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Master's Thesis

**E-commerce web application development, maintenance and
optimization**

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DIPLOMA THESIS ASSIGNMENT

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Systems Engineering and Informatics
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Thesis title

E-commerce Web Application Development, Maintenance and Optimization

Objectives of thesis

This Diploma Thesis aims to provide a user guide for the users interested in eCommerce web app development. Based on the requirements of the market and customers, this work will guide to choosing the best technologies and various methodologies in a structured way. It will help growing organizations to proceed in the right direction by managing and optimizing web applications.

Methodology

The approach of the thesis will be to analyze the market needs of users and also do an analysis of tools and technologies available in the market. Based on the analysis deliver the best approach to develop the e-commerce web application, maintenance, and optimization.

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Brian P. Hogan, Chris Warren, Mike Weber, Chris Johnson. 2015. Web Development Recipes. Pragmatic Bookshelf.

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Declaration

I declare that I have worked on my diploma thesis titled "E-commerce Website Development, Maintenance and Optimization" by myself and I have used only the sources mentioned in the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any third person.

In Prague on 2022

Supriya Kumari

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E-commerce Web Application Development, Maintenance and Optimization

Abstract

The current era is a digital era, the role of IT and computer science in all areas is like oxygen which is an essential and necessary element of the life. In the same way computer science is as important and essential as oxygen in our day to day lives. In modern and fast paced life, each area thrives on digital platform to grow at its best. It has helped us from ordering food to booking transport tickets just in one click of a button. It has provided a magnificent digital platform for every organization on which they can advertise their business, products, qualities, benefits to the population without any limitation. It has created a borderless platform which can be easily accessible to anyone sitting in any parts of the world. We have recently witnessed a global pandemic which has pushed most of the world population to go digital, from having online delivery market place to online education system. It has given a narrative to go digital in most of the area of the businesses which was not very popular to pre-pandemic era. E-commerce website helps all business in every possible way to increase their visibility and economy by providing an important tools to consumer in order to plan and decide what to buy and it also empowers by giving an opportunity to customer to check if the products and services are available without being physically present at the shop. Programming languages gives a window of opportunity to any individual who can build their website from scratch and setup an ecommerce business without having to have much knowledge and experience in this field. Computer science and IT are the vast area of interest in a digital age, which embraces everyone who have their personal interest and it helps to grow at their highest extent. In the modern digital era it is undeniable that we cannot imagine our life without internet and its various attributes. Current pandemic has pushed a “Go Digital Economy” narrative which will change our digital footprint in very significant way in near future. I believe with help of this thesis any individual can get an idea on how to proceed with website preparation in best possible way without having to spent tremendous amount of time on internet. In this thesis work, I have implemented a very simple and easy to understand approach by mentioning simple and necessary guidelines steps on how any individual or small organization can start building an e-commerce website without having to spend tremendous amount of money and resources. It also consists a guidelines for using different tools which can be useful in maintenance and optimization of the website.

Keywords: e-commerce website, Scaling, Analyzing, maintenance, optimization, programming language, Digital era, WordPress, Java, HTML, CSS, Bootstrap, Logstash, Elasticsearch, New Relic.

