in real- time, watching any object's progress is simply a matter of sitting at a computer.

Many modern vehicle tracking devices combine both active and passive tracking abilities: when a cellular network is available and a tracking device is connected it transmits data to a server; when a network is not available the device stores data in internal memory and will transmit stored data to the server later when the network becomes available again.

Historically vehicle tracking has been accomplished by installing a box into the vehicle, either self-powered with a battery or wired into the vehicle's power system. For detailed vehicle locating and tracking this is still the predominant method; however, many companies are increasingly interested in the emerging cell phone technologies that provide tracking of multiple entities.

Different Types of Tracking System

There are three main types of GPS vehicle tracking that are widely used. They all use active devices. They are:

- Automatic Vehicle Location (AVL) system
- Assisted Global Positioning System (AGPS)
- Radio Frequency Identification (RFID)

Automatic Vehicle Location (AVL) system AVL system is an advanced method to track and monitor any remote vehicle with the device that receives and sends signals through GPS satellites. AVL comprises of Global Positioning System (GPS) and Geographic Information System (GIS) in order to provide the real geographic location of the vehicle. AVL system consists of PC-based tracking software to dispatch, a radio system, GPS receiver on the vehicle and GPS satellites. Among the two types of AVL, GPS-based and Signpost-based, GPS-based system is widely used. The tracking method uses GPS satellite to locate the vehicle equipped with

GPS modem by sending satellite signals. The accuracy of the tracking method depends on the AVL system which provides the vehicle location with the accuracy of about 5m to 10m. The information transmitted by the tracking system to the base station is location, speed, direction, mileage, start and stop information and status of vehicle. The information of the vehicle is often transmitted to the central control system (base station) from the vehicle after every 60 seconds. If the base station receives the data, it displays it on a computerized map. GPS receiver on the vehicle receives the signals of its geographic location. Then the receiver sends that data plus speed, direction, etc. to the base station via a radio system. If AVL system is used to track a vehicle the average cost of per vehicle is $1 to $2 per day. The system can provide additional services like: vehicle route replay facility, external sensor data, speed alerts. The system also has some limitation; using the AVL system we cannot get accurate, complete and sufficient satellite data in dense urban areas or indoors and when transmission is blocked by natural obstructions (heavy tree cover) or many buildings. It can also occur in RF-shadowed environments and under unfriendly Radio Frequency (RF) conditions. Sometimes, a position fix can be impossible.

Assisted GPS (AGPS) system In AGPS system, a terrestrial RF network is used to improve the performance of GPS receivers as it provides information about the satellite constellation directly to the GPS receivers. AGPS uses both mobiles and cellular networks to locate the accurate positioning information. AGPS is used to overcome some limitations of GPS. With unassisted GPS, locating the satellites, receiving the data and confirming the exact position may take several minutes. The tracking method of AGPS uses GPS satellites to track the vehicles. A GPS receiver in vehicle is always in contact with 4 satellites (3 satellites determine latitude, longitude and elevation and the fourth provides element of time) hence it never fails to detect the location of a vehicle. Location of the vehicle is provided with accuracy of between 3m and 8m, and speed of 1km using this method. Information like Vehicle location, average speed, direction, path traversed in a selected period and alerts (Engaged/Unengaged, speed limit, vehicle breakdown and traffic jam) are delivered by the tracking system to the base station. The system provides continuous updates after every 10 seconds while the vehicle is in motion. It also provides data storage for up to 1 year. The location is retrieved from the GPS device and relayed as a SMS using the cell phone by the Client Node to the Base station. This system is more expensive than the AVL system as it gives continuous update of the vehicle location. If the user needs update after every 10 seconds then the subscription for

this system is $1.33 per day per vehicle and if the user needs update after every 5 seconds it is $1.67 per day per vehicle. The system can provide further services like atomic time (Accurate Time Assistance). There is a "panic" button. When pressed, you can contact an operator and he or she will help you out or keep you safe from accidents or hijacks. The system has also some limitations as GSM network is used to transmit data from the vehicle to the base station, the cost of sending SMS is a major concern to be considered.

Radio Frequency Identification (RFID) System RFID is an automatic identification method using devices called tags to store and remotely retrieves data. RFID uses radio waves to capture data from tags. The tracking method of RFID is comprised of three components: tag (passive, semi passive and active), reader (antenna or integrator) and software (middleware). RFID tag which contains microelectronic circuits sends the vehicle information to a remote RFID reader which is then read via the software. This system provides the location of the vehicle with the accuracy of 4m to 6m. Information such as location of the vehicle, mileage and speed are delivered by the tracking system to the centre. The information is updated every one minute. The information is sent to and received from RFID tags by a reader using radio waves. RFID reader, basically a radio frequency (RF) transmitter and receiver, is controlled by a microprocessor or digital signal processor (DSP). RFID reader with an attached antenna reads data from RFID tags.

Display GPS Location

Google Map

OpenMap

SMS

2.4 System Requirement Specification

General structure of a user story described in this document:

{User story name}: As a {role}, I want {goal}, so that {benefit} ({priority}).

2.4.1 Functional Requirements

Browse Products

List products: As a customer, I want to list all products of the shop (1).

Filter by category: As a customer, I want to see only those products that belong to a particular category and any category descendant, so that I can narrow down the list to what fits best my needs (2).

Filter by price: As a customer, I want to see only those products from the product list which prices fall within a specific price range, so that I can narrow down the list to best fit my economic requirements (3).

Filter by color: As a customer, I want to see only those products from the product list which main color matches any of the colors I selected, so that I can narrow down the list to best fit my liking (4).

Sort by name: As a customer, I want to sort the products from the product list by their name in an ascendant or descendant order (9).

Sort by price: As a customer, I want to sort the products from the product list by their price in an ascendant or descendant order (8).

Pagination: The product list needs to be displayed divided into pages and the customer should be given the ability to browse through them (3).

Product detail: As a customer, I want to see all information regarding a particular product and its variants, so that I can make a better decision about buying it (1).

Breadcrumb: As a customer, I want to be informed of my location inside the category tree via a breadcrumb, so that it can help me to navigate and have a better understanding of the web-shop structure (6).

Empty list message: As a customer, I want to be informed with an informative message when a product list request has no results (5).

Not found message: As a customer, I want to be informed with an informative message when a category or product I requested cannot be found (10).

Purchase Products

Add item to cart: As a customer, I want to add a particular product to the shopping cart, so that I can buy it with the next order (1).

Update item in cart: As a customer, I want to change the number of units of a particular item in the shopping cart, so that I can buy a different quantity of the product with the next order (6).

Remove item from cart: As a customer, I want to remove a particular item from the shopping cart, so that I do not buy it with the next order (3).

Place order: As a customer, I want to place an order, so that I can actually buy the items in my shopping cart (2).

Payment: As a customer, I want to be able to pay online my orders, so that I can pay immediately the moment I buy them instead of using other possibly unpleasant billing options (4).

List orders: As a registered customer, I want to see a list of my orders, so that I can see all the purchases I did in the past (5).

Mini cart: As a customer, I want to be able to see my current shopping cart from any page via a so-called mini-cart, so that I can always be aware of its contents and pricing details (5).

User Management

Sign up: As an anonymous customer, I want to sign up a new customer account, so that I can place orders more easily and take advantage of many other benefits (4).

Log in: As an anonymous customer, I want to log in with an existing customer account, so that I take advantage of the benefits of being a registered customer (4).

Log out: As a registered customer, I want to logout from my customer account, so that nobody else can use it from the same machine (5).

Recover password: As an anonymous customer, I want to be able to recover my password, so that I can log in with my account when I forget my current password (7).

Update account: As a registered customer, I want to update my personal data such as the email address used (6).

Change password: As a registered customer, I want to change my current password to another one of my choice (5).

Add address: As a registered customer, I want to add a postal address to my address book, so that I can select it as shipping or billing address when placing an order (5).

Update address: As a registered customer, I want to update the data of a particular postal address from my address book, so that it corresponds to my current situation (6).

Remove address: As a registered customer, I want to remove a particular postal address from my address book, so that I cannot longer select it when placing an order (5).

2.4.2 Non-functional Requirements

The non-functional requirements involved to perform the implementation of e-commerce and express database and source code are as listed below.

Normalization The basic objective of normalization is to reduce redundancy which means that information is to be stored only once. Storing information several times leads to wastage of storage space and increase in the total size of the data stored.

If a database is not properly designed it can give rise to modification anomalies. Modification anomalies arise when data is added to, changed or deleted from a database table. Similarly, in traditional databases as well as improperly designed relational databases, data redundancy can be a problem. These can be eliminated by normalizing a database.

Normalization is the process of breaking down a table into smaller tables. So that each table deals with a single theme. There are three different kinds of modifications of anomalies and formulated the first, second and third normal forms (3NF) is considered sufficient for most practical purposes. It should be considered only after a thorough analysis and complete understanding of its implications.

Safety It there is extensive damage to a wide portion of the database due to catastrophic failure, such as disk crash, the recovery method restores a past copy of the database that was backed up to archival storage (typically tape) and reconstructs a more current state by reapplying or redoing the operations of committed transactions from the backed up log, up to the time of failure.

Performance Requirements

- The product shall be based on web and has to be run form a web server or Cloud.
- The product shall take initial load time depending on internet connection strength which also depends on the media from which the product is run.
- The performance shall depend upon hardware components of the client/customer.

Security Security system need database storage just like many other applications. However, the special requirements of the security market mean that vendors must choose their database partner carefully.

- The database system has to be secure to prevent unauthorized access, theft and/or disruption to data and services held and offered by the system.
- The system's back-end servers shall only be accessible to authenticated administrators.
- The system's back-end databases shall be encrypted.

Scalability

- The system will begin offering its service to a small number of users but must be capable of being upgraded to serve larger number of users and process more transactions.

Robustness

- The system should be able to operate and handle various types of data needed to function properly.

Availability The web-site should be available on the specified date and specified time as many customers are doing advance buying selling delivery.

Supportability

- There are no memory requirements in client's side.
- The computers must be equipped with any of the web browsers.
- The product must be stored in such a way that allows the client easy access to it.
- Response time for loading the product should take no longer than five minutes.
- A general knowledge of basic computer skills is required to use the product.

2.4.3 Business Rules

BR1: For using systems functionality customers are required to sign-up.

BR2: Consumer customers are not required any subscription fee.

BR3: Merchants are required subscription fee.

BR4: Any Customers are subjected to taxation.

BR5: Monthly subscribed vendors are the only ones that can use fulfillment by Vendor method. subscription fee.

2.5 System Requirement Analysis

2.5.1 Actor and Use Case Identification

A use case diagram is a graphic depiction of the interactions among the elements of a system. A use case is a methodology used in the system analysis to identify, clarify, and organize system requirements in this context, the term s̈ystem" refers to something being developed or operated such as a mail-order product sales and service website. Use case diagram are employed in UML (Unified Modeling Language). A standard notation for the modeling of real-world object and systems. System objectives can include planning overall requirements validating a hardware design, testing and debugging a software product under development, creating an online help

reference, or performing a consumer-service oriented task. For example, use case in a product sales environment would include item ordering, catalog updating payment processing, and customer relations. A use case diagram contains four components.

- The system boundary, which defines the system scope or boundary in accordance to the real world around it.
- Use case actors are individuals or users involved in the system. Each actor has different roles or actions to perform in the system.
- The use cases specify the scenarios or possible outcome that can be performed by the actors in the system.
- The relationships between the actors and the use cases represents the possible scenarios and outcomes, it shows how system behaves according to different scenario and actor.

Below is a list of the elements that you will see in the diagram on the next page as well what is included in the use case templates that follow.

Name	Diagram	Description
Actors		Shown in the diagram as stick figures with a name underneath. They represent elements that will be directly interacting with the system.
Use Cases		Oval shapes that have their names in the center. These represent direct functionality within the system that must be implemented.
Interactions		Lines that connect the actors with the different Use Cases. These show that there is some form of direct interaction between the actor and that specific functionality.
Includes		Dotted lines labeled "<<include>>" that connect two use cases and have an arrow pointing towards one. This means that the use case without the arrow calls on the functionality of the use case with the arrow.
Extends		Dotted lines labeled "<<extend>>" that connect two use cases and have an arrow pointing towards one. This means that the use case without the arrow takes all of the functionality of the use case with the arrow and adds extra functionality.
The System Boundary		The large rectangle that contains the Use Cases. Everything within the rectangle is what the system is responsible for implementing.
Use Case Template		Describes the basic functionality and features of each use case and the can be found in the pages following the use case diagram.

Actor identification

E-commerce Actor identification The top level actors that interact with the system are the customer, the Website Administrator, the identity manager, the warehouse manager, the warehouse clerk, the customer service and the marketing administrator. The customer can be an anonymous customer or an identified customer. The identified customer can be a vendor, a consumer or both for a better understanding the generalization of actors are illustrated in figure 2.5.1.

Website Administrator: The Admin works with the different facility that help

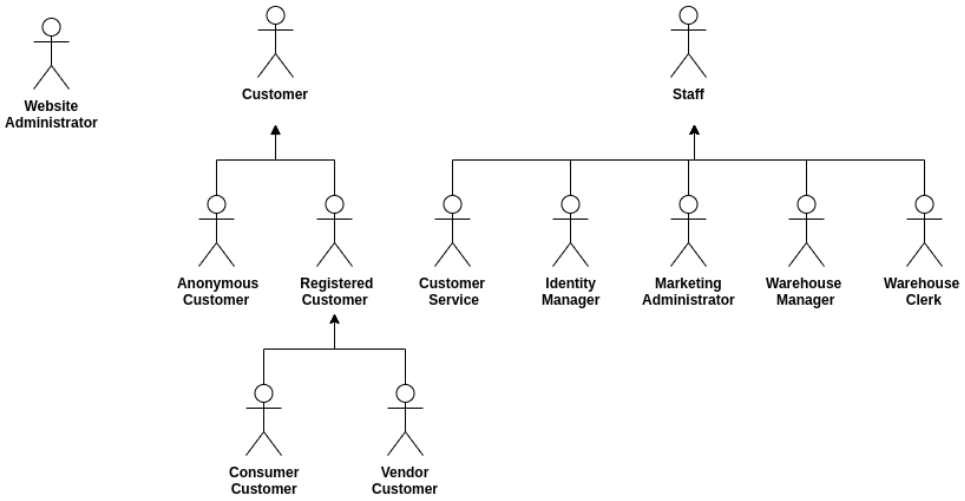

Figure 2.1: Actors involved - Guya E-commerce

to solve the problem of manual work and contact can be easily maintain with the all branches. It's job includes the following:

- Set default language
- Set taxation rate
- Set Term and Conditions
- Set Privacy Policies
- Managing user groups and setting different privileges
- Managing user sessions
- Logs
- Staff allocation
- Staff revocation
- Branch creation
- Branch termination

Identity Manager: Is used to ensure that users (customers) provide information that is associated with the identity of a real person. This management service verity the authenticity of physical identity documents such as:

- Drivers license
- Passport
- Residential proof

Customer Service: Is majorly concerned with customer relation including:

- Check delivery status
- Take customer's feedback
- Mange customers to some extent

Marketing Administrator: Refers to activities undertaken to promote the buying and selling of products or services.

- Make Link click through sales commission
- Make physical (delivery) item promotion (e.g. sample soaps, perfumes...)
- Set a discount price or rate
- Label items (e.g. Assured quality)
- Set price to catalogs
- Add new department
- Remove department
- Send promotion Email, SMS
- Create promotion i.e. deal of the day
- Make featured product
- Create discount/fee coupon for items
- Forecast inventory in warehouse (can be done automatic or manually)

Warehouse Manager: It is related to quantitative value of products, the quantitative value of products is managed by tow way one is automatic update that is done when a product is ordered or returned, the other is done while stocking the warehouse or removing stocks (that is done manually by the warehouse manager

Warehouse Clerk: Fulfillment of orders

- Viewing Orders in order to pack
- Responsible with returned orders

Anonymous Customer: (Is generalized under actor name Customer) Is an registered person who comes to the website to sell, buy or browse catalogs. visitors are allowed to:

- View catalogs

- View available departments
- Add catalogs to cart
- View available stores
- checkout (but in checkout they are required to register)
- Signing up
- Report illegal sales i.e. copyright, adultery contents

Vendor: (Is generalized under actor name Customer) Is a person or a company offering inventory/stocks for sale. Vendors functionality include the following:

- Add catalogs
- Remove catalogs
- Set pricing to catalogs
- Make a discount
- Send/Make promotion based on Consumer's choice
- Add multiple self fulfillment centers address
- Set return policy for catalogs based on fulfillment plan

Consumer (Is generalized under actor name Customer) Is an individual who pays some pays some amount of money for catalog to consume goods and services.

- View store
- Rate a store
- Order items
- checkout
- Add catalog to wish list
- Subscribe for physical item promotion (e.g. sample soaps, perfumes...)
- Register for link click through sales commission
- Report illegal sales i.e. copyright, adultery contents

Express Actor identification The top level actors that interact with the system are listed below and the generalization of actors are illustrated in figure2.5.1.

Customer: Customers can use various service by online with the help of internet. These services help the user to do their work effectively and efficiently. The services are following:-

- Pickup Request
- Destination Locator
- Track Locator
- Rate Calculator
- Consignment Guidelines

Website Administrator: The Website Administrator works with the different facility that help to solve the problem of manual work and contact can be easily maintain with the all branches. It's job includes the following:-

- Branch creation
- Branch termination
- Send message
- Staff allocation
- Staff revocation
- View report

Delivery Guy: (Is generalized under actor name Staff) Is the person who delivers parcels to customers usually over a regular local route some of responsibility includes :-

- Collect payments from customer at the time of product delivery
- Take customer signature for proof of delivery (POD) at the time of product delivery
- Pick up parcels-

Front Desk Receptionist: (Is generalized under actor name Staff) Responsible for handling front office reception, also serves as a Customer Support/Service some of the services include :-

- Receive parcels and collect payment for those
- Check for delivery status (tracking of parcels)
- Provide enter form for customers and printing labels for those parcels

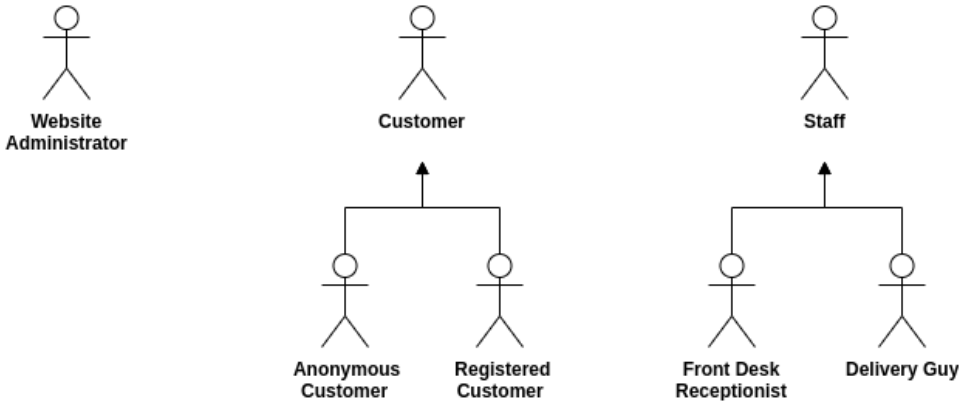

Figure 2.2: Actors involved - Guya Express

Use Case Diagram And Description

Website security requirements mandate separation of administrative interface from common functions provided to users. This segregation, for example, is strongly recommended by ISO 17799.

System should have separate application for administrators and for common users. It is recommended by OWASP Guide 2.0[3] that website administration application should not be accessible from the internet without going through some management networks eg. via a strongly authenticated VPN or from a trusted network operation center.

Except for administrators, some part of the administrative interfaces should be also available to the Help desk staff (Customer Service) and some staffs, as they need to be able to assist customers having issues while using the customer oriented website.

Top level use case diagram below shows some administrative functions that administration website could provide.

Administrative Use Case Diagram

Manage Logs Website administrator see status of logs. The status could include verification that logging is stil functional (there is enough space on disk and/or connection to database is not stable), and that older log files are on schedule being moved to a permanent storage for archiving. List of administrative functions include in the log management depend on the security requirements supported and implemented by the website, which we will detail on the implementation phase.

[3] **https://www.owasp.org**.

Logs accessing is not associated with our system, but we will be implementing logging functionality that is stored as a text file not in database, instead the website administrator view logs using either the file manager form web hosting provided panel or FTP.