Vývoj, údržba a optimalizace webových aplikací pro elektronické obchodování

Abstrakt

Současná doba je digitální, role IT a informatiky ve všech oblastech je jako kyslík, který je základním a nezbytným prvkem života. Počítačová věda je stejně tak důležitá a nezbytná jako kyslík v našem každodenním životě. V moderním a rychlém životě každá oblast prosperuje na digitální platformě, aby co nejlépe rostla. Pomohlo nám to od objednání jídla až k rezervaci jízdenek na dopravu jediným kliknutím na tlačítko. Poskytla velkolepou digitální platformu pro každou organizaci, na které mohou bez omezení inzerovat své podnikání, produkty, kvality, výhody pro obyvatelstvo bez jakéhokoli omezení. Vytvořila platformu bez hranic, která může být snadno přístupná každému, kdo sídlí v jakékoli části světa. Nedávno jsme byli svědky celosvětové pandemie, která přiměla většinu světové populace přejít na digitální vysílání, od online trhu doručování po online vzdělávací systém. Dalo to smysl přechodu na digitální vysílání ve většině oblastí podniků, což nebylo v předpandemické éře příliš populární. Web elektronického obchodu pomáhá všem podnikům všemi možnými způsoby zvýšit jejich viditelnost a ekonomiku tím, že poskytuje důležité nástroje pro spotřebitele, aby mohl plánovat a rozhodovat se, co koupit, a také dává příležitost zákazníkům zkontrolovat, zda jsou produkty a služby jsou k dispozici bez fyzické přítomnosti na prodejně. Programovací jazyky dávají příležitost každému jednotlivci, který může vytvořit své webové stránky od nuly a nastavit podnikání v oblasti elektronického obchodu, aniž by musel mít v této oblasti mnoho znalostí a zkušeností. Informatika a IT jsou v digitálním věku obrovskou oblastí zájmu, která zahrnuje každého, kdo má svůj osobní zájem, a pomáhá k růstu na nejvyšší úrovni. V moderní digitální době je nepopíratelné, že si svůj život bez internetu a jeho různých atributů neumíme představit. Současná pandemie prosadila příběh „Go Digital Economy“, který v blízké budoucnosti velmi významným způsobem změní naši digitální stopu. Věřím, že pomocí této práce si každý může udělat představu, jak nejlépe postupovat při přípravě webu, aniž by musel trávit obrovské množství času na internetu. V této diplomové práci jsem implementovala velmi jednoduchý a snadno srozumitelný přístup uvedením jednoduchých a nezbytných pokynů, jak může každý jednatel nebo malá organizace začít budovat webovou stránku elektronického obchodu, aniž by musela utrácet obrovské množství peněz a zdrojů. Obsahuje také pokyny pro používání různých nástrojů, které mohou být užitečné při údržbě a optimalizaci webu.

Klíčová slova: webové stránky elektronického obchodu, škálování, analýza, údržba, optimalizace, programovací jazyk, digitální éra, WordPress, Java, HTML, CSS, Bootstrap, Logstash, Elasticsearch, New Relic.

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1. INTRODUCTION

Traditional businesses and institutions are turning to e-commerce to help them break down geographical and temporal barriers, allowing them to provide a more customized service to their customers. E-commerce has spawned a slew of innovative new businesses as a result of these efforts. E-commerce and the software that supports the innovation have changed dramatically over the last four decades and continue to do so. Despite the fact that e-commerce is no longer just about online purchasing, the majority of e-commerce solutions are focused on developing web stores. E-commerce platforms that allow developers to access and process the data from any application are the primary goal of the company. To put it another way, e-commerce is the practice of purchasing and selling items online. Internet marketing, electronic payments transfer, and mobile commerce are just a few of the many advantages of doing business online. Sellers participating in online marketplaces where many transactions involve third parties. Developers will be able to utilize this implementation as a starting point for creating their own custom online stores. In 1979, British inventor Michael Aldrich developed teleshopping, an early type of online shopping, in this technique, a telephone connection was used to connect the television to a shopping transaction program. In 1984, Jane Snowball became the first-ever online home shopper, purchasing goods from the Tesco store in London. The main aim of this thesis is to develop a prototype which will be used to optimize E-commerce web application. The advantages of applications contain faster purchasing process, setting up a store and product listings, reduced expenses, cost-effective marketing and advertising, The ability to adapt to changing needs of the clientele, there is no height restrictions, product and cost comparisons are also included, increased responsiveness to the needs of customers and the market and there are a variety of ways to pay. Development of e-commerce site is not the only task do in e-commerce business, there are many other tasks such maintenance and optimization also have importance like building and designing a website. To perform these tasks simultaneously is an important point. There are many third party entities and company which provides facility for website development while how far these services would be successful it is not certain. Building a customized e-commerce website is a good practice so that maintenance and optimization could also be possible for website in order to manage and save application from system failure.