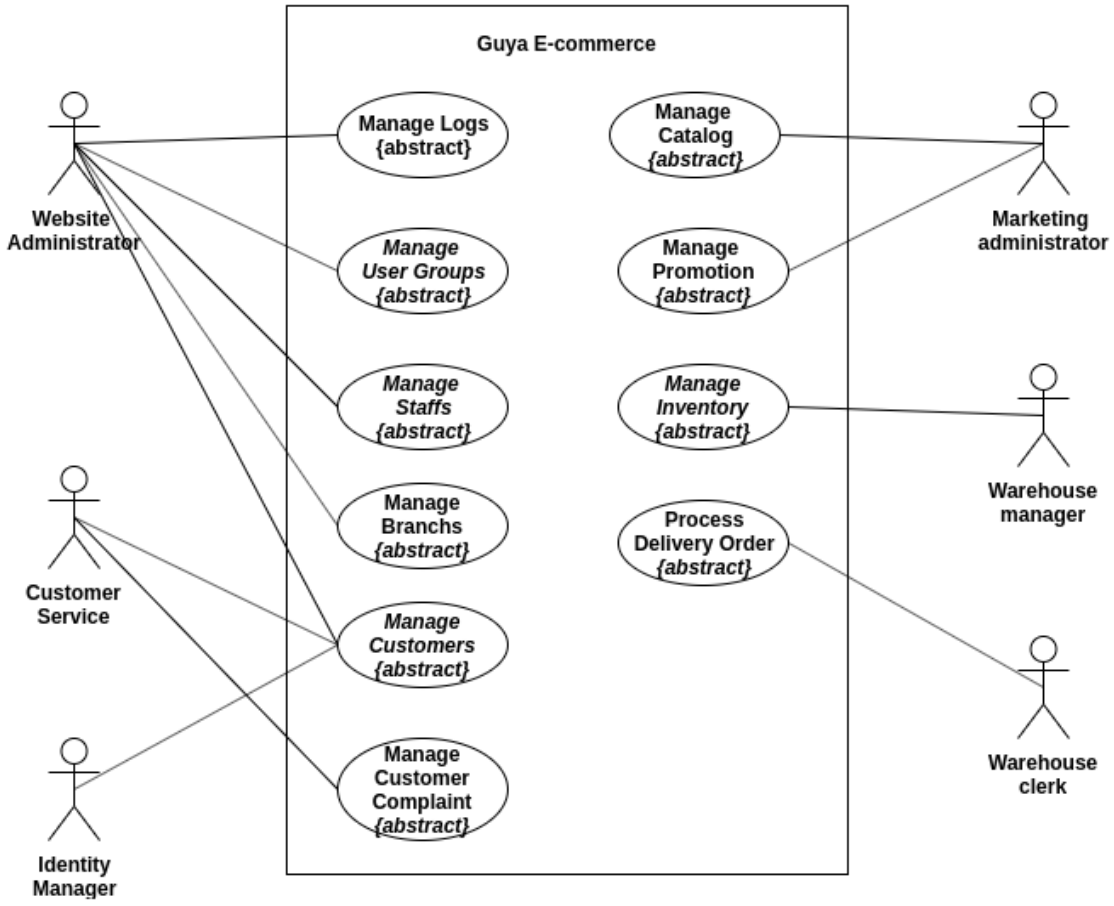

Figure 2.3: Top level use case diagram for the administration website - Guya E-commerce

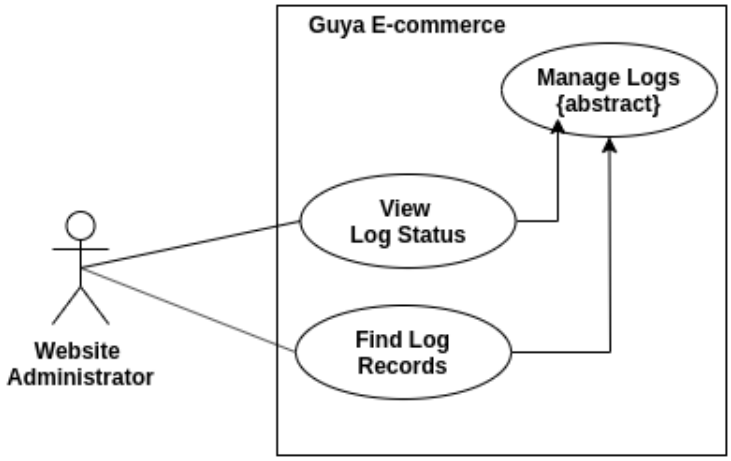

Figure 2.4: Manage logs use case diagram for administration website - Guya E-commerce

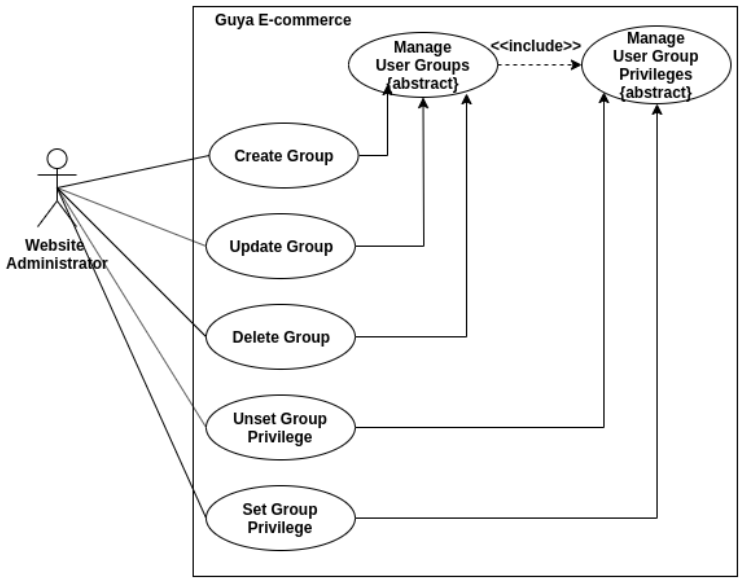

Figure 2.5: Manage user groups use case diagram for administration website - Guya E-commerce

Use Case Name	Manage User Groups	
Description	The idea is that website administrator could create different user groups, for example having different privileges or options, and later some user groups could be modified or even deleted	
Primary Actor	Website Administrator	
Pre-Condition	User has been logged on to system	
Post-Condition		
Basic Flow	**Actor Action**	**System Response**
	1. The Use Case starts when the user is logged on to the website and select the manage user groups menu.	**2.** The system will display lists of user groups.
	3. The user will select create new user group.	**4.** The system will display form for creating new user group with group name, group id, list of privileges.
	5. The user will fill the displayed from and submit the form.	**6.** The system will verify the information like if the data is redundant or not and store the user group information. **7.** The Use Case ends.
Alternate Flow	**A1 :** If the website administrator requests to edit an existing user group then:	
	Actor Action	**System Response**
	2.1 The user click edit button/icon for the listed user groups.	**2.2** The system display the same form as creating new user group, but filled with the selected user group information.
	2.3 The user edits the options and submit the form.	**2.4** The flow continues to Basic flow 6
	A2 : If the website administrator requests to remove an existing user group then:	
	Actor Action	**System Response**
	2.1 The user click remove button/icon for the listed user groups. **2.3** The user confirms.	**2.2** The system display confirmation message. **2.4** The system will set all the users under the removed user group to default user group i.e no user group and remove the user group safely.

Table 2.2: Manage logs use case description - Guya E-commerce

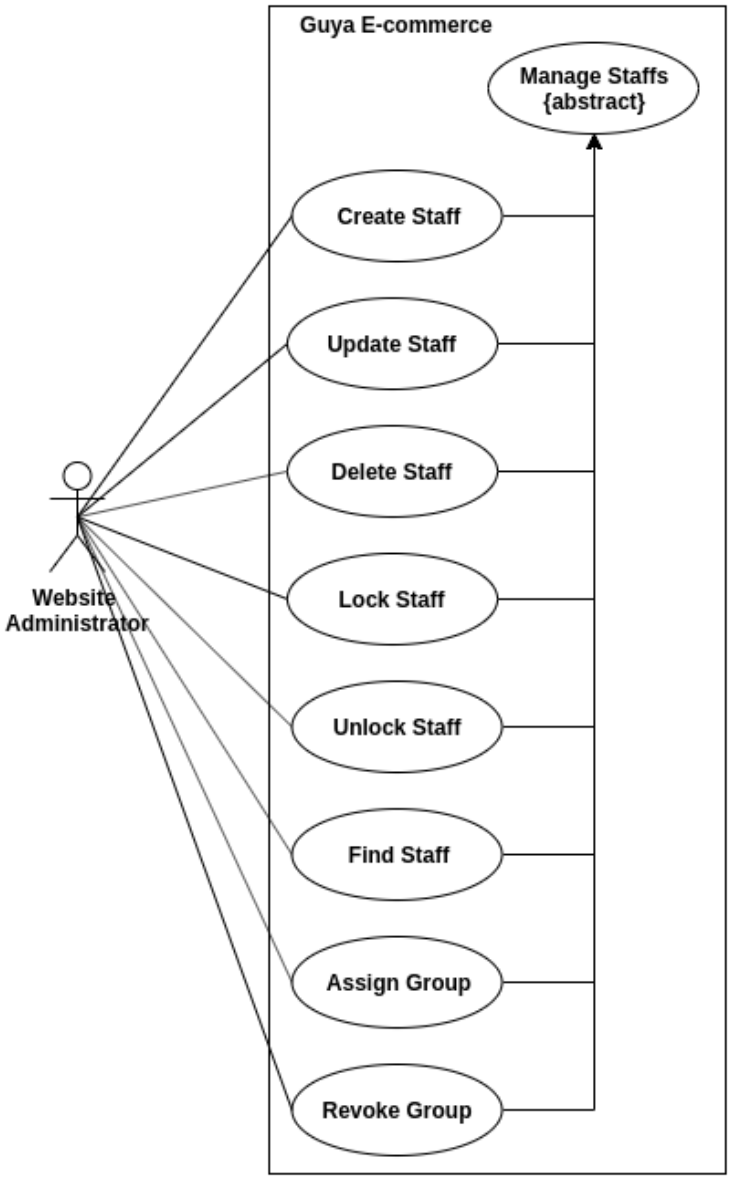

Figure 2.6: Manage staffs use case diagram for administration website - Guya E-commerce

Use Case Name	Manage Staffs	
Description	Is the management of subordinates in the organization, manage staffs refers to the administrative actors	
Primary Actor	Website Administrator	
Pre-Condition	User has been logged on to system	
Post-Condition		
Basic Flow	**Actor Action**	**System Response**
	1. The Use Case starts when the user is logged on to the website and select the manage staffs menu.	**2.** The system will display lists of staffs.
	3. The user will select create new staff.	**4.** The system will display form for creating new staff with staffs personal info, username, password, branch and user group.
	5. The user will fill the displayed from and submit the form.	**6.** The system will verify the information like if the data is redundant or not and store the information. **7.** The Use Case ends.
Alternate Flow	**A1 :** If the website administrator requests to edit an existing staff then:	
	Actor Action	**System Response**
	2.1 The user click edit button/icon for the listed staff.	**2.2** The system display the same form as creating new staff, but filled with the selected staff's information.
	2.3 The user edits the options and submit the form.	**2.4** The flow continues to Basic flow 6
	A2 : If the website administrator requests to remove an existing staff then:	
	Actor Action	**System Response**
	2.1 The user click remove button/icon for the listed staff. **2.3** The user confirms.	**2.2** The system display confirmation message. **2.4** The system delete assigned branch, login info, delete assigned user group but personal info is preserved if and only if the staff have a foreign key reference unless it is completely deleted.
Alternate Flow	**A3 :** If the website administrator requests to find staff, this can be accomplished by entering a key word and the system return any staff that match the key word.	
Alternate Flow	**A4 :** The website administrator can either lock or unlock from the listed staffs. This flow is specific to website security. This locking and unlocking is usually done automatically by the intrusion detection or website authentication subsystem, this manual mode is just in case.	

Table 2.3: Manage staffs use case diagram for administration website - Guya E-commerce

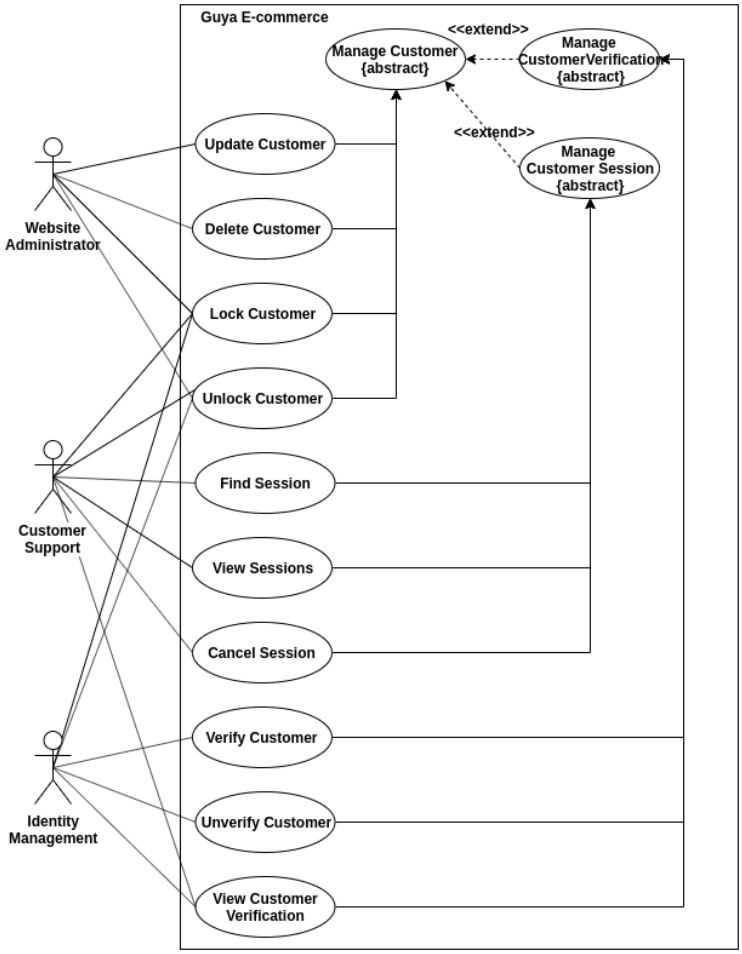

Figure 2.7: Mange customer use case diagram for administration website - Guya E-commerce

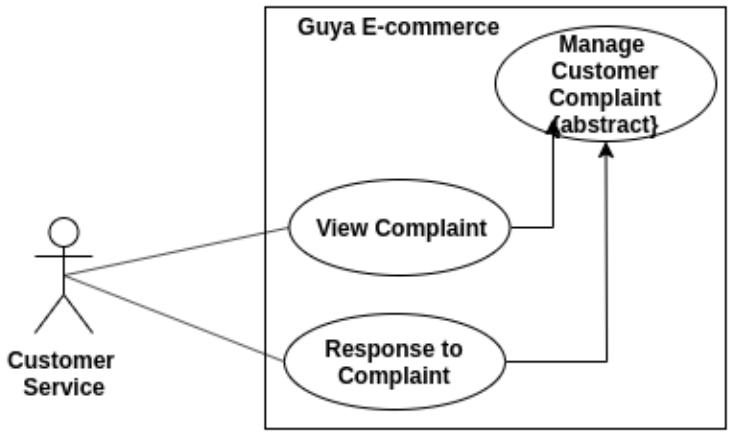

Figure 2.8: Manage customer complaint use case diagram for administration website - Guya E-commerce

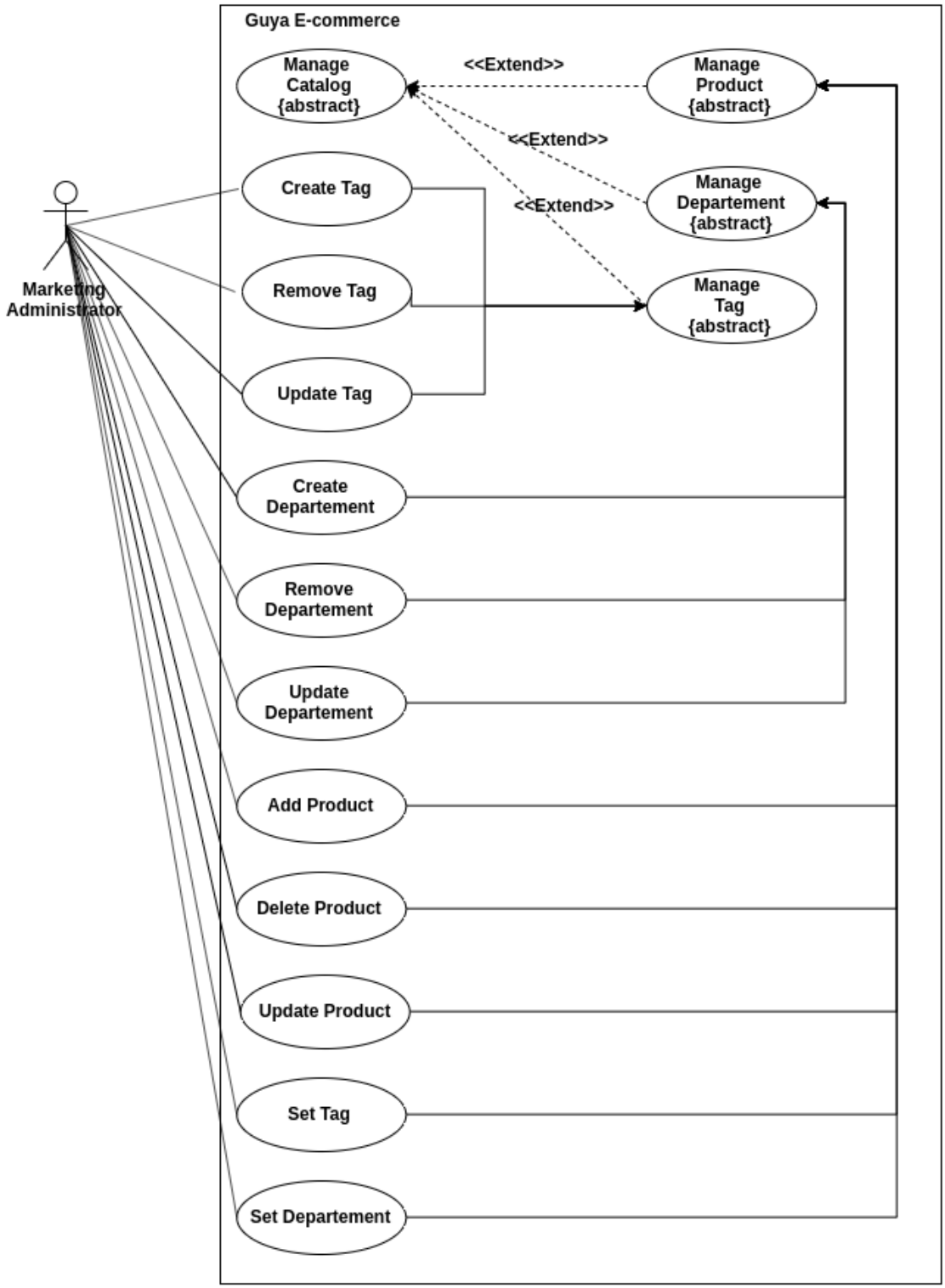

Figure 2.9: Mange catalog use case diagram for administration website - Guya E-commerce

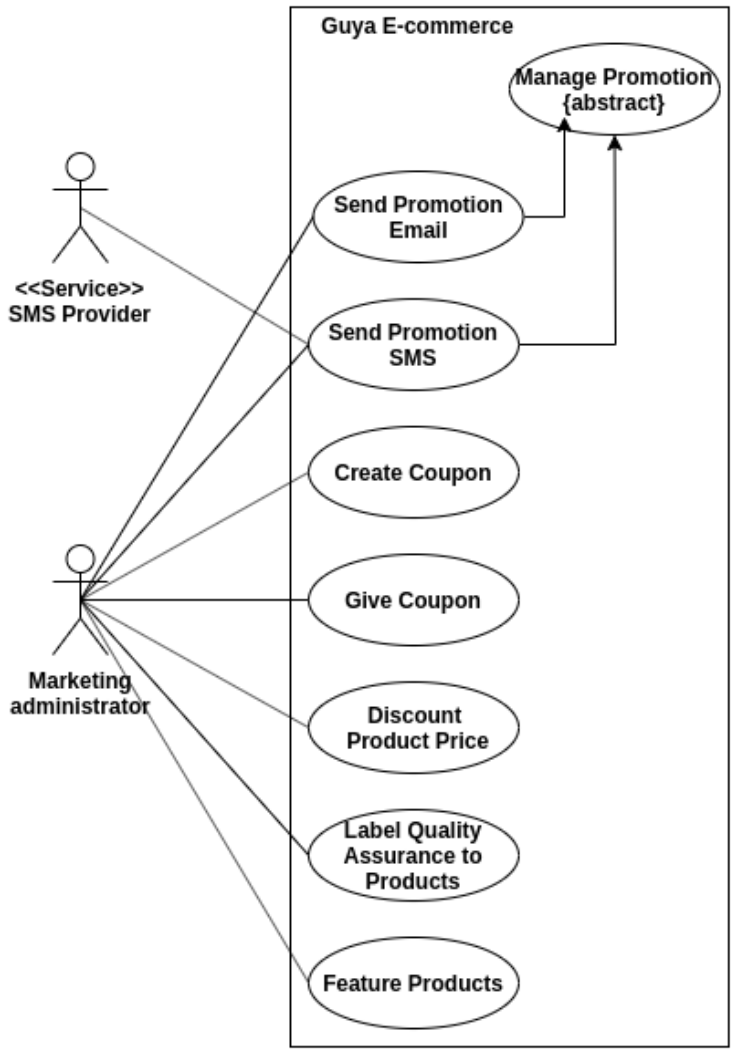

Figure 2.10: Manage promotion use case diagram for administration website - Guya E-commerce