1.1 Motivation

In the future, e-commerce will require more flexible solutions, and it's safe to say that custom software won't be able to meet those needs. It makes more sense to provide merchants with a robust and flexible platform on which to build their own products rather than pre-building a finished product on top of an e-commerce platform that can then be customized to meet the needs of individual merchants (Laudon et al., 2013).

SPHERE.IO's development team was inspired by that question when they came up with this new commerce platform-as-a-service. E-commerce platforms that allow developers to access and process commerce data from any application are the primary goal of the founders of this company.

Regardless of the programming language or framework used to develop the application, the SPHERE.IO backend system may be accessed via a RESTful web API (Luiz Escoriza, 2014). Open-source Java client libraries were the first of several to be developed to make development more user-friendly. The SPHERE.IO Play SDK, a web application development toolkit for the Play framework, was also created (Figure 1.1).

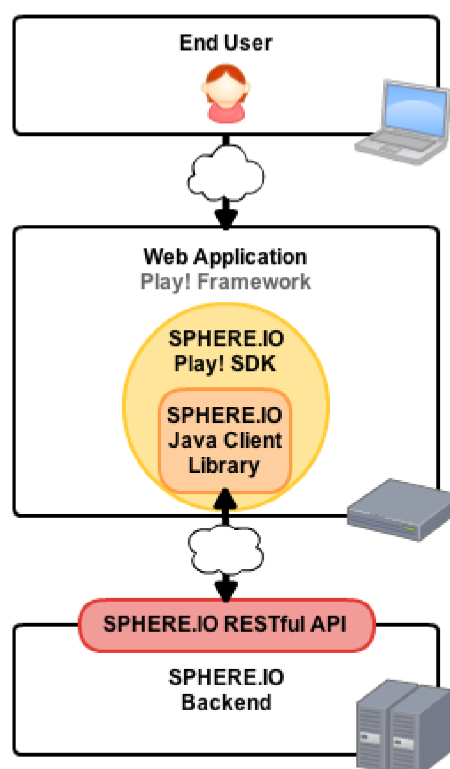


Figure 1.1 SPHERE.IO-based Java web application diagram.

An e-commerce application is needed to assess the benefits and drawbacks of this platform because no system has ever been constructed with this platform except for a few modest testing

sites. Another requirement is to have a bootstrap project whose code can be reused by other projects, be they internal or external.

1.2 Objectives

There are two primary goals of this project, and they are intertwined. One objective is to analyze the e-commerce web application and second is to provide information about the tools based on research and on how to use those tools. Students cum developers will be able to utilize this implementation as a starting point for creating their own custom e-commerce website. Additional documentation will be provided in the form of GitHub source code links, where users can visit and take an idea from source code and implement as per their specific requirement. Better alternatives will be provided to the user in future work whenever possible with the purpose of improving the original concept.

1.3 History of e-commerce

For decades, e-commerce has been steadily increasing its importance in the commercial context as the standard known as EDI was developed in the mid-1960s and began to replace traditional mail and fax documents. British inventor Michael Aldrich developed tele marketing, an early type of online shop, in 1979, and termed it as teleshopping. Telephone lines were used to connect a real-time transaction processing system with an online shopping application to a home television. For communication, it made use of a residential telephone connection and a modem chip originally developed for the prestel system. As a result, televisions were being used as real-time terminals in Aldrich's system despite the fact that the Prestel data transmission protocol was not being fully utilized (Tian et al., 2006).



Figure 1.2 preproduction system for Redifon's on-line retail sales in 1979

For the first time in operations, Thomson Travel Group was able to purchase Michael Aldrich's Redifon Computers' online buying system (Figure 1.2) in 1981. (a subsidiary of the Thomson Corporation). Although Aldrich initially designed his system for B2C online shopping, the initial demand was for B2B online shopping for holiday travel, vehicles and spare parts, sales, loan finance and credit scores, despite his system working from a low-cost domestic television and using a domestic telephone line. (Dos Santos et al., 2017).

It wasn't until Aldrich's teleshopping system made it to Jane Snowball's house in 1984 and she became the first-ever online home shopper, purchasing goods from the Tesco store in London, United Kingdom (Figure 1.3). To help elderly individuals who couldn't go shopping, she used a social service project in the English city of Gateshead, called the GSS (Gateshead Shopping Service). It worked out great! Two years later, in the English city of Bradford, a considerably larger experiment for the city's most impoverished residents was conducted. Both projects necessitated the use of an early version of the shopping cart system.



Figure 1.3 A 1984 grocery delivery from Mrs. Snowball's house

Europe has seen the introduction of similar interactive television systems that use telephone lines. French telecommunications company France Telecom developed an online service called Minitel in 1982, and it was by far the most popular and widely used at the time. Only a few B2B transactions were a success with teleshopping in this particular instance, however People were unable to access the technology required for B2C because it was too difficult for them to do so. However, local governments partnered with supermarkets to try out social experiments involving grocery delivery for elderly and disabled residents.

Electronic commerce necessitated an expansion of its customer base beyond the realm of strictly business-to-business transactions. In 1990, when he combined hypertext technology with the Internet to create the World Wide Web, Tim Berners-Lee provided that opportunity [Ber00]. Internet commerce was not permitted even though it was technically possible. A fee based on network usage was instituted in 1991 as a condition of the restriction being lifted. This fee was used to pay for the network infrastructure. When commercial Internet use became completely free in 1995, these restrictions were also eliminated (Kalakota, et al., 1997).

For the first time, in 1994, Netscape released a commercial browser that included the SSL cryptographic protocol. B2C businesses were finally able to thrive in an expanding market thanks to the rise of the internet and a protocol that ensured secure online transactions. Web shops and e-commerce solutions to help merchants sell online began to appear in the early 1990s. Within a year, two of today's largest online retailer companies, Amazon.com and eBay, were born.

A revolution in payment systems was unavoidably a corollary to all of these developments. Mobile payments, online banking, debit and prepaid cards via cell phone are among the many innovations that have entered our daily lives over the last three decades and have had the

greatest impact on e-commerce. All of them made it easier to make online payments by increasing the number of payment service providers available. PayPal is one of the most widely used e-commerce payment systems today, handling transactions between merchants and acquirer banks in a secure manner over the Internet.

1.4 Purpose of Study

While building a web application, most important thing is to make sure that users are compelled to spend time on website. The first step is to get to know the customers and their expectation from the website by leveraging gathered historical data from various tools.

The goal is to learn where a user looks when they first land on a homepage so that we can identify key points of interest and focal points. The search for a specific pattern that reflects the differences between the attitude of web pages and the reasons why people favor one site over another is also an important consideration.

1.5 Chapter Summary

SPHERE.IO's development team was inspired by that question when they came up with this new commerce platform-as-a-service. E-commerce platforms that allow developers to access and process commerce data from any application are the primary goal of the founders of this company. The EDI was developed in the mid-1960s and began to replace traditional mail and fax documents. British inventor Michael Aldrich developed teleshopping, an early type of online shopping, in 1979. For communication, it made use of a residential telephone connection and a modem chip originally developed for the Prestel system.

Aldrich's teleshopping system made it to Jane Snowball's house in 1984. Snowball was the first-ever online home shopper, purchasing goods from the Tesco store. France Télécom developed an online service called Minitel in 1982. Tim Berners-Lee combined hypertext technology with the Internet to create the World Wide Web. For the first time, in 1994, Netscape released a commercial browser that included the SSL cryptographic protocol.

Web shops and e-commerce solutions to help merchants sell online began to appear in the early 1990s. Mobile payments, online banking, and debit and prepaid cards via cell phone are among the many innovations that have entered our daily lives.