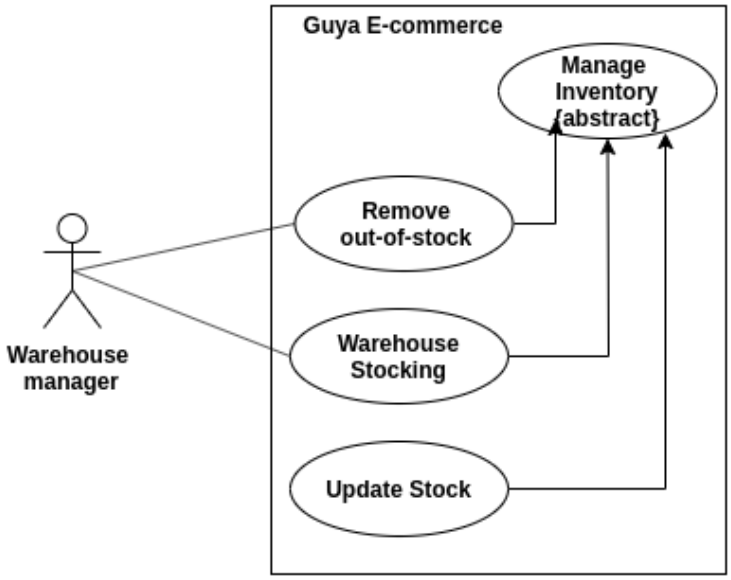

Figure 2.11: Manage inventory use case diagram for administration website - Guya E-commerce

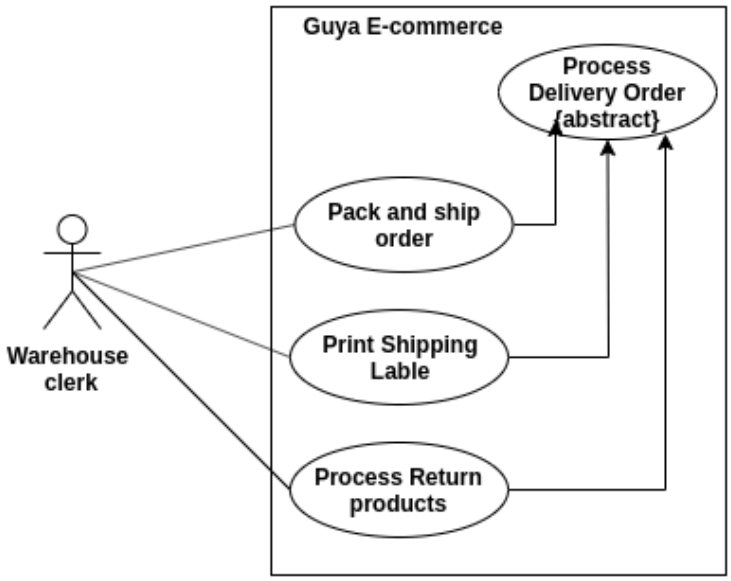

Figure 2.12: Manage delivery orders use case diagram for administration website - Guya E-commerce

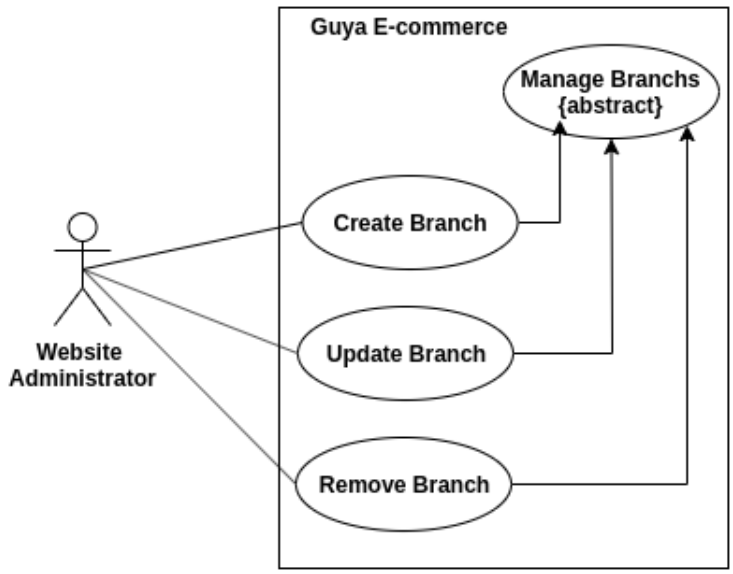

Figure 2.13: Manage branches use case diagram for administration website - Guya E-commerce

Customer Use Case Diagram

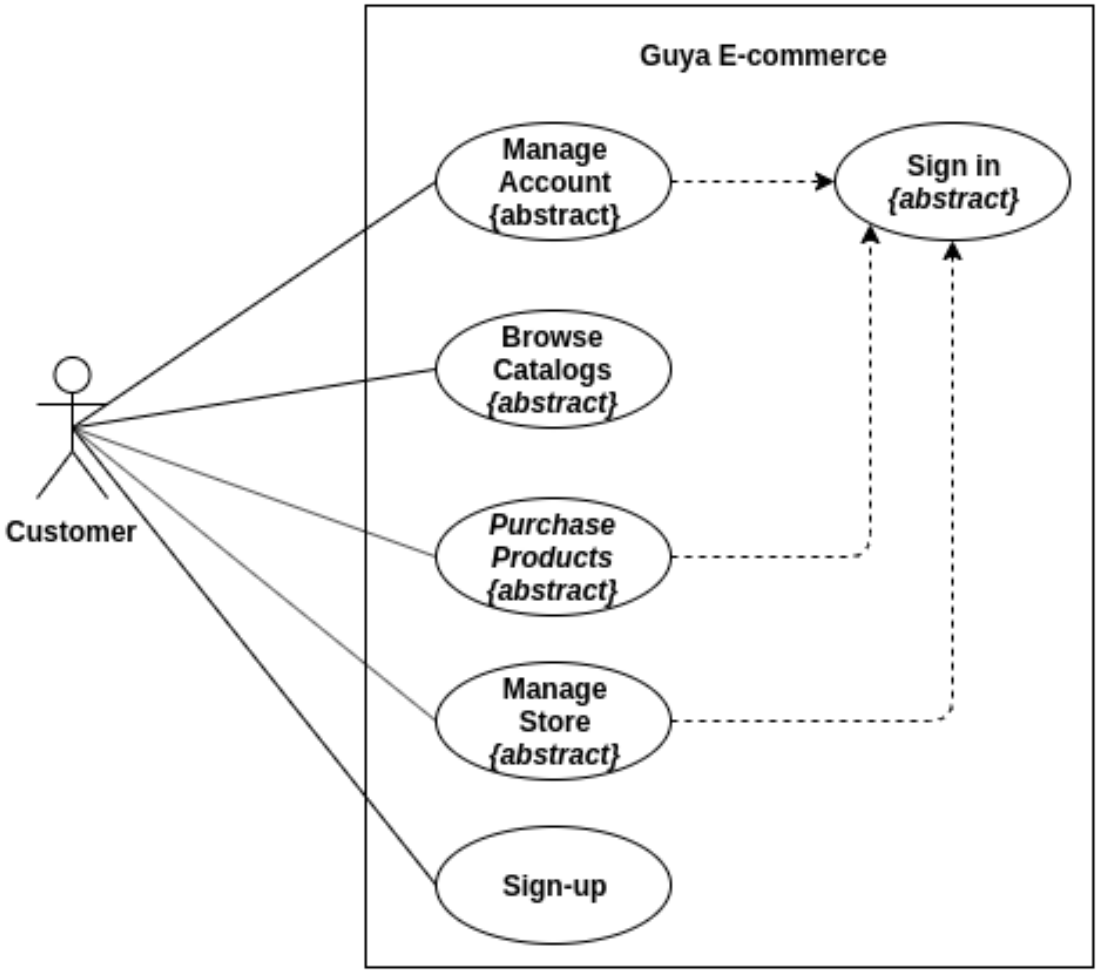

Figure 2.14: Top level use case diagram for the customer website - Guya E-commerce

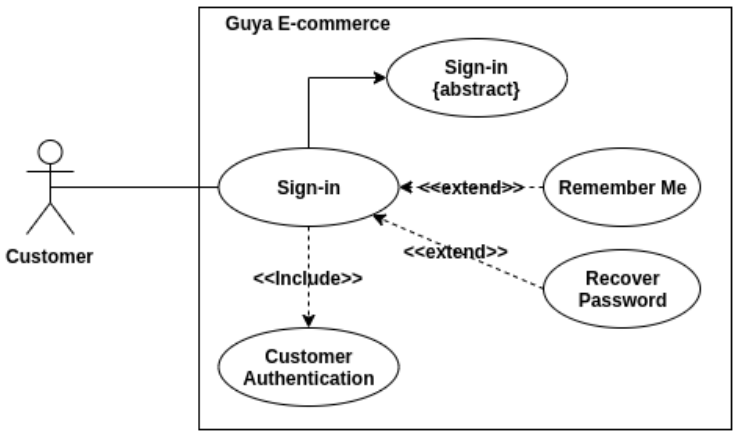

Figure 2.15: Sign in use case diagram for customer website - Guya E-commerce

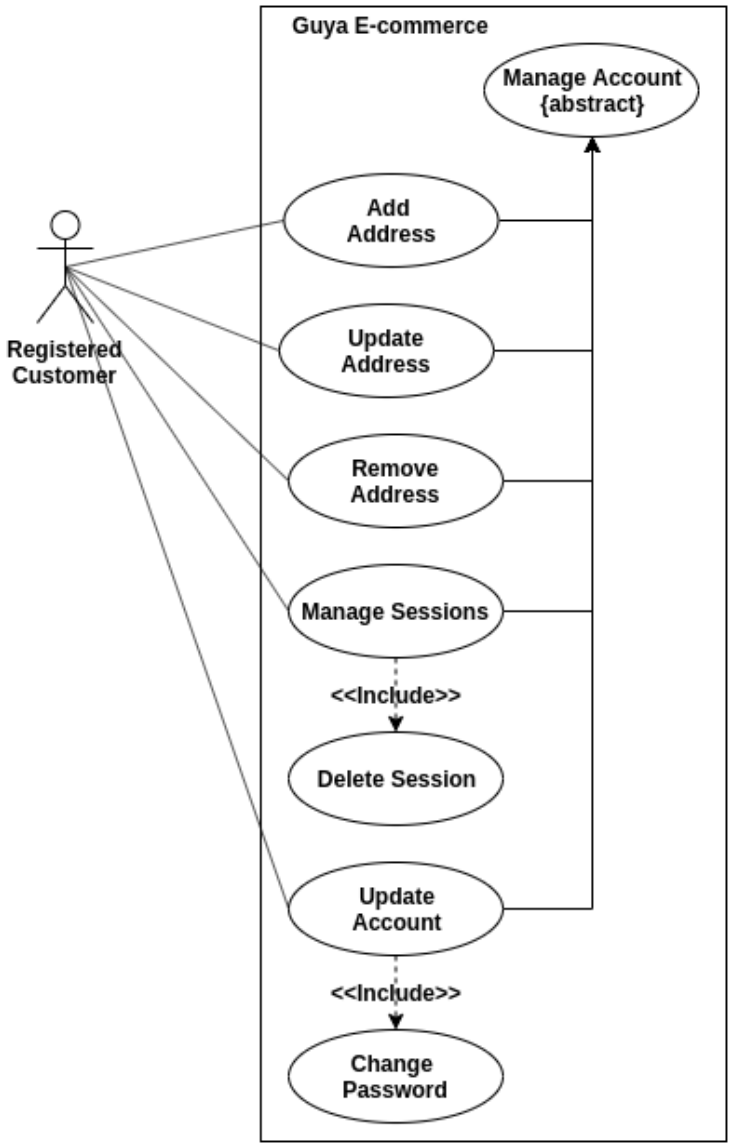

Figure 2.16: Manage account use case diagram for customer website - Guya E-commerce

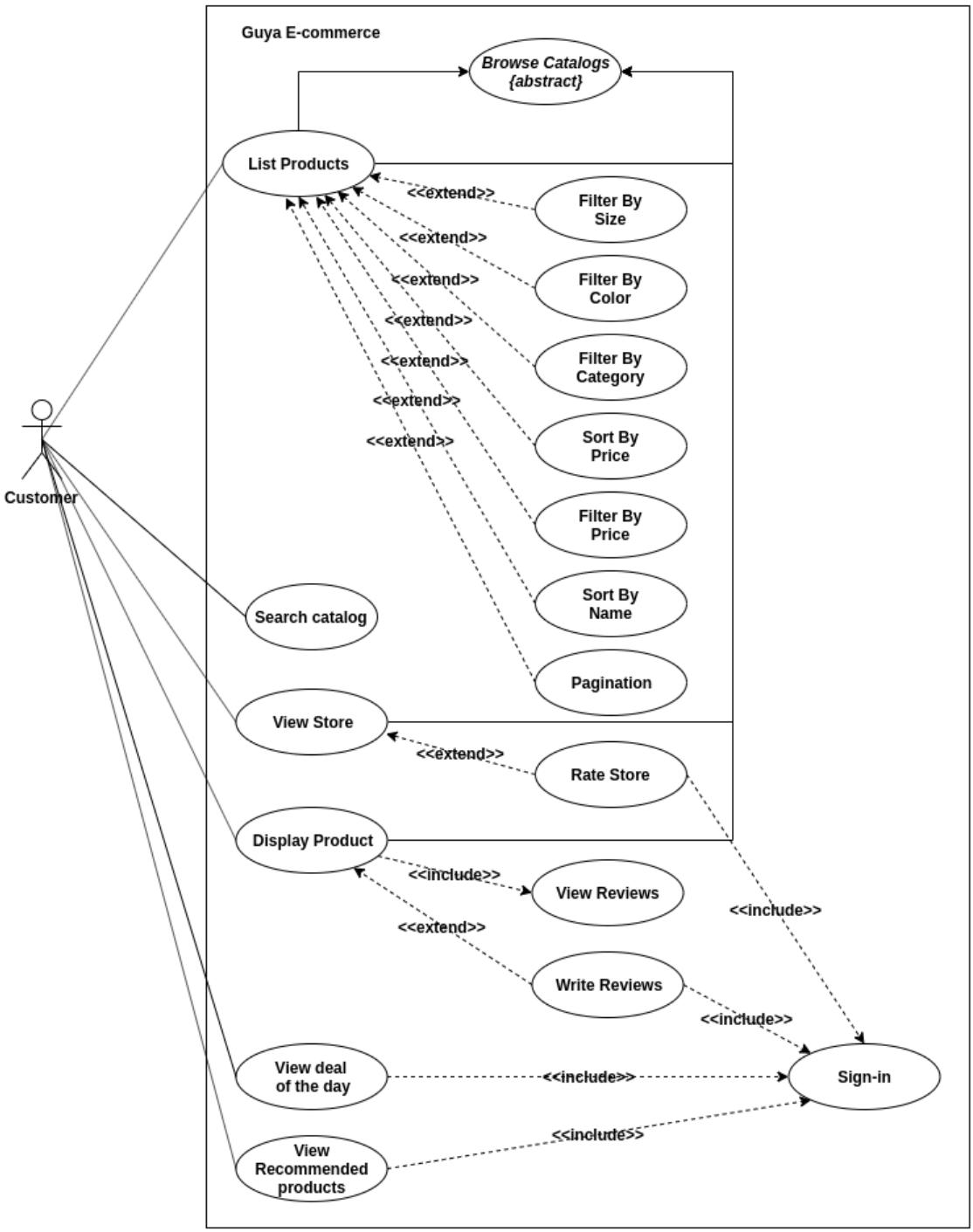

Figure 2.17: Browse catalog use case diagram for customer website - Guya E-commerce

Figure 2.18: Use case diagram overall system - Guya Express

Use Case Name	Sign-in	
Description	This Use Case describes the process by which users log into the order processing system. It also sets up access permissions for various categories of users	
Primary Actor	Customer	
Pre-Condition	sign-up	
Post-Condition		
Basic Flow	**Actor Action** **1.** The Use Case starts when the user starts the application. **3.** The user enters a username and password. **8.** The system will display the user's home screen.	**System Response** **2.** The system will display the login screen. **4.** The system will verify the information. **5.** The system will verify the information. **6.** The system will set server session. **7.** The system will set access permissions. **9.** The Use Case ends.
Alternate Flow	If the credentials are wrong & try's more than three times IP address will be captured and locked for sometime.	

Table 2.4: Use Case Login - Guya E-commerce and Guya Express

Use Case Name	Register/Sign-up	
Description	This Use Case describes the process by which users newly registering customer	
Primary Actor	Customer	
Pre-Condition		
Post-Condition		
Basic Flow	**Actor Action** **1.** The Use Case starts when the user opens the registering page. **3.** The user fills the provided form. **6.** The user will user will click on E-mail sent link or enter sent SMS code, or both.	**System Response** **2.** The system will display the register screen. **4.** The system will verify the information. **5.** The system will either send E-mail verification link or cell phone number verification code, or both. **7.** The user will user will verify user's email address or cell phone number, or both **7.** The system will log-in (sign-in) to the system. **9.** The Use Case ends.
Alternate Flow	If the verification link, SMS haven't reached the user the system will resend it.	

Table 2.5: Register/Sign-up use case description - Guya E-commerce and Guya Express

Use Case Name	Staff Login	
Description	This Use Case describes the process by which employee log into the order processing system. It also sets up access permissions for various categories of Employee types	
Primary Actor	Customer	
Pre-Condition	sign-up	
Post-Condition		
Basic Flow	**Actor Action** **1.** The Use Case starts when the user starts the application. **3.** The user enters a username and password. **7.** The system will display the user's home screen.	**System Response** **2.** The system will display the login screen. **4.** The system will verify the information. **5.** The system will verify the information. **6.** The system will set access permissions. **8.** The Use Case ends.
Alternate Flow	If the credentials are wrong & try's more than three times IP address, staff credentials will be captured and locked for further analysis.	

Table 2.6: Use Case Employee Login - Guya Express

2.5.2 Activity Diagram

Are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams are intended to model both computational and organizational processes (i.e., workflows), as well as the data flows intersecting with the related activities. Although activity diagrams primarily show the overall flow of control, they can also include elements showing the flow of data between activities through one or more data stores.[4]

–

Below figure describes activity diagram for both sub-projects any for any user i.e Administrative and Customer Login

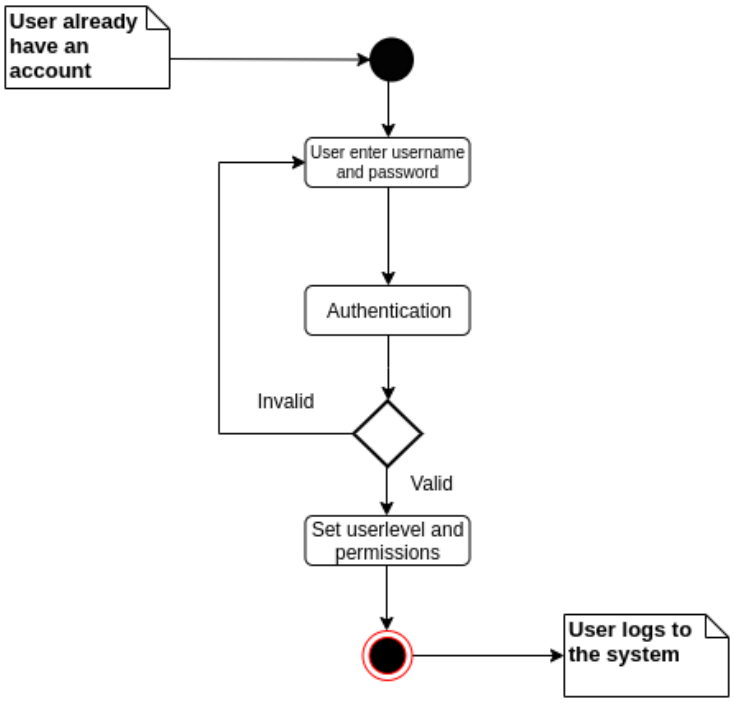

Figure 2.19: Login activity diagram - Guya E-commerce and Guya Express

[4]Wikipedia contributors, *Activity diagram*.

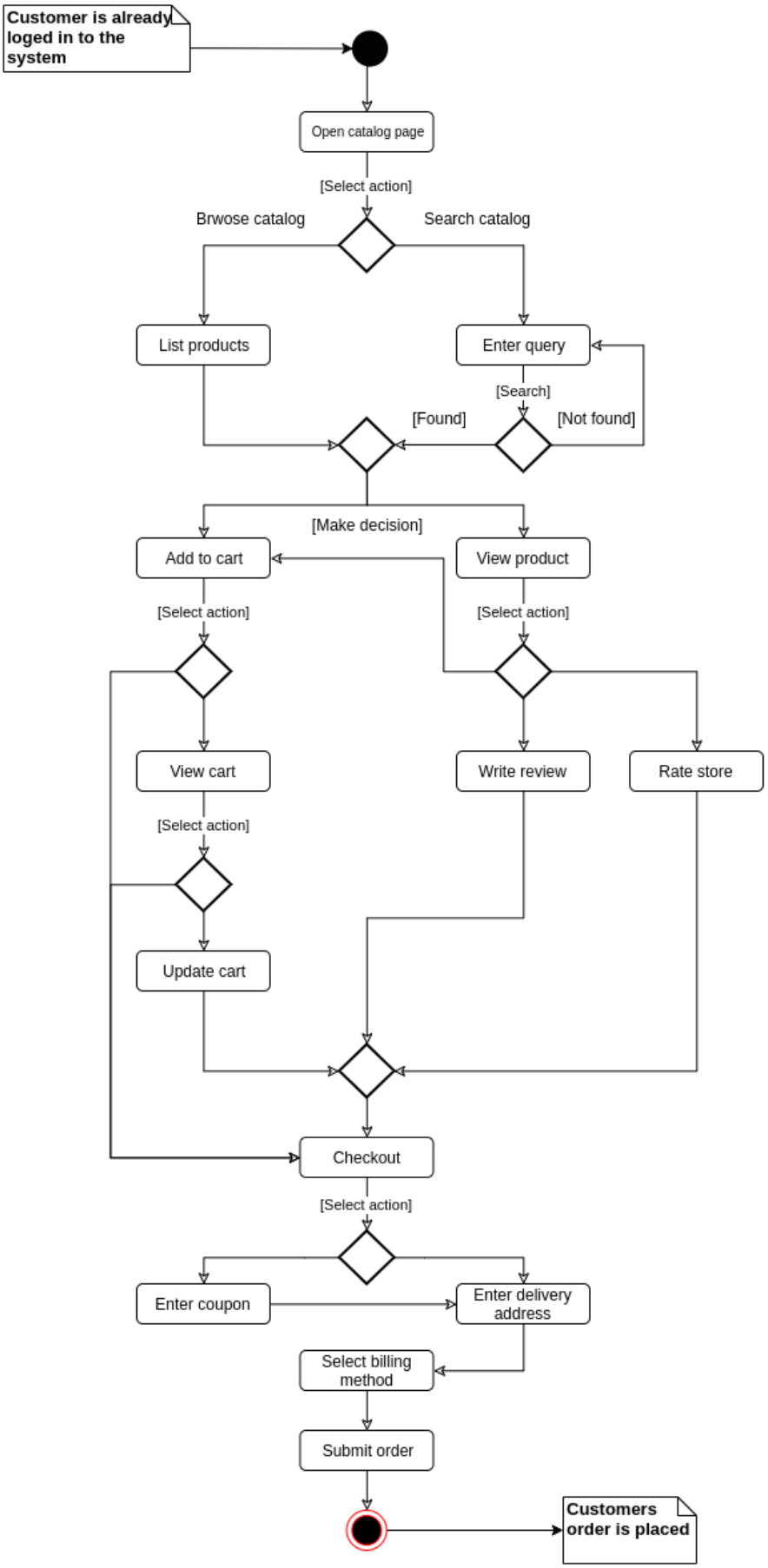

Figure 2.20: Check out activity diagram - Guya E-commerce

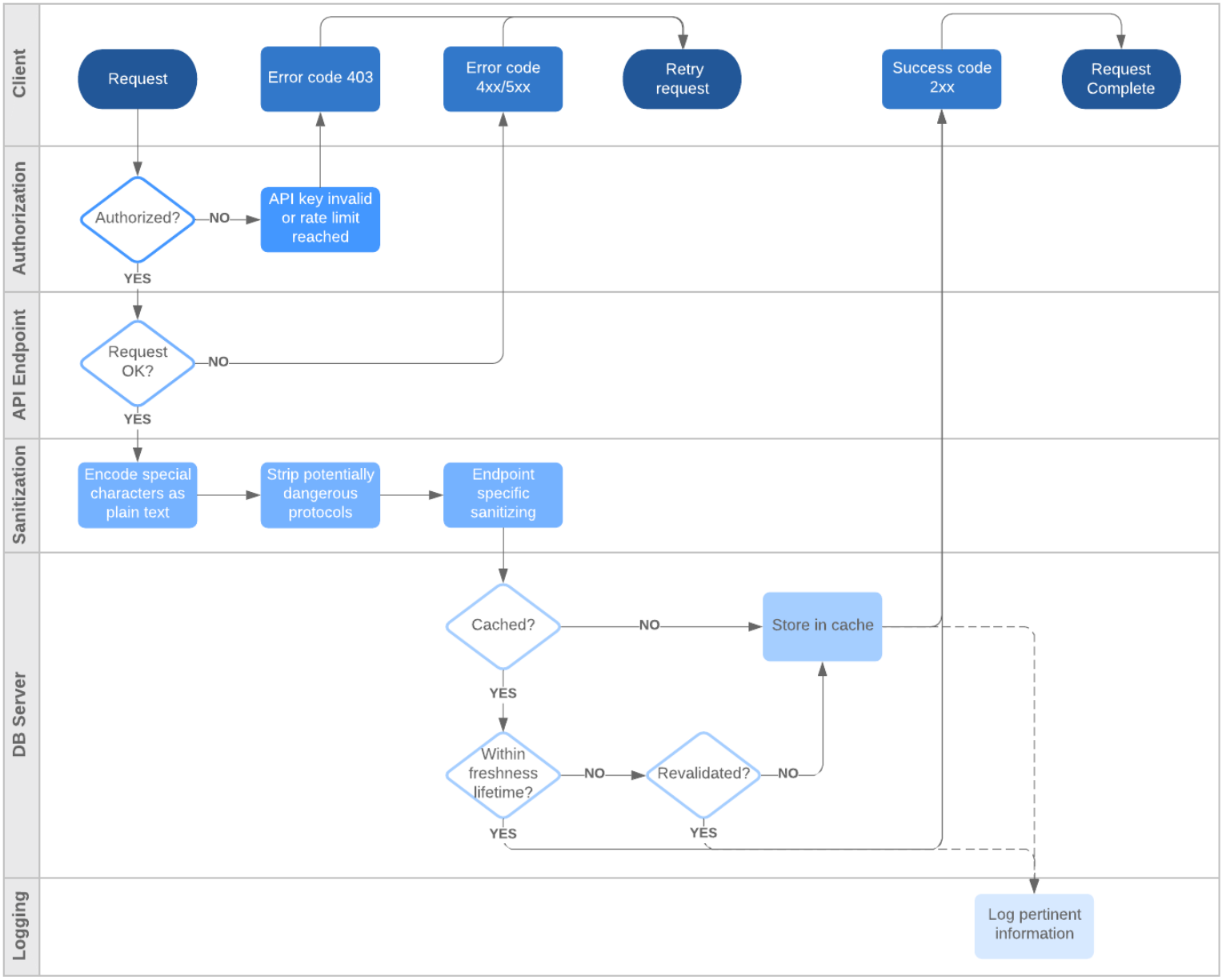

Figure 2.21: Api Flowchart with swimlanes - Guya E-commerce and Guya Express

2.5.3 Sequence Diagram

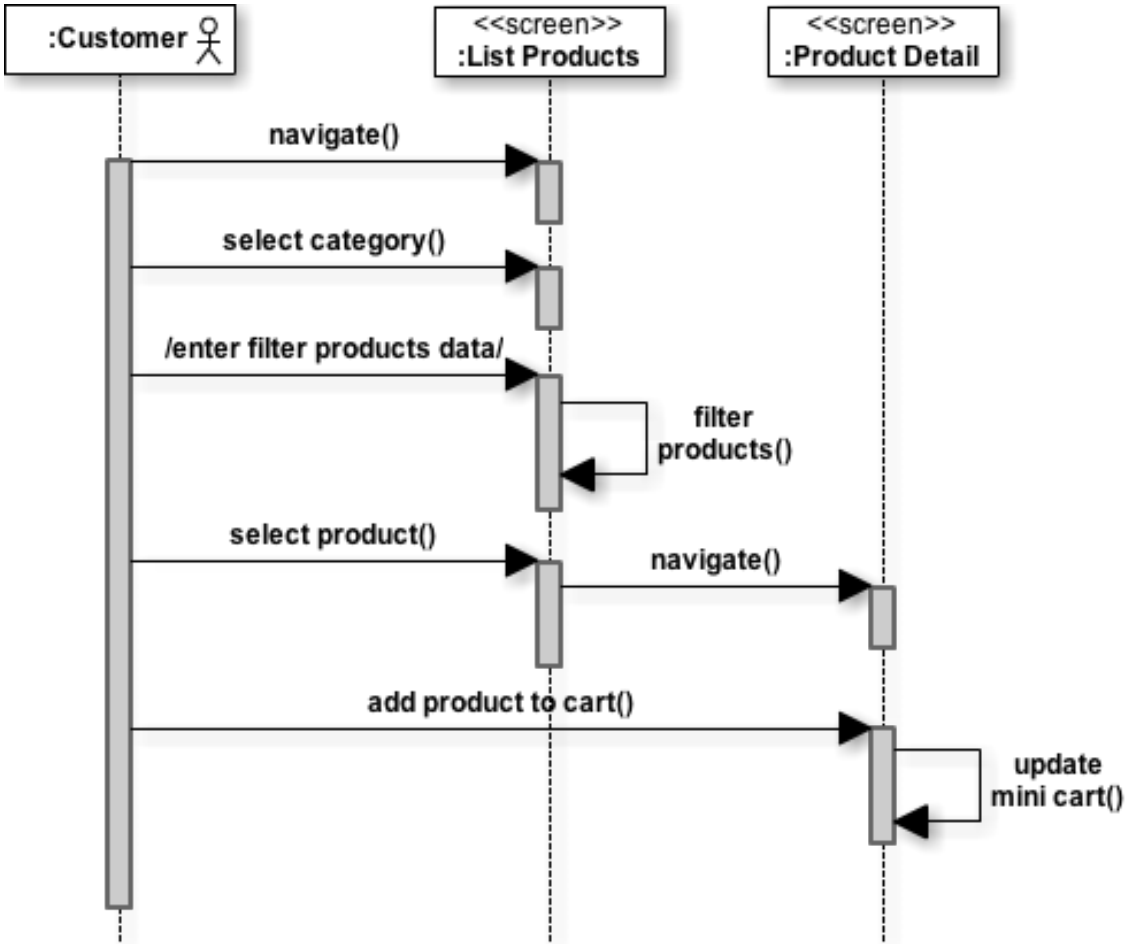

Figure 2.22: Storyboard sequence of the browse catalog top-level use case - Guya E-commerce

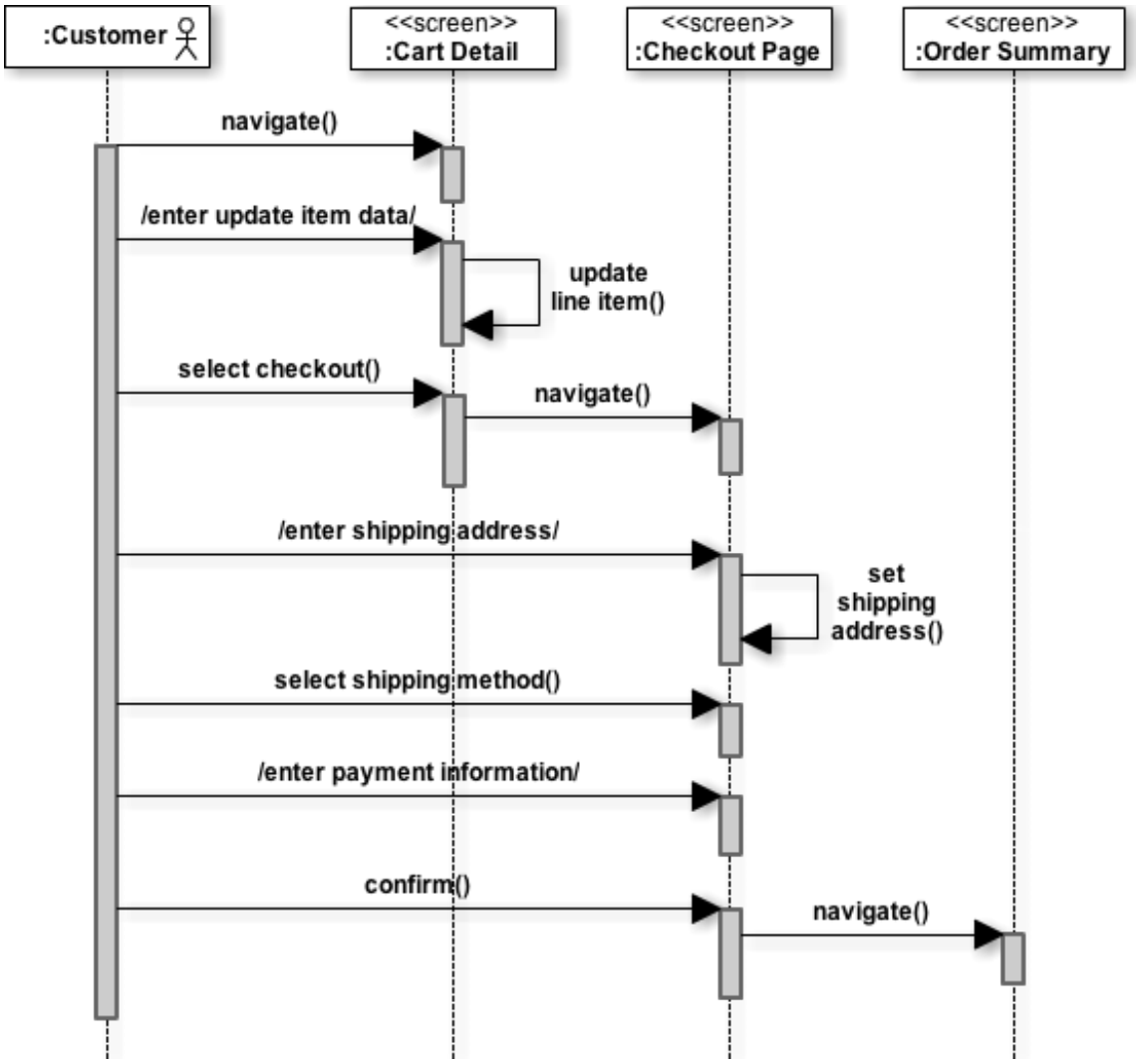

Figure 2.23: Storyboard sequence of the checkout top-level use case - Guya E-commerce

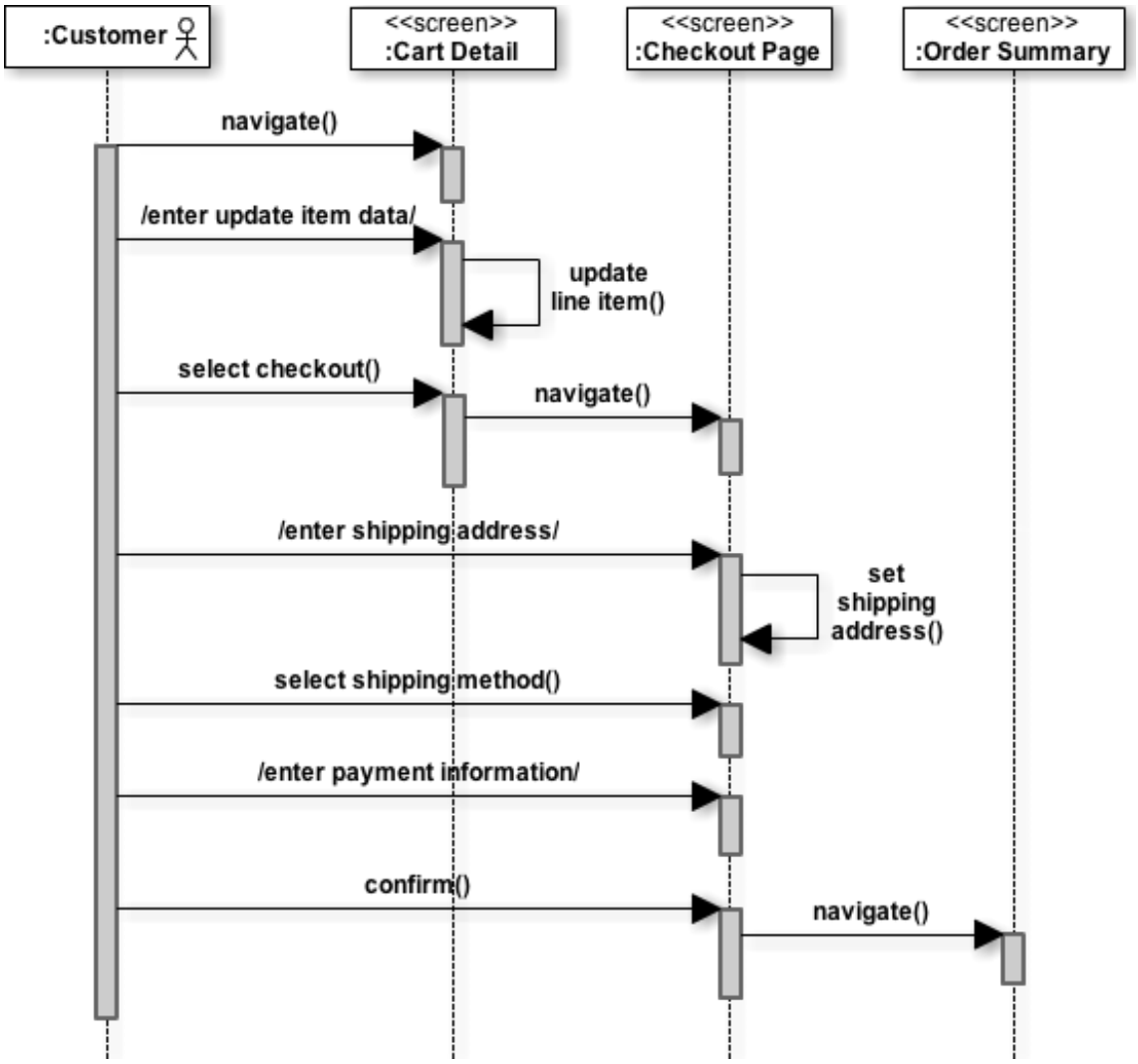

Figure 2.24: Storyboard sequence of the check order top-level use case - Guya E-commerce