2. Literature review

2.1 E-commerce web application

An online technology is equivalent to bridge which provides a platform where any individual can buy and sell goods or services digitally. These platforms facilitate the transfer of payment, invoices, shipment, and many more functionalities available on the existing website. The digital platform enables people to shop for products wherever they are without going to a physical store. People nowadays choose to shop online because of the outstanding offers offered by the companies (Qin et al., 2009).

2.2 Types of E-Commerce:

2.2.1 Business-to-Business (B2B):

It is a type of E-Commerce based on transaction of products and services between organizations. Example: A company sells Citrix environment, SAP products to other companies (Lucking-Reiley, 2001).

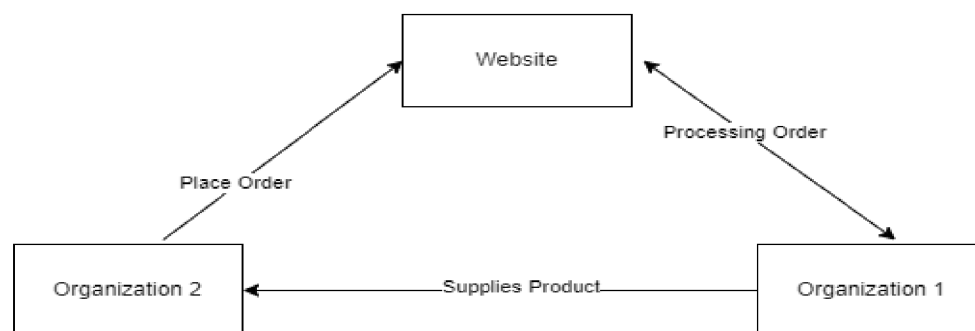


Figure 2.1 Business to business block diagram

2.2.2 Business-to-Consumer (B2C):

It is a type of E-Commerce based on transaction of products and services between consumers and organizations. Example: Amazon, Alibaba or Walmart sells product to us (consumers) (Ranganathan et al., 2002).

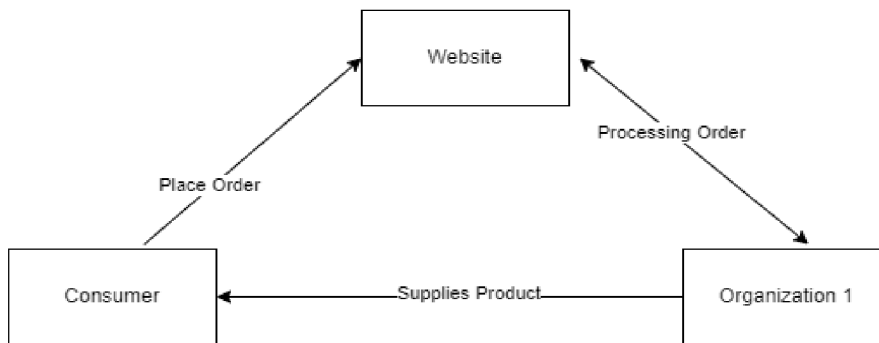


Figure 2.2 Business to Customer block diagram

2.2.3 Consumer-to-Consumer (C2C):

It is a type of E-Commerce based on transaction of products and services between consumers only with the help third party who works on commission. Example: You can sell your used product on eBay to another consumer.