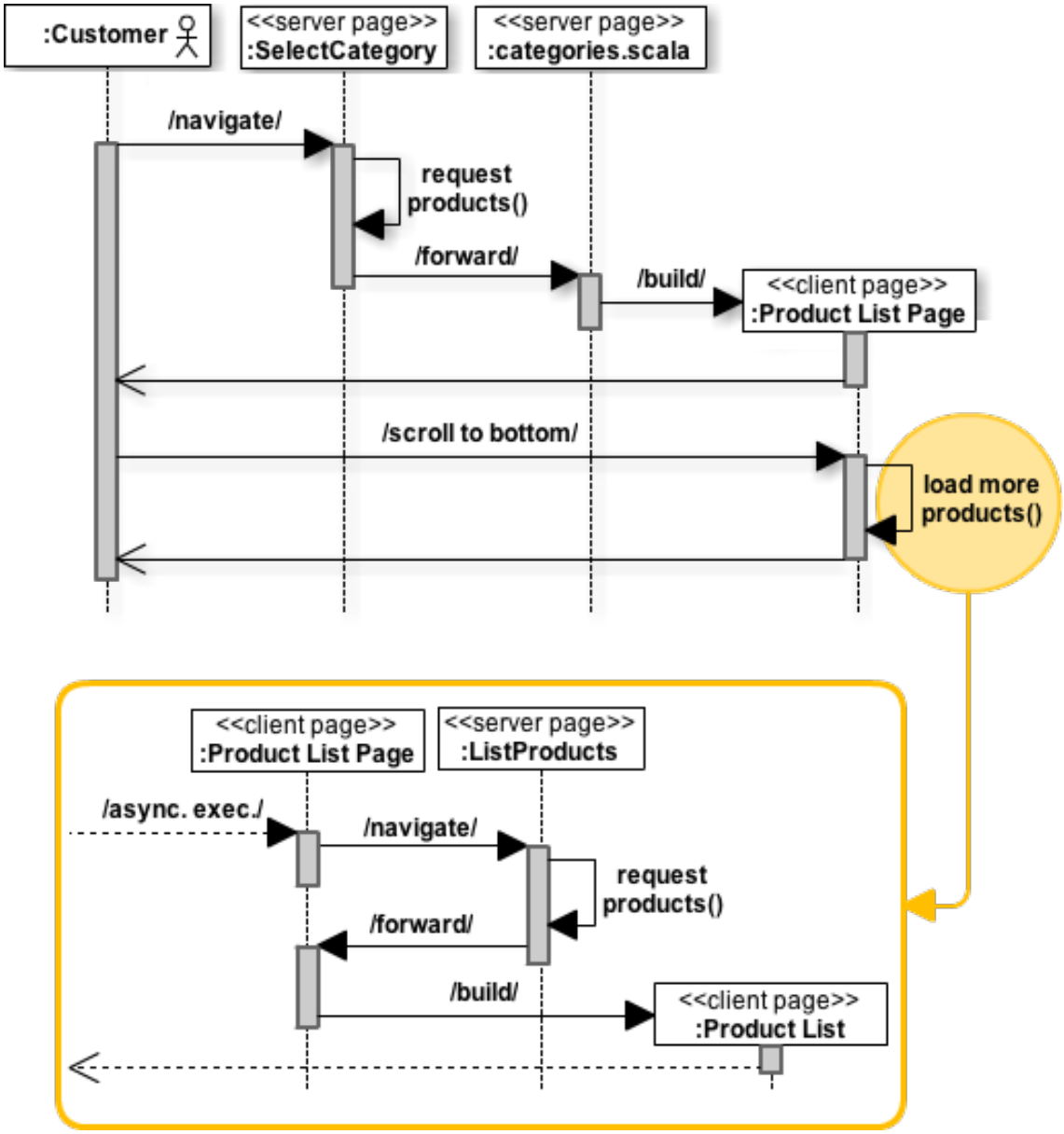

Figure 2.25: Internal design sequence diagram of the pagination - Guya E-commerce

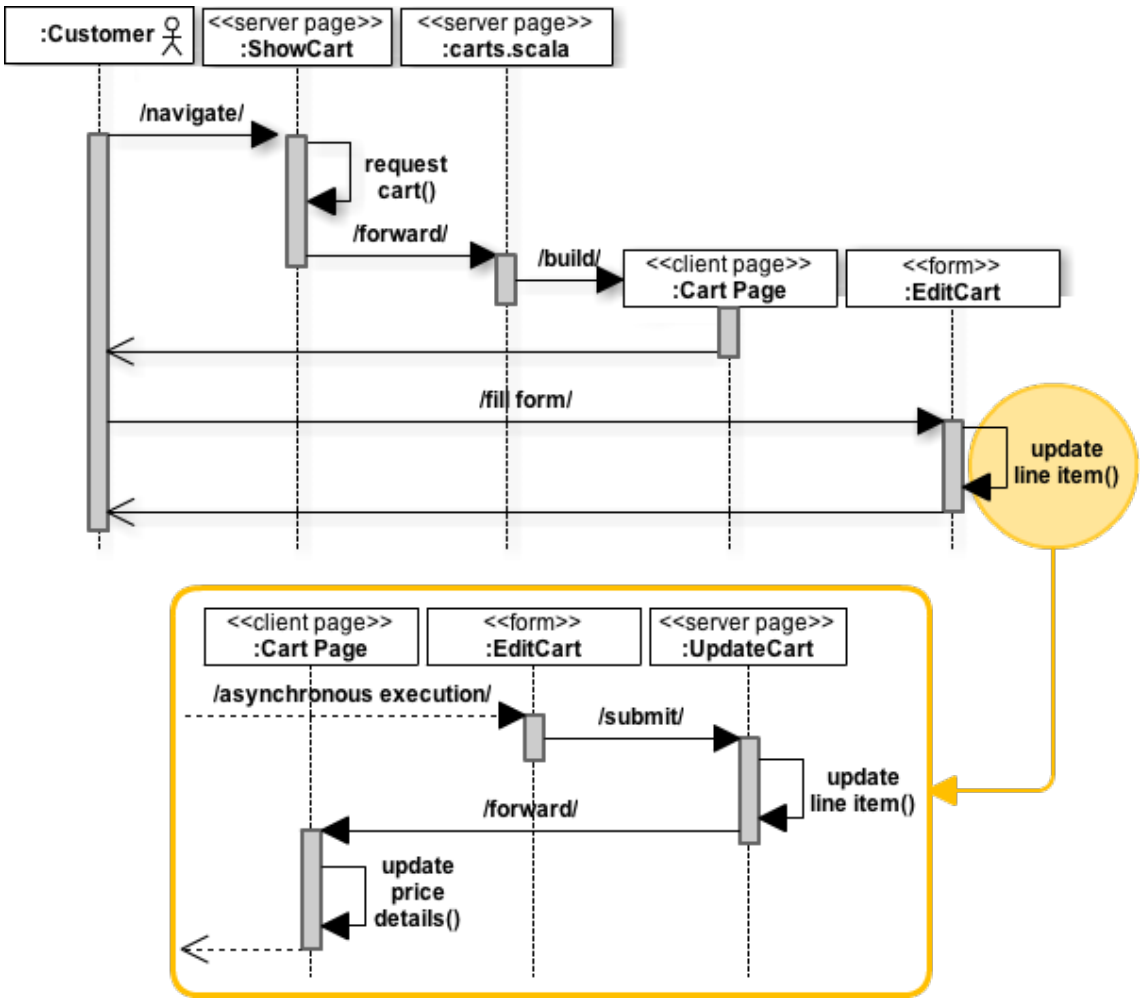

Figure 2.26: Internal design sequence diagram of the update item in cart - Guya E-commerce

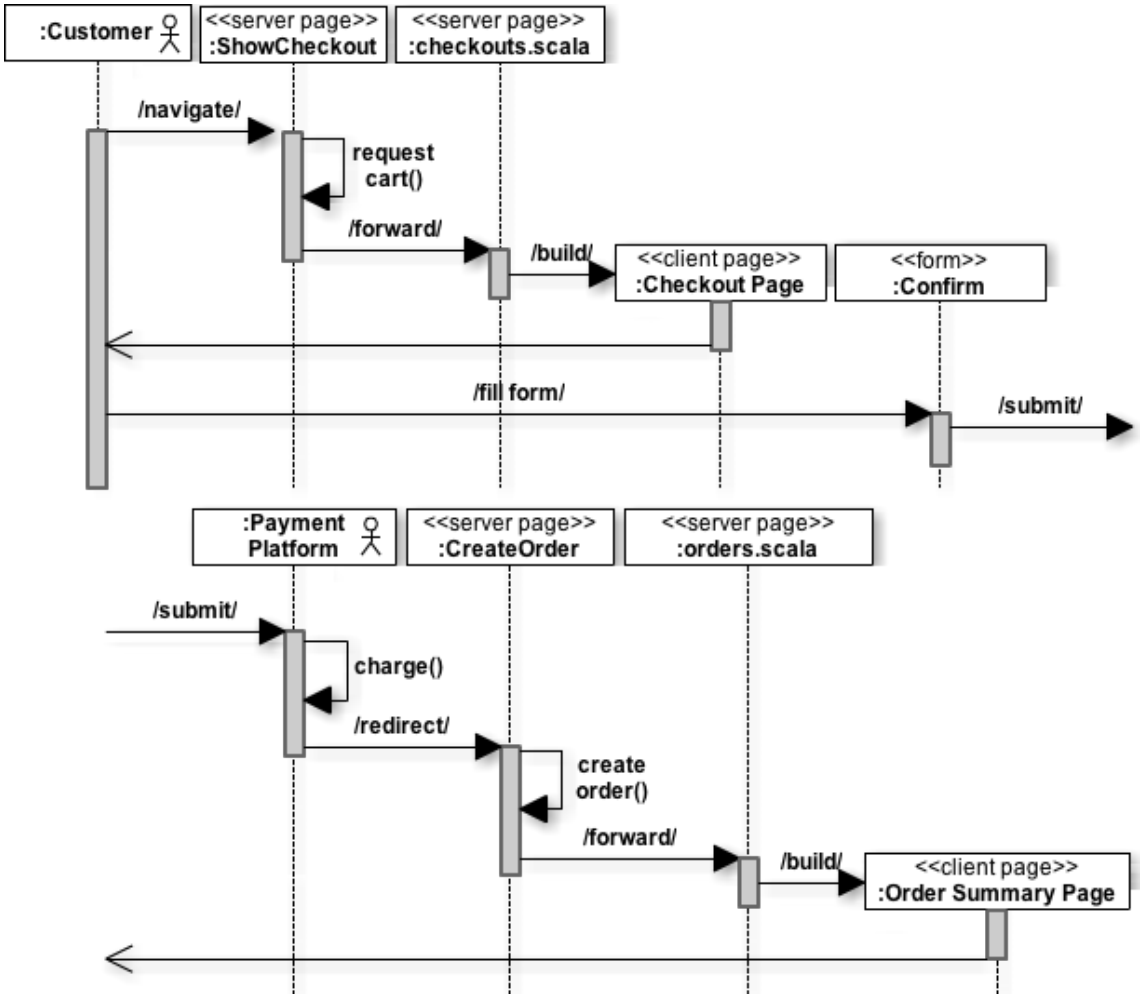

Figure 2.27: Internal design sequence diagram of the place order and payment - Guya E-commerce

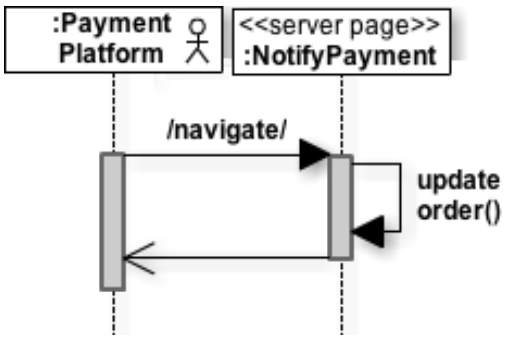

Figure 2.28: Internal design sequence diagram of the notification event in the payment - Guya E-commerce

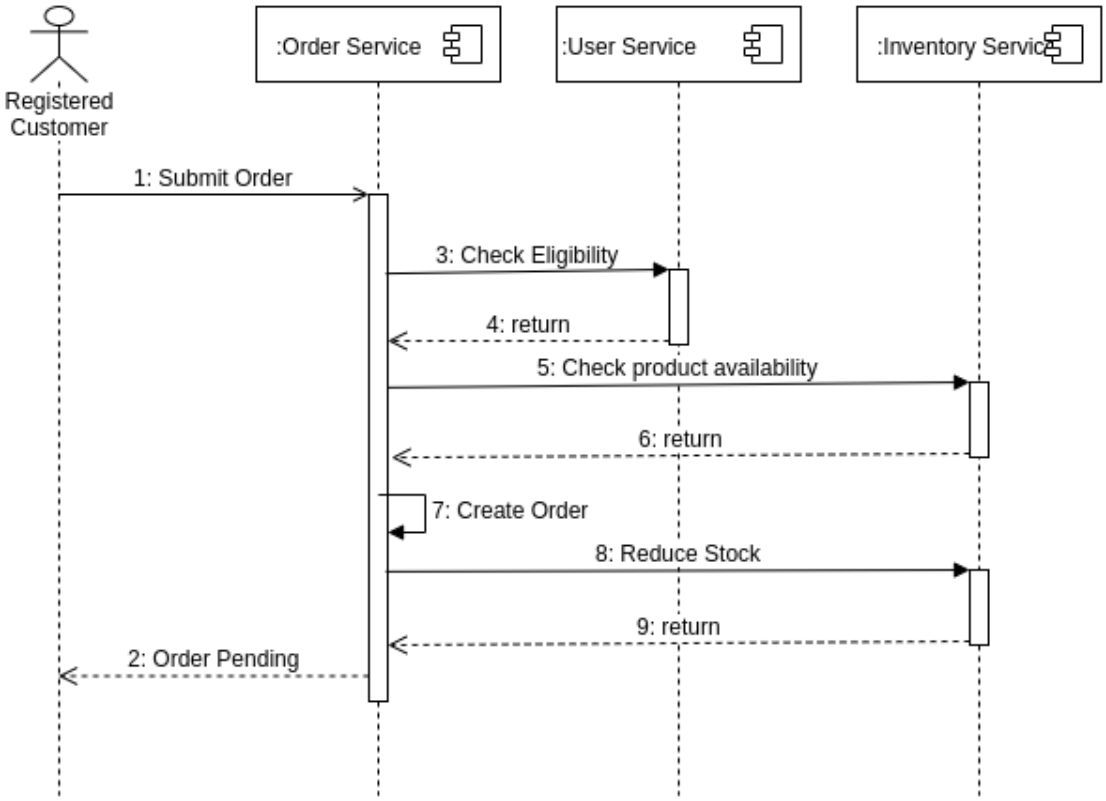

Figure 2.29: Ordering sequence diagram - Guya E-commerce

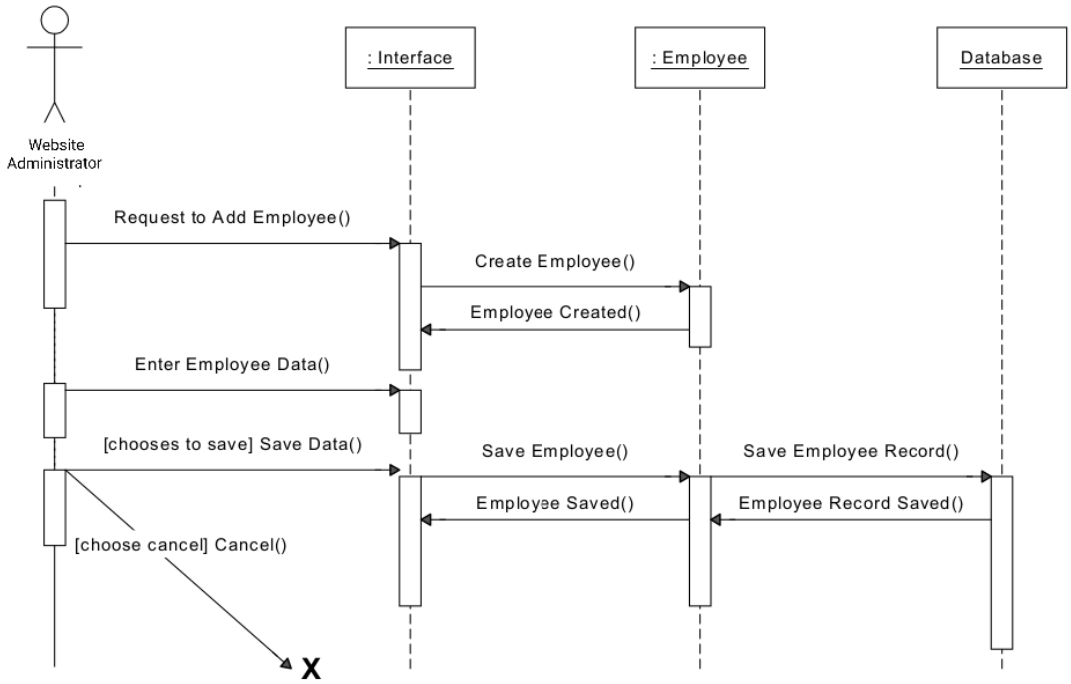

Figure 2.30: Add employee/staff sequence diagram - Guya Express

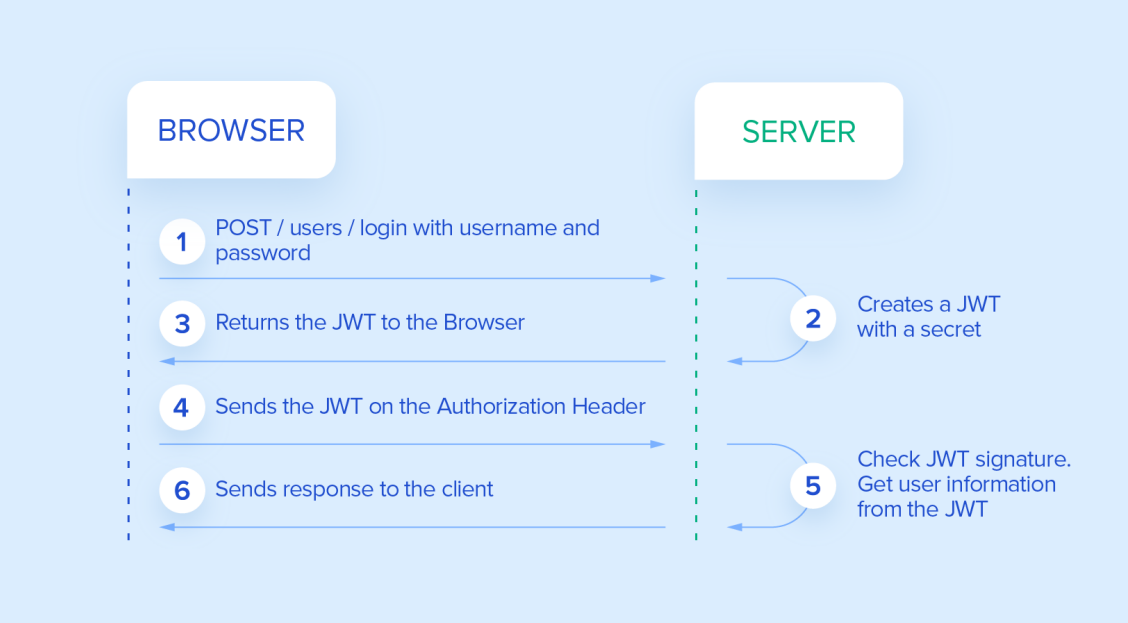

Figure 2.31: JWT security authentication - Guya E-commerce and Guya Express

2.5.4 State Diagrams

There are two interesting state diagrams of this system, both related to the cart element. The first diagram (Figure 2.32) describes how a cart instance changes until it becomes a complete order. As the diagram below shows, the current cart is the initial state, which allows to change its contents in multiple ways, such as adding or removing line items or selecting a shipping address. Once the checkout is finished the cart becomes an order, being this an irreversible change. From now on the order can only change from an open to a complete state, and vice versa.

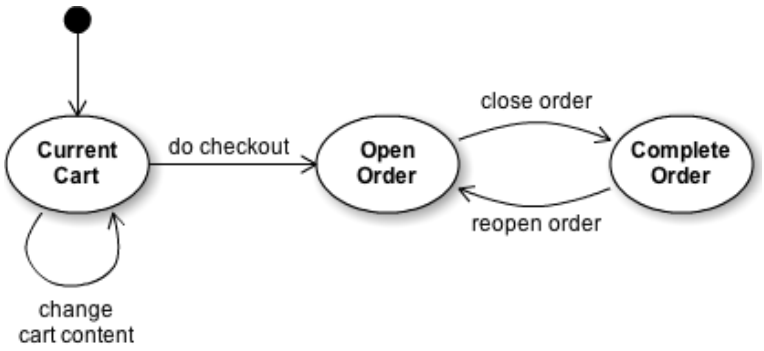

Figure 2.32: State diagram of the cart class - Guya E-commerce

The second diagram (Figure 3.12) describes the whole process of managing the shopping cart and eventually purchasing these products in the checkout process. This diagram will become especially useful when designing the checkout interface, as it clearly displays the requirements of each step of the checkout process.

At the beginning of the process a new cart is created. Once the cart contains an item it can be further updated, then at any moment the user can start or exit the checkout process. Initially the checkout process requires a shipping address to display the shipping methods, then it requires a shipping method to display billing options. Of course this sequence can be skipped if the cart has already these requirements. When the user provides the billing information and finalizes the checkout, the system charges the customer. The order is then created after the payment platform confirms that the payment was successful. The moment the previous cart becomes an order, a new cart is created for the customer in order to start the process once again.

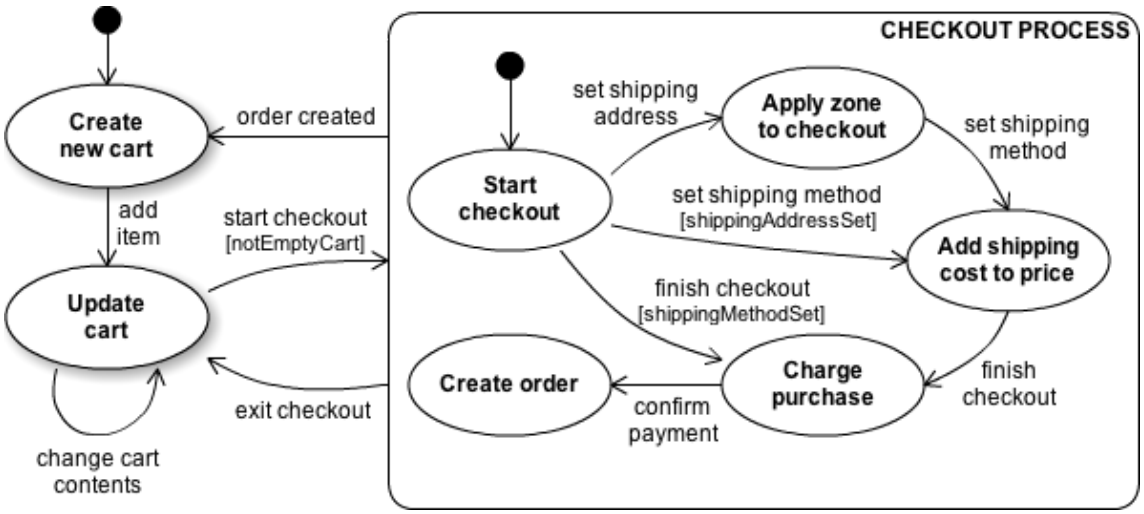

Figure 2.33: State diagram of the cart class - Guya E-commerce

2.5.5 Analysis Class Diagram

In the world of information architecture, UML still has a strong foothold. Therefore class diagrams are still desired, even when designing RESTful APIs, We have there sought a way to represent that pieces that make up an API as UML and found that although this is somewhat intuitive, there is not one set way of doing this.

Identifying variable (properties) which is done by writing <<representation>> below it is the representation name, identifying resources is done by writing <<resource>> below the resource is the name of REST API name. In the methods variables, variable that begins with a capital letter represent a set(array or json) of messages, except for Accept-Language which is a header, which are refereed to (mapped to) representation and for the arrow is a path. For example for login resource the resource name is login, representation/message is Login, path is /v1/users/login and method will be put(Accept-Language, [username, password]).

Figure 2.34: Class diagram (API diagram) - Guya E-commerce

Chapter 3

System Design

The software design describes the final details of a system before it is implemented. During the design process decisions are taken in order to meet the gathered requirements, decisions that are then applied to the system defined in the section Specification 3. Both physical and logical designs of the system are described in detail in the current chapter (sections System Physical Architecture 4.1 and System Logical Architecture 4.2), with an overview of how the resulting product needs to be implemented. Every technology used is carefully justified and the major characteristics are explained (section Description of Used Technologies).

The selection of a technology is a decisive process aimed to obtain the optimal results of a project. An unwise decision can sometimes seriously affect the total resources needed or the successful fulfillment of the proposed objectives. It is also important to design correctly the structure of the system, for example identifying and applying the software patterns that can solve existing problems in this particular project.

3.1 Design Class Diagram

3.1.1 Class Diagram Description

3.2 Database Design

3.2.1 Normalization

3.2.2 Physical Data Model

3.3 User Interface Design

Undoubtedly, it is difficult to imagine how a new system will look and behave from reading a textual requirements specification. There are three ways to visualize textual requirements:

Wireframes: are schematic pages used as a visual guide that shows the pilot system framework. They aim to represent functionality without displaying Visual elements.

Mockups: reflect the design choices for color schemes, layouts, typography, iconography, the visuals of navigation, and the overall system design solutions; are static and unclickable.

Prototypes: are clickable system representations that display how users can interact with the system in a real world; enable designers to test users journey and find potential issues throughout the interaction flow.

3.3.1 Website Wierframe Visual Guides

A website wireframe, also known as a page schematic or screen blueprint, is a visual guide that represents the skeletal framework of a website. Wireframes are created for the purpose of arranging elements to best accomplish a particular purpose. The purpose is usually being informed by a business objective and a creative idea. The wireframe depicts the page layout or arrangement of the website's content, including interface elements and navigational systems, and how they work together. The wireframe usually lacks typographic style, color, or graphics, since the main focus lies in functionality, behavior, and priority of content. In other words, it focuses

on what a screen does, not what it looks like. Wireframes can be pencil drawings or sketches on a whiteboard, or they can be produced by means of a broad array of free or commercial software applications, the type of software application we used to sketch the diagrams is stated in subsection 1.8.3. Wireframes are generally created by business analysts, user experience designers, developers, visual designers, and by those with expertise in interaction design, information architecture and user research, but in our case; since it is a Capstone project we do not have a labor division only concerned with user interface design. Below are wireframe figures for both websites.

Display Products

Product listing is the first functionality that a customer uses when arriving at the web-shop and the one he will be using for longer periods of time, so it needs to have a comfortable way to display and paginate the products. At best, traditional web-shops usually have very rigid ways of listing products: pagination consists of an interface that allows to select the page and the amount of products per page, while display options let the user select between a list or a grid type of view.

So instead of showing a traditional shop catalog, it was considered a better option to let the products flow freely through the web page, using all the width and height possible to show at once the maximum amount of products to the user (Figure 3.1). On the other hand, the pagination needs to be natural without losing already viewed products, so when the user reaches the bottom of the page new products should appear automatically under the previous ones.

The product thumbnails, besides price and name, will be showing a picture of the product and the different color variants. The selected variant will be highlighted, and when hovering a different color the thumbnail will be updated with that variant information, such as picture and price, if different. The thumbnail will also include a button to add the selected product variant to the shopping cart. In case the product has different sizes available, when hovering the button a list of the different sizes will be shown, so that the user can select the desired size he wants to add to the cart.

When clicking on a product thumbnail the user will be redirected to the product detail of the variant he had selected (Figure 3.2), if any. There he can select any other color variant, in which case a new page will be loaded in order to update the URL, to let the user share the product URL that points to this particular color. He can also select a different size, but in this case the page is not reloading, as it

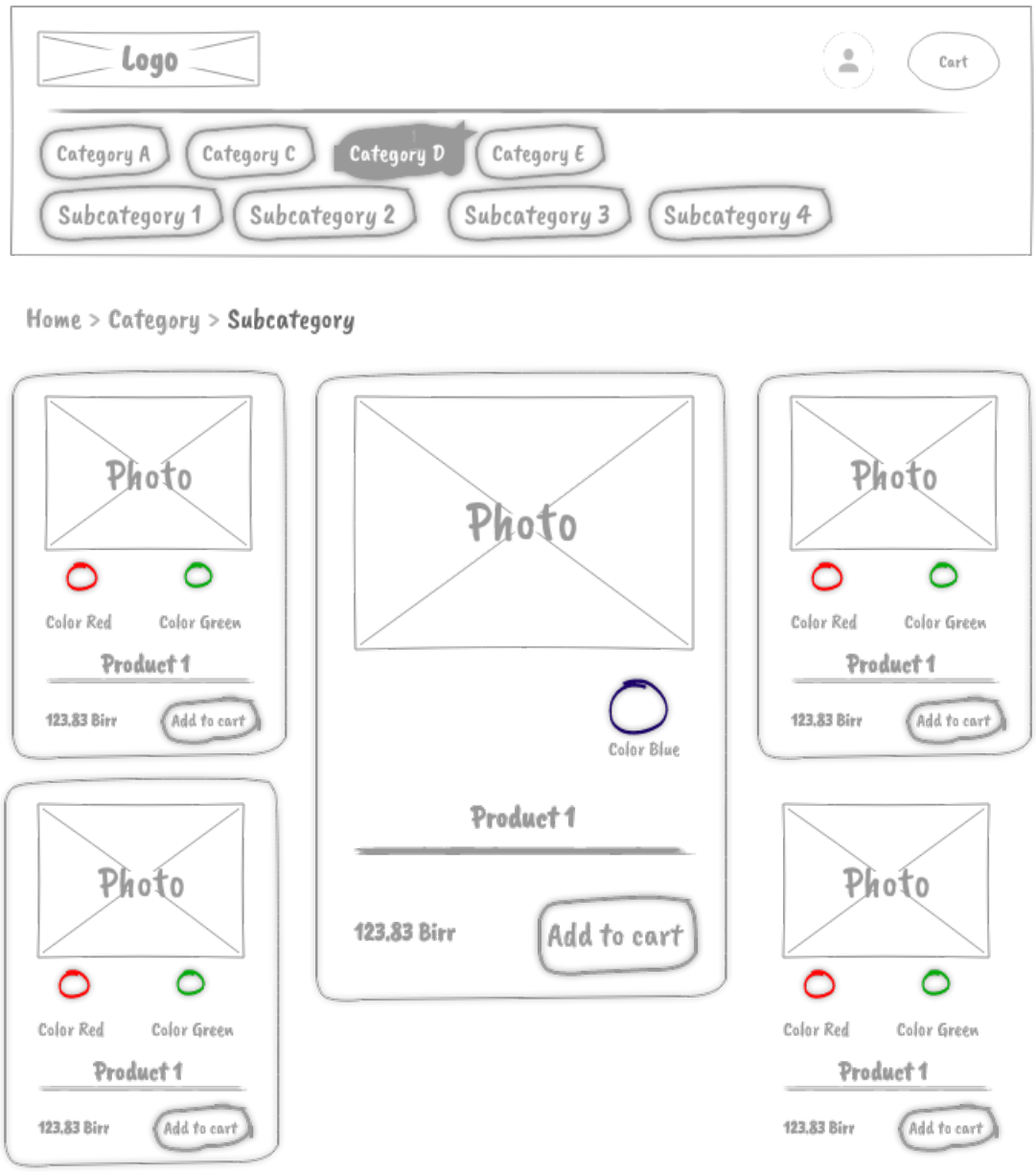

Figure 3.1: Wireframe prototype of the product listing screen, filtering by category - Guya E-commerce

was considered that the user does not have a need to share the exact size. Below one can add the selected product variant to the cart, optionally indicating the exact quantity.

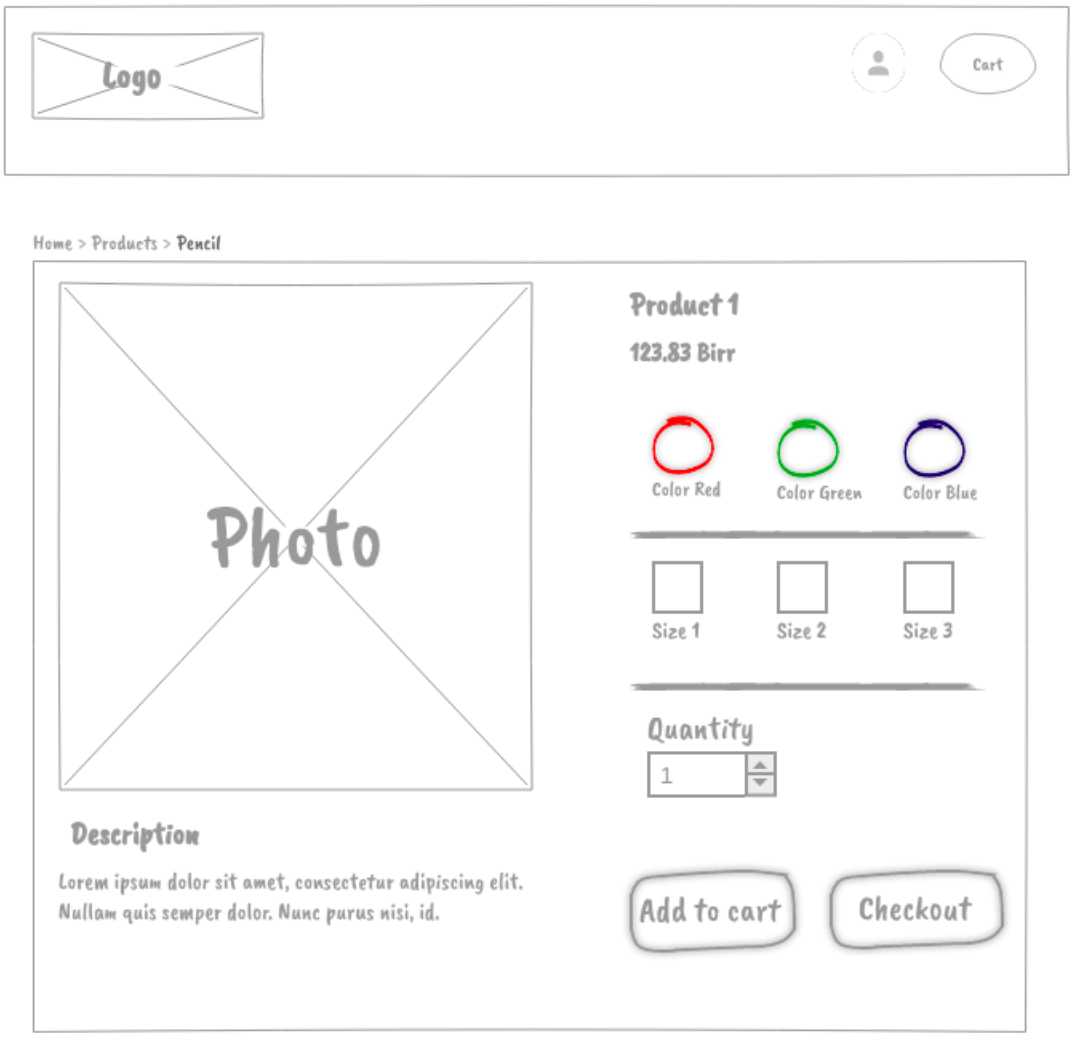

Figure 3.2: Wireframe prototype of the product detail screen - Guya E-commerce

The header contains a mini-cart and the login panel throughout the website. In any product list or product detail page, the header also contains the categories and subcategories of the shop to let the user filter products by category. The rest of the pages should contain a button to allow the user go back to the last category or product he visited. When scrolling, the header is always kept at the top of the page. Below the header, a breadcrumb is showing the current category path.

Whenever a product is added to the cart, the mini-cart located on the header appears for a few seconds, to let the customer know that the product was added successfully. At any time the user can see again the contents of his shopping cart when hovering the cart button on the header, that will be closed automatically when moving the cursor away from the mini-cart.

Purchase products

In order to start the checkout process, the user will first access the cart detail page by clicking on the cart button. This page shows the items and their details, along with the possibility to remove them or change the number of units of each item (Figure 3.3). Both actions are performed without reloading the page, just updating the contents of the shopping cart and the pricing details accordingly.

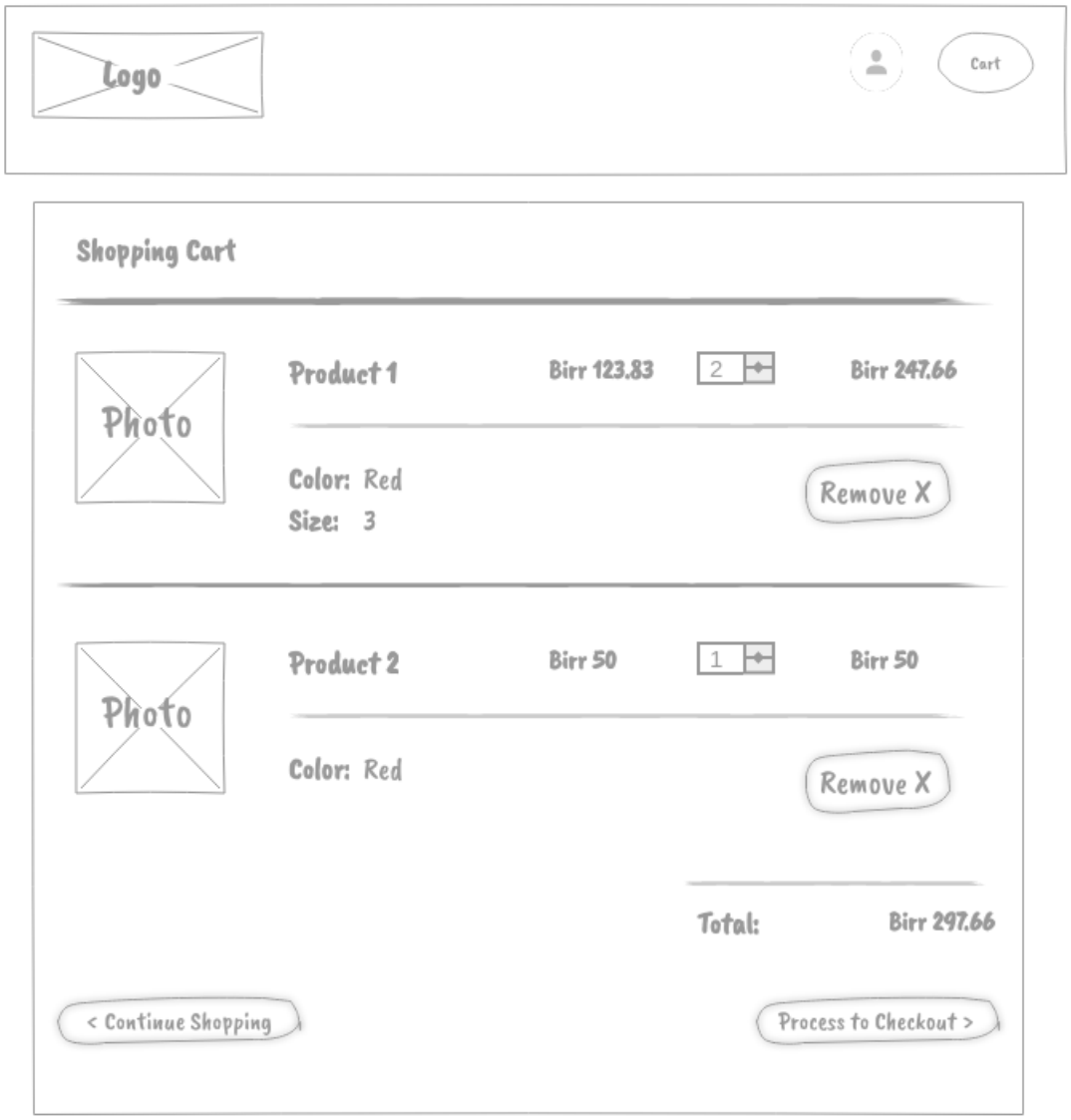

Figure 3.3: Wireframe prototype of the shopping cart detail screen - Guya E-commerce

The checkout page can be accessed from both mini-cart and cart detail page. The checkout page is probably one of the least frequented pages of a web-shop, but it is for sure the most important when it comes to user experience. The customer needs to feel he has control of the flow and that he is able to quit at any time. The checkout needs to be a secure and robust environment to the user.

Traditional web-shops usually reload when moving from one checkout step to the other, and it can be sometimes difficult to change the data of a step that is not immediately before the active one. In some cases it is also hard to know what changes are modifying the price or to review what was entered on previous steps. All these issues are affecting negatively the feeling of control the user has.

Figure 3.4: Wireframe prototype of the shopping cart detail screen - Guya E-commerce

For this design it was considered a good idea to display all the steps throughout the page as sections that can be expanded, so that the user modifies them (see Figure 3.4). Once edited, the section closes again and displays a summary with the selected options. Every change automatically updates the pricing details that are always shown at the bottom of the page. As a way of guiding the customer through the checkout process, the user can only open new sections sequentially. Also when a form is still not available due to missing requirements (e.g. shipping method cannot be displayed until shipping address is set) a message will be shown instead until the requirements are met. The checkout is divided into three steps: first a cart summary, to verify the items are correct; second the shipping information, to determine where and how the goods are being delivered; and third the billing information, to select the way the products are being paid. Both shipping and billing sections have on the left side a form to set the postal address and on the right side the shipping and payment options, respectively. When the customer is logged in, his address book will appear on the right side, allowing him to select one of his addresses, which data will then be copied to the corresponding address form.

User Management

Before attempting to access his profile page, the user needs to identify himself to the system. This is done in the login screen, a page that also contains a form to register into the system (see Figure 3.5). In case the user forgot his password, the login form contains an option to recover it, which renders a modal window where an email address is requested when the option is clicked.

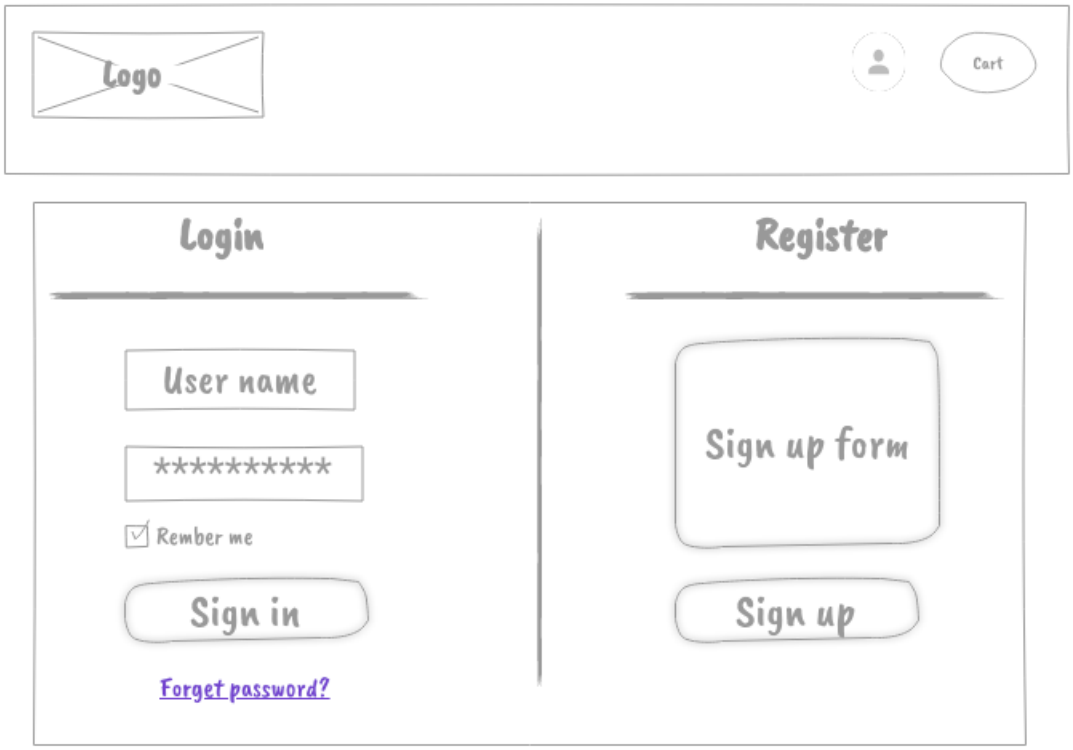

Figure 3.5: Wireframe prototype of the login screen - Guya E-commerce and Express

Submitting this form will send an email to the user with a new URL, that redirects to the same login page but with a different modal window to enter a new password. Once the password is submitted the modal window closes, thus showing the login form again to allow the user enter his new credentials.

Figure 3.6: Wireframe prototype of the user profile screen, order list section - Guya E-commerce

The user profile is a single page with sections to change user data, password, manage the address book and view the list of orders (see Figure 3.6). The latter consists of some stockable sections, each one containing all information about a particular order, such as the products purchased, the price details and all shipping and billing related information. When clicking on a section, this one expands showing its contents, while all other sections remain closed.

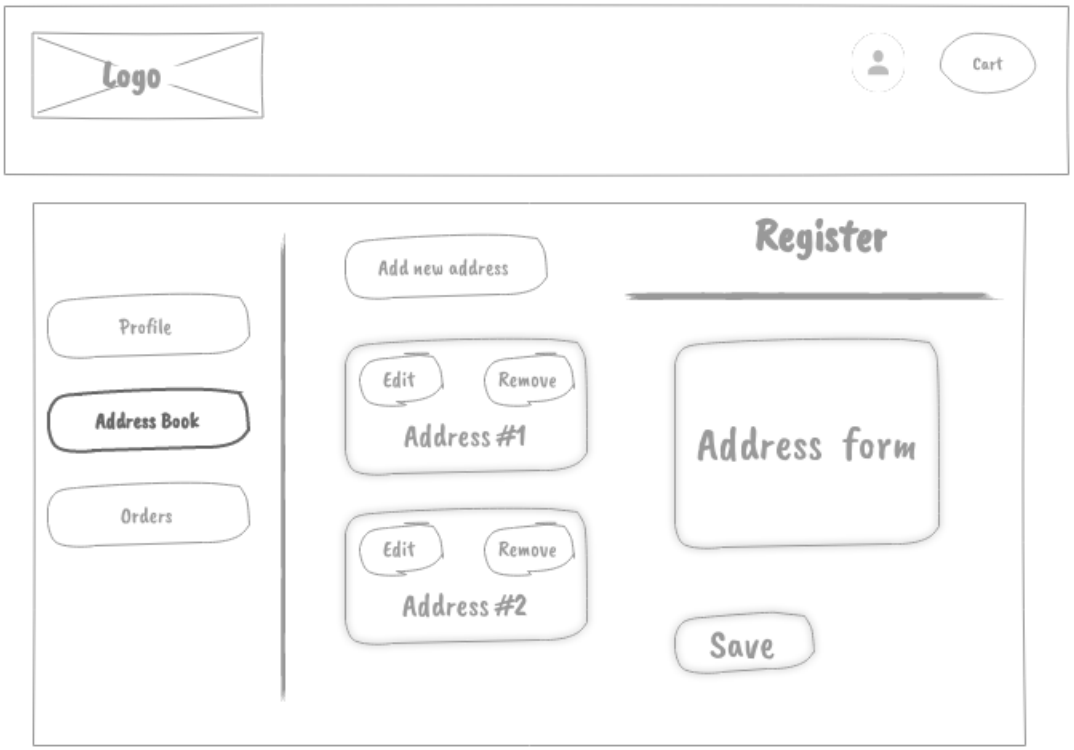

Figure 3.7: Wireframe prototype of the user profile screen, address book section - Guya E-commerce

The address book is the only section with a slightly complex design. This component has a list of existing addresses on the left and an empty form on the right to add a new address (Figure 3.7). When the user selects an address the form changes into edition mode, highlighting the address and copying its data to the empty form. A button at the top allows the user to return the form to its initial mode. Whenever the user adds, updates or removes an address, the list of addresses is updated accordingly.

3.3.2 Mail Interface Templates

Figure 3.8: Invoice Template - Guya E-commerce

Figure 3.9: Welcome Email Template

Guya

Welcome, {{name}}!

Thanks for trying Guya. We're thrilled to have you on board. To get the most out of Guya, browse our catalogs:

Browse Catalogs

For reference, here's your login information:

Login Page: {{login_url}}
Username: {{username}}

You've started a {{trial_length}} day trial. You can upgrade to a paying account or cancel any time.

Trial Start Date: {{trial_start_date}}
Trial End Date: {{trial_end_date}}

If you have any questions, feel free to email our customer success team. (We're lightning quick at replying.) We also offer live chat during business hours.

Thanks,
Chala and the Guya Team

P.S. Need immediate help getting started? Check out our help documentation. Or, just reply to this email, the Guya support team is always ready to help!

If you're having trouble with the button above, copy and paste the URL below into your web browser.

{{action_url}}

Figure 3.10: Three days left Trail Template

Guya

Your Guya trial ends in 3 days

Thanks for trying Guya. You've added a lot of data, so here are several options for you to consider going forward.

Upgrade your account

If you're not ready to upgrade to a paying account, you have a few other options available to you…

Restart your trial - If you didn't get a chance to fully try out the product or need a little more time to evaluate, just let us know. Simply reply to this email and we'll extend your trial period.

Share feedback - If Guya isn't right for you, let us know what you were looking for and we might be able to suggest some alternatives that might be a better fit.

Export your data - If Guya wasn't a good fit, you can export your data for use elsewhere.

Close your account - You can close your account and delete your data. Or, do nothing and we'll automatically close it and delete your data for you in 90 days. But don't worry, we'll send you another email before that happens.

Regardless of your choice, we want to say thank you for trying Guya. We know it's an investment of your time, and we appreciate you giving us a chance.

Thanks,
Chala and the Guya Team

P.S. If you have any questions or need any help, please don't hesitate to reach out. You can reply to this email or join us on live chat during business hours.

Guya, PLC
Addis Abeba, Ethiopia

Figure 3.11: Trial Expired Template

Guya
Guya Logo

Your Guya trial expired

Thanks for trying Guya. You've added a lot of data, so here are several options for you to consider going forward.

Upgrade your account

If you're not ready to upgrade to a paying account, you have a few other options available to you…

Restart your trial - If you didn't get a chance to fully try out the product or need a little more time to evaluate, just let us know. Simply reply to this email and we'll extend your trial period.

Share feedback - If Guya isn't right for you, let us know what you were looking for and we might be able to suggest some alternatives that might be a better fit.

Export your data - If Guya wasn't a good fit, you can export your data for use elsewhere.

Close your account - You can close your account and delete your data. Or, do nothing and we'll automatically close it and delete your data for you in 90 days. But don't worry, we'll send you another email before that happens.

Regardless of your choice, we want to say thank you for trying Guya. We know it's an investment of your time, and we appreciate you giving us a chance.

Thanks,
Kebed and the Guya Team

P.S. If you have any questions or need any help, please don't hesitate to reach out. You can reply to this email or join us on live chat during business hours.

Figure 3.12: Password Reset Template

Guya
Guya Logo

Hi {{name}},

You recently requested to reset your password for your Guya account. Use the button below to reset it. **This password reset is only valid for the next 24 hours.**

Reset password

For security, this request was received from a {{operating_system}} device using {{browser_name}}. If you did not request a password reset, please ignore this email or contact support if you have questions.

Thanks,
The Guya Team

If you're having trouble with the button above, click below link.

Guya Website

Guya, PLC
Addis Abeba, Ethiopia
Lafto

Figure 3.13: Password Reset Failed Template

Guya
Guya Logo

We received a request to reset the password to access [Product Name] with your email address ({{email_address}}) from a {{operating_system}} device using {{browser_name}}, but we were unable to find an account associated with this address.

If you use Guya and were expecting this email, consider trying to request a password reset using the email address associated with your account.

Try a different email

If you do not use Guya or did not request a password reset, please ignore this email or contact support if you have questions.

Thanks,
The Guya Team

If you're having trouble with the button above, click below link.

Guya Website

Guya, PLC
Addis Abeba, Ethiopia
Lafto

3.4 Shipping Label Templates

Labels are used at every checkpoint of Guya Express shipping process. Starting from pickup point (warehouse or Guya Express location). These labels are used to identify the packages and assign them to correct delivery vans. The labels are designed to be read by both machines and humans.

3.4.1 Address Formats

A post code (also known locally in various English speaking countries throughout the world as a postcode, post code, PIN or ZIP code) is a series of letters or digits or both, sometimes including spaces or punctuation, included in a postal address for the purpose of sorting mail. Conversion is done using post code references listed in Appendix C.

3.5 System Architecture

3.5.1 Component Diagram

3.5.2 Deployment Diagram

3.5.3 Network Diagram

3.5.4 System Physical Architecture

3.5.5 System Logical Architecture

3.5.6 Description of Used Technologies

Docker

Docker Compose

ReactJs

ELK Stack

Logstash

Figure 3.14: handlebars.js logo.

Elastic Search

kibana

Kong Api Gateway

Konga

Sass Css

Openmap

Makefile

Typescript

Webpack

Bit.dev

Storybook

PatternLab

Jade

SQLAlchemy

Handlebars.js

Handlebars is the web template system used in this project to manage client-side templates. It is a JavaScript implementation of the platform-independent Mustache project, that allows to render input data in a template using a very clean syntax. Mustache has a so-called logic-less. template syntax because there are no explicit

control flow statements, all needed logic comes exclusively from the data in the form of booleans, arrays or lambdas[1] .On the contrary Handlebars templates are compiled, allowing to define helpers to reuse code for presentation. It also comes with built-in helpers to control the default flow of the template, such as loops or conditional statements. Handlebars comes also with better support for paths to access the data. In short, this solution makes easier to implement templates than Mustache while still keeping logic separated from presentation. There is another project, Dust.js, with the same strong points as Handlebars and with useful additional features like template composition. Apparently is a better choice but the project has been abandoned for two years, maybe the reason why Handlebars has the largest community. During the last year LinkedIn has been contributing actively to a separated Dust.js project that the company is using for its website [Bas12]. Regardless it has been considered that Handlebars is a safer option, since the additional features are not indispensable for this project.

[1]Lambda is an anonymous function, meaning that it is not bound to any kind of identifier.

Chapter 4

Implementation

Implementation is the part of SDLC in which necessary tasks are performed to put the new system in effect. Implementation is done after designing and coding stage. Implementation is comprised of the involvement of the efforts of the user department, who determines that the software is made as they wanted. The data processing department, inputs the previous data from the system in to the new system to get the new system running. Training of staffs who would use the system this is mostly done by conducting a training session where the system users are instructed on how to use the system. User manual or video tutorial provide a great resource which can later on be used by the system users when then have any query about the system.

4.1 Overview Of Programming Language Used

4.1.1 Python

4.1.2 Ruby

4.1.3 R

4.1.4 PHP

4.1.5 Java

4.1.6 Javascript

4.1.7 Luna

4.1.8 Css

4.2 Algorithms Used

4.3 Development Environment

The development pipeline consists of three stages: development, staging and production. The development environment is a portable machine with Linux based as operative system. The source code is developed with the support of the text editor (i.e not an IDE), mainly used for its debugging and code edition features. Google Chrome is the preferred web browser, which has a built in developer tool, Chrome DevTools, highly useful to inspect HTML DOM and CSS, as well as debugging JavaScript code.

Git is used as a revision control system. The most notable characteristic of Git is its distributed system, in which each user has his own local repository where changes are committed. Only when the developer deems it convenient, the local changes are then synchronized with the remote repository, thus making them accessible to the whole team. The remote repository is hosted by GitHub, with a very interesting social networking functionality useful for future collaboration with the developer community.

In everydays development, Continuous Deployment technique is followed (see Figure

4.1). Jenkins and TravisCI is used in the staging environment as a continuous deployment tool, triggering a process to deploy the system every time changes are pushed to the remote repository. This process consists of building and testing the system, running automated acceptance test and deploying the project to production once staging is stable and ready. Whenever these steps fail at some point, the process is stopped and feedback is registered in order to solve the problem.

For this to work, every new feature developed for the system should always go along with tests validating that feature. Automating these tests on a staging system allows to flawlessly merge small pieces of code with the mainline of the project at a rapid pace. The code merging also triggers a review process with all developers involved, which results in higher code quality. Besides, acceptance tests that verify the business logic can be run each time to ensure that the project requirements are met.

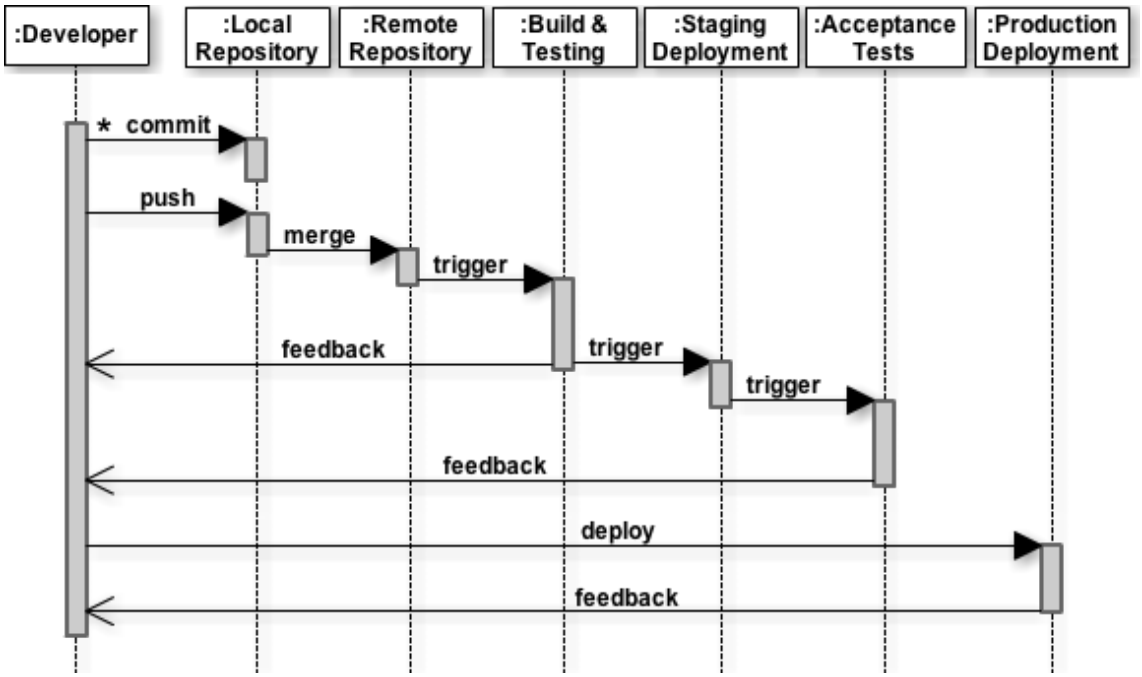

Figure 4.1: Sequence diagram of the continuous delivery process

Chapter 5

Testing

The reason behind testing was to find errors. Every program or software has errors in it, against the common view that there are no errors in it if the program or softare is working executing the programs with the intention of finding the errors in it is therefore testing; hence a successful test is one which finds errors. Testing is an activity however, it is restricted to being performed after the development phase is complete, but is carried paraller with all stages of system development, starting with requirement specificaton.

Test cases were devised with a purpose in mind. A test case is a set of data that a system will process as normal input. The software units developed in the system are modules and routines that are assembled and integrated to perform the required function of the system. Test results once gathered and evaluted, provide a qualitative indication of the software quality and reliability and serve as the basis for design modification if required. In this phase, testing is done at different levels. Actually testing phase of the implementations works accurately and efficently before live operation commences.

The primary objective of testing includes:-

- To identify defects in the application.
- The most important role of testing is simply to provide information.
- To check the proper working of the application while CRUD functions works properly.

5.1 Functional Tests

5.1.1 Acceptance Tests

Acceptance tests are ensuring that the main requirements agreed for the project are met in the current version. So they need to prove that it is possible for a user to achieve at least the main goals for which he is using the web application, reason why they will be covering the top-level use cases described in the early section Use Case Model. Given that acceptance tests are guaranteeing the correctness of the current version, it is imperative to use real data instead of mocking it.

These type of tests need to be supervised by the client of the product, usually non-technical people. This makes it a requirement to be easy to understand them by using a plain language to define the rules. Cucumber is used in this project as a tool to write these acceptance tests, allowing to write the rules in plain text (see Figure 6.5), while describing the technical details of each rule in Ruby in a separated file.

```
Feature: Browse catalog
  In order to buy products
  As a customer
  I want to browse the catalog and save those products of my interest

  Scenario: Add a product to the cart successfully
    Given I visit the web shop
    And I select a product
    When I add the product to the cart
    And I go to the cart
    Then I have only the chosen item
    And The total price is correctly calculated
```

Figure 5.1: Example of rules to verify that browsing catalog can be achieved, in browseCatalog.feature- Guya E-commerce

5.2 Performance Tests

Constantly during the project development, the tool Chrome DevTools was used to check the performance of the projects web, paying special attention to repeated calls or some unexpected behavior resulting from a flaw in the software. This way it was possible to detect a bug in the endless scroll for the product list, which executed repeated calls to the web application server even when there were no more product available. Also some methods with high response times could be fine-tuned with this tool.

Another tool from Google, PageSpeed Insights, is an online performance test that

analyzes the web page looking for elements that may affect its fast execution, such as resources that may unnecessary block the page. This test suggested to use minified versions of the JavaScript and CSS files, which was an easy task thanks to Webpack compiler built-in support.

It also reported that there were too many JavaScript and CSS files being fetched before the page could even be loaded, which meant that the browser had to wait until the last file was fetched in order to allow the user take control of it. It was necessary to find a solution for this, because in order to make the systems Reactjs components more understandable for the developer, the code was split into several files and classes, which in some cases raised the amount of files fetched to more than ten.

The best way to face this issue was to use RequireJS, an asynchronously module and file loader for JavaScript files, that allowed to fetch a JavaScript file in the background first, and then load all its dependencies in parallel. Although it required a bit of effort to integrate with the current code, the results were very satisfactory. It is also worth mentioning that almost all third-party client-side libraries are being fetched from CDNJS, a community-driven CDN[1] for web libraries that allows to decrease the loading time considerably.

[1]CDN stands for Content Management Network and it is a large distributed system of servers deployed in multiple data centers across the Internet, allowing to server content with high availability and performance.

Chapter 6

Conclusion and Recommendations

6.1 Conclusion

The internet has become a major resource in modern business, thus electronic shopping has gained significance not only form the entrepresneur's but also from the customer's point of view. For the entrepreneur, electronic shopping generates new business opportunities and for the customer,it makes comparative shopping possible.

As per a survey, most consumers of online stores are impulsive and usually make a decision to stay on a site within the first few seconds. "Website design is like a shop interior ". If the shop looks poor or like hundreds of other shops the customer is most likely to skip to the other site.

Hence we have designed the project to provide the user with easy navigation, retrieval of data and necessary feedback as much as possible. In this project, the user is provided with an e-commerce web site that can be used to buy any type of products online.

Language	Lines of Code
php	30

6.2 Recommendation and Future Enhancement

6.2.1 Recommendation

6.2.2 Future Enhancement

Online payment:

6.3 Our Conclusions

After explaining how we have contributed to make this project a reality, we did not want to finish this document without expressing before how this project has contributed in our academic and professional learning. This has been an exceptional year in which we had the opportunity to work in a very dynamic and innovative environment, surrounded by extremely talented and splendid people.

In this atmosphere we were encouraged to try new approaches and technologies to solve design and implementation problems. In fact, it is precisely the acquired technological knowledge we value the most of our learning, especially when compared with our previous experience, which basically consisted of traditional and outdated technologies. This obtained knowledge largely includes the complete functional testing of a web and mobile system, a pending subject in ours professional and academic life.

Working with a proper development environment was also a gratifying experience that we never had the chance to put in practice before. We enjoyed as well getting to know agile methodologies from inside instead of learning the theory from a book. And not only the methodology, but also the work philosophy of the company, which can be simply summarized with the feeling of joining a professional team that cares about doing things right from the start, valuing quality over quantity.

And of course, the development of this template became a very challenging and motivational project to us, with a concept completely different from those we have developed before. It was particularly a pleasure to work with requirements that involved a more humanistic approach of the solution, such as user and developer experience. And yet it was quite surprising how technological these requirements can be.

Appendices

Appendix A

Interview Questionnaire

This is considered as one of the best fact finding techniques. This includes direct interaction with the customer. It is considered as the best technique, because it is the only way the user can reveal the details and facts about his past, present and expected working, requirements, technologies, desertions to analysts. This is the information, which gives us the description of the system. we have to implement our logic and our own ideas and make this description to turn to a reality, to work as a real system which the user desires.

In the following appendix, some example, structured interview and questionnaire sample documents are given. These documents have been used or can be used, directly or as a model, for gathering data under the context of this project.

A.1 A List of Interview Questions Asked

A.1.1 List of Interview Questions Asked For the E-commerce

- What type of subscription fee do you prefer on Guya E-commerce:-
  1. Monthly Fixed Fee?
  2. Fee by Sells?

A.1.2 List of Interview Questions Asked For the Express

- The first service (From Whom & What), a sender receives; when he/she comes/arrives/inquires at the branch office.

- Summary of the whole management process; that takes place, in between a user and the service company.
- Questions From A Senders Point of View:-
    1. How sender contact branch office and get info about destination?
    2. How track the courier and get update.
    3. How much is the cost to send a courier according to weight?
    4. What is the route of courier and estimated time needed to deliver the courier?
    5. How handle such acts like those that pending or return backed to the client etc.
    6. What happened if courier lost or damaged.
    7. Some other related services?
    8. How/Do provide delivery service for E-commerce.
- Questions From Express Services:-
    1. Process of handling a customer (How and by whom), when he/she comes/arrives the first time.
    2. Booking process of a customer.
    3. The delivery process of a courier to a customer.
- Billing Process:-
    1. How (and by whom) the bill payment process of a customer is done?
    2. What happen if the courier is redirected?
    3. Is there and advanced process related with the billing process?

A.2 A Sample Questionnaire

A.2.1 A Sample Questionnaire For E-comnmerce

Questionnaire

Welcome to this very important survey with which we want to look deep inside of you your company. Thank you for filling it all out.

About you

1. **Your name**: _____
2. **Contact Number (Optional)**: _____
3. **How old are you?** ☐ 1 - 18. ☐ 19 - 24. ☐ 25 - 39. ☐ 40 - 60. ☐ 60+

About this questionnaire

4. **What kind of Carrier type do you use (Please check all you use)?**
   - ☐ 2G.
   - ☐ 3G.
   - ☐ 4G.
   - ☐ Auto.
   - ☐ Other: _____
5. **What device do you use for internet surfing (Please check all you use)?**
   - ☐ Mobile Phone.
   - ☐ Tablet.
   - ☐ Laptop.
   - ☐ Desktop.
   - ☐ Other: _____
6. **What kind of software do you use for exploring the internet (Please check all you use)?**
   - ☐ Opera.
   - ☐ Microsoft Edge.
   - ☐ Microsoft explorer.
   - ☐ Chrome.
   - ☐ Uc Browser
   - ☐ Other: _____

A.2.2 A Smaple Questionnaire For Express

Questionnaire

Welcome to this very important survey with which we want to look deep inside of you your company. Anyway, thank you for filling it all out.

About you

1. **Company Name**: _____
2. **Your name**: _____
3. **Contact Number**: _____
4. **How old are you?** I am _____ years old.

About this questionnaire

5. **How many employee do you have** _____ .
6. **How is your whole working process?**
   - ☐ Manual.
   - ☐ Mixed.
   - ☐ Automated/Computerized.
   - ☐ Other: _____
7. **Have any online tracking system:?** ☐ Yes ☐ No
8. **Have any online branch info:?** ☐ Yes ☐ No
9. **What type of payment method is available?** ☐ Bank. ☐ Mobile Banking. ☐ Cash.
10. **How calculate the cost of courier?**

    _____
11. **What happen if courier lost or damage?**

    _____
12. **How is employee data stored?**

    _____

Appendix B

Parcel Labeling Guide

B.0.1 Introduction

Purpose

This section has been developed to make it easier to create and use labels on parcels shipped via the Guya Delivery System.

While some flexibility exists in design of shipping labels, using these standards will make label certification easier and make processing your parcels more efficient.

Scope

This section will focus primarily on the layout and content of domestic and ground shipping labels and will cover the following topics:

- Specifications for label elements
- Label examples displaying layout and content
- Applicable Intelligent Mail^{TM} package barcode (IMpb) standards

Audience

This guideline is designed for use by any party interested in creating or understanding Guya parcel labeling requirements. This may include:

- Third-party vendors developing shipping software applications

- Customers integrating Guya shipping capabilities in their custom shipping systems
- Integrators or Value Added Resellers (VARs) producing shipping labels
- Guya employees involved in label production, label processing, or assisting third-parties in label development

Appendix C

Label Placement

Improperly applied shipping labels can cause scanning problems and affect the quality of tracking data provided by the Express. The following label placement guidelines will help ensure maximum label scanning and processing.

- Always place the label fully on the address side of the package without overlapping the side or any other label.
- If for some reason, the Intelligent Mail package barcode appears on a separate label from the delivery address, you should place the barcode above or to the left of the delivery address with less than 1/2 inch between the label and the address.
- Do not cover the barcodes with tape or plastic wrap that may negatively impact readability of these barcodes.
- When placing a barcode onto a convex or round object (such as a mailing tube), it is very important that the barcode be placed on the package such that the bars of the barcode are perpendicular to the curve of the item (note: if a parcel curves in more than one direction, you should consider placing the item within a box or other flat- sided container).

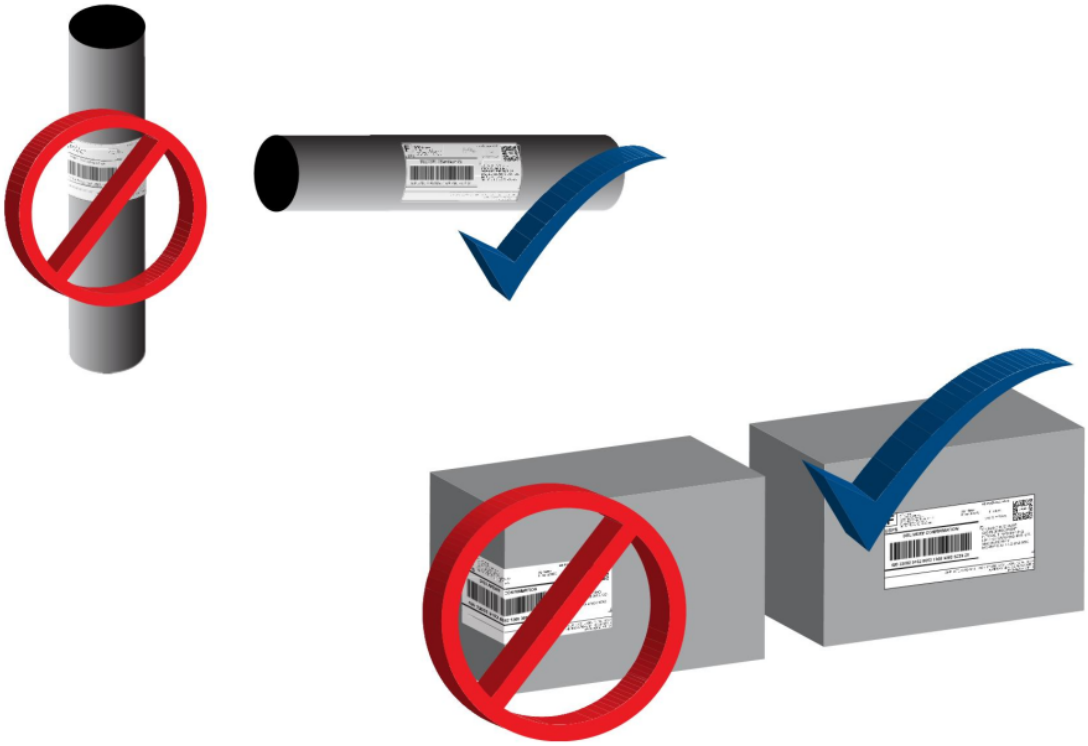

Figure C.1: Label placement

Appendix D

Developer Manual

D.1 Live Demo

D.1.1 UI Framework Live Demo

Visit a live demo of this template a http://bit.dev/guya-ltd/gcss

You can also consult the source code of this template at http://github.com/Guya-LTD/bits

D.2 Set It Up

- Install Docker(http://docker.io)
- Install Docker-compose(http://docker-compose.io)
- Clone[1] guya-ltd project from GitHub, or download it as a zip file
- Go to project root directory and

[1]For more information see: https://help.github.com/articles/github-glossary#clone

D.3 Configure It

D.4 Deploy It

D.5 Develop It

Appendix E

Testing Information

E.1 Unit Testing Design

List of scenarios to be tested for each user story.

Browse Products

List home products

- When the home page is requested, display all products of the shop.
- When no products found, show an informative message.

List products from a category

- When a category is requested, the chosen category will be indicated and its immediate children categories will be displayed, as well as all products belonging to that category or any descendant category.
- When the selected category does not exist, show a not found error message.
- When no products found, show an informative message.

Filter products by price

- When a price range filtering is requested in any product list page, the chosen price range will be displayed, as well as all products from the previous list (discarding any previous price filtering) whose price falls within the range.

- When minimum and maximum price are swapped, recover exchanging them.
- When invalid price provided, dismiss the price filter request.
- When no products found, show an informative message.

Filter products by color

- When a color filtering is requested in any product list page, the chosen color will be displayed, as well as all products from the previous list whose main color matches the selected color.
- When more than one color is selected at once, products whose main color matches any of the selected colors will be displayed.
- When no products found, show an informative message.

Show product detail

- When a product is requested, the chosen product will be displayed with all its information and pictures, as well as all the possible variants of that product.
- When the selected product does not exist, show a not found error message.

Show product variant detail

- When a product variant is requested, the chosen product variant will be displayed with all its information and pictures, as well as all other possible variants of that product.
- When the selected product variant does not exist, display the default variant instead.
- When the selected product does not exist, show a not found error message.

Purchase Products

Show cart detail

- When the shopping cart is requested, display the cart contents and the price details.
- When the shopping cart is empty, show an informative message.

Add item to cart

- When a product is requested to be added to the shopping cart, add the selected variant in the cart and display the updated cart content.
- When the product is already in the cart, the quantity will be updated with the addition.
- When the selected product does not exist, show a bad request error message.

Update item in cart

- When the quantity of an item in the shopping cart is requested to be updated in the cart detail page, replace the previous quantity with the new one provided and display the updated cart content.
- When the item does not exist in the cart, show a bad request error message.
- When the new quantity is invalid, show a bad request error message.

Remove item from cart

- When a product from the shopping cart is requested to be removed in the cart detail page, remove the item from the cart and display the updated cart content.
- When the item does not exist in the cart, show a bad request error message.

Start checkout

- When the checkout process is requested to start, display an order summary (i.e. cart content and price details) and the corresponding shipping and billing forms.
- When the shopping cart is empty, display the last visited page.

Finish checkout

- When the checkout process is requested to finish, display success message and all order details (i.e. cart content, price details, shipping and billing options).

- When invalid data provided, show a bad request error message and pre-fill the forms.
- When the shopping cart is empty, display the last visited page.

User Management

Show user profile

- When the user profile is requested, display the user data, change password and address book forms, as well as the list of orders from the user.
- When the user is not logged in, show an unauthorized error message and display login.

Do sign up

- When signing up a new user is requested, register the user and display the user profile.
- When user already registered, show a bad request error message and pre-fill form.
- When invalid data provided, show a bad request error message and pre-fill the form.
-

Do log in

- When logging in a user is requested, sign in with the user and display the user profile.
- When invalid credentials provided, show an unauthorized error message and pre-fill form.
- When user already logged in, display the user profile.

Do log out

- When logging out a user is requested, sign out the user and display the last visited page.
- When user already logged out, display the last visited page.

Edit user data

- When the user data is requested to be updated, edit data and display updated user profile.
- When invalid data provided, show a bad request error message and pre-fill the form.
- When the user is not logged in, show an unauthorized error message and display login.

Edit user password

- When the user password is requested to be updated, change password and display user profile.
- When invalid current password provided, show a bad request error message.
- When the user is not logged in, show an unauthorized error message and display login.

Recover password

- When the user password is requested to be recovered, send email to the address provided with a temporary link to the recovery page, where the user can insert a new password.
- When the email provided does not exist, show a bad request error message and pre-fill form.

Add address to address book

- When an address is requested to be added to the address book in the user profile page, add the selected address in the address book and display the updated user profile.
- When the address is invalid, show a bad request error message and pre-fill the form.

Update address in address book

- When an address is requested to be updated in the user profile page, replace the previous address with the new provided and display the updated user profile.
- When the address does not exist in the address book, add it to the address book.
- When the address is invalid, show a bad request error message and pre-fill the form.

Remove address from address book

- When an address is requested to be removed in the user profile page, remove the address from the address book and display the updated user profile.
- When the address does not exist in the address book, show a bad request error message.

E.1.1 Acceptance Tests Design

Cucumber based list of rules.

Browse catalog

- Given I visit the web shop
- And I select a product
- When I add the product to the cart
- And I go to the cart
- Then I have only the chosen item
- And the total price is correctly calculated
- When I add one more item
- Then the total price is correctly updated

Checkout

- Given I visit the web shop
- And I select a product
- When I add the product to the cart
- And I go to the checkout
- And I enter a valid address
- Then taxes are correctly calculated
- And the shipping methods are listed
- When I select a shipping method
- Then shipping cost is added to the total price
- And the payment form is displayed
- When I enter valid payment data
- And I finish the checkout
- Then I have purchased the product

Check order

- Given I visit the web shop
- And I go to the signup page
- When I enter valid personal information
- Then I am successfully registered
- When I select a product
- And I add the product to the cart
- When I go to the checkout
- And I enter a valid address
- And I select a shipping method

- And I enter a valid payment data
- When I finish the checkout
- And I go to the user profile page
- And I go to the order history
- Then I have only one order
- When I select the order
- Then the total price is correct
- And the address is correct
- And the shipping method is correct
- And the payment is paid

Appendix F

Ethiopia Post Code

F.1 Ethiopia Post Code Address Format

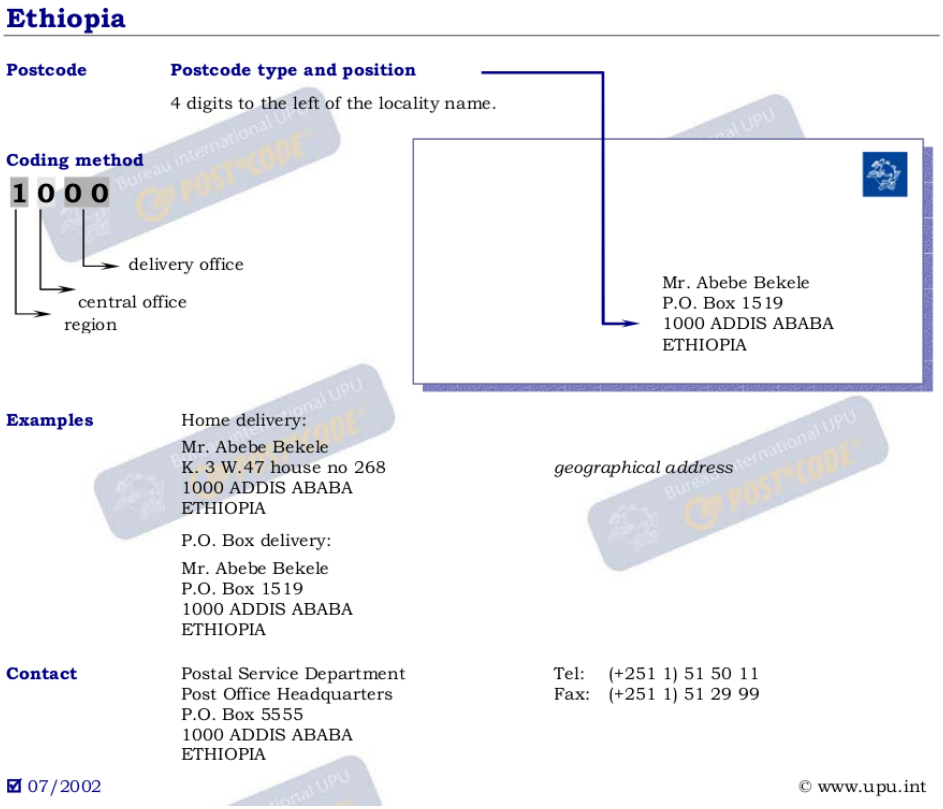

Figure F.1: Ethiopia Post Code Envelope and Address Format

F.2 Ethiopia Postcodes Reference List

Postcode	Administration / Region / Zone	Loca
1000	Addis Ababa-Addis Ababa Zone 1	Addi
1000	Addis Ababa-Addis Ababa Zone 1	Addi
1000	Addis Ababa-Addis Ababa Zone 1	Addi
1000	Addis Ababa-Addis Ababa Zone 2	Alem
1000	Addis Ababa-Addis Ababa Zone 2	Alem
1000	Oromia-Semen Shewa	Eydu
1000	Oromia-Semen Shewa	Gebr
1000	Oromia-Semen Shewa	Golje
1000	Oromia-Semen Shewa	Muke
1000	Oromia-Semen Shewa	Robe
1000	Oromia-Semen Shewa	Semb
1000	Oromia-Semen Shewa	Send
1000	Oromia-Semen Shewa	Shen
1000	Oromia-Semen Shewa	Sulul
1000	Oromia-Semen Shewa	Tulu
1150	Addis Ababa-Addis Ababa Zone 2	Alem
1230	Addis Ababa-Addis Ababa Zone 6	Ak'a
2040	Oromia-Arssi	Abor
2040	Oromia-Arssi	Adel
2040	Oromia-Arssi	Beke
2040	Oromia-Arssi	Carri
2040	Oromia-Arssi	Dino
2040	Oromia-Arssi	Golo
2040	Oromia-Arssi	Mech
2040	Oromia-Arssi	Seru
2040	Oromia-Arssi	Shek
2040	Oromia-Arssi	Tinsa
2120	Oromia-Arssi	Asas
2120	Oromia-Arssi	Bekó
2120	Oromia-Arssi	Bilbi
2120	Oromia-Arssi	Bucc
2120	Oromia-Arssi	Kofe
2120	Oromia-Arssi	Sire
2140	Oromia-Arssi	Ager
2140	Oromia-Arssi	Dera
2140	Oromia-Arssi	Ham
2140	Oromia-Arssi	Huru
2140	Oromia-Arssi	Robi
2140	Oromia-Arssi	Sire
3000	Dire Dawa-Dire Dawa	Dire
3000	Dire Dawa-Dire Dawa	Dire

Appendix G

Azure Technologies

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