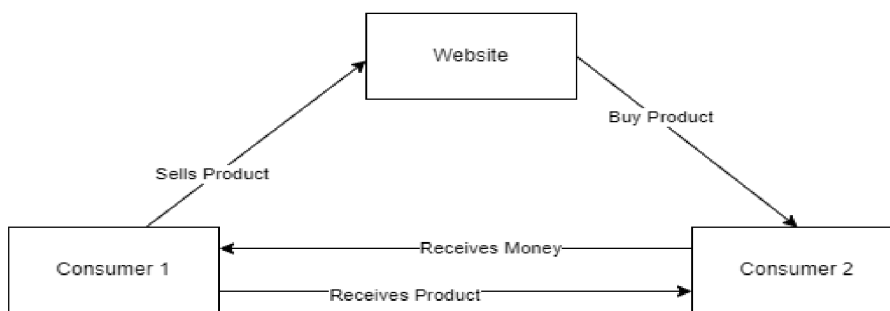


Figure 0.3 Consumer-to-Consumer block diagram

2.2.4 Consumer-to-Business (C2B):

It is a type of E-Commerce based on transaction of products and services where person offers to organizations. Example: A freelancer is a person who provides website development services to companies. They can work on specific projects for a specific period.

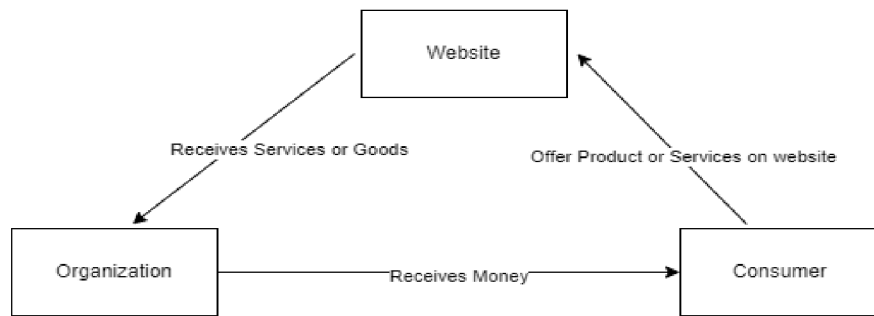


Figure 2.3 Consumer-to-Business block diagram

2.3 Factors by which customers start moving towards ecommerce website:

E-commerce transactions are quite different than marketplace shopping. Since two entities in traditional business, negotiations are done face to face among both parties whereas on e-commerce website customer doesn't know about the identity of seller therefore it is the main reason that website should be reliable for customers to increase the traffic on the website. (Le et al., 2017)

2.4 Trustworthy e-commerce website:

Consumer satisfaction and client trust sites have a significant impact on customer loyalty. According to research, consumer loyalty is described as a relationship built on trust. In addition, customers who have confidence in a website are more likely to create a positive attitude toward the goods, pay a fair price, remain loyal, and spread excellent word of mouth about the company.

2.5 Importance of e-commerce website

2.5.1 If you want your business to be able to compete in the long run, having an ecommerce website is an important step. One of the most critical aspects of having a website is that it allows you to build online marketplace and sell directly to your customers.

2.5.2 Maintaining a traffic of regular customer is much harder on online marketplace than it is on established store, as there is no interpersonal relationship involved and it gives a window of opportunity to understand customer need by providing online assistance program.

2.5.3 Having a website enables business to gather useful information from customers to customize and improve their online purchasing experience.

2.5.4 Main focus is to create and maintain a strong connection between brand and product. Having a website that works seamlessly and effectively will allow business to control all its elements in sufficient ways. You can also use custom boxes and promotional items to reinforce your brand.

2.6 Type of customers visit on ecommerce website:

Having a website allows you to better understand your customers by gathering valuable information about them, such as their location and how they found you. This will help you improve their experience and make them more profitable (Hua et al., 2019).

2.6.1 Product-Focused:

Specific product-focused customers are those who know exactly what they want and are ready to buy it immediately. They usually go to stores to research but are also goal oriented. The product-focused shopper doesn't want to browse the site. Instead, they want to find the product as per their need and buy it (Hua et al., 2019). Their main goal is speed shopping. Get the users to browse the site and then take them to the checkout. They don't want to spend time on the site and are more likely to continue with their intended purchase. Key elements for product-focused customers include clear descriptions of each product, an effective search engine, and a streamlined checkout.

2.6.2 Browsers:

Browsers are people who are usually slow and want to stay up to date on the latest trends and new sites. They are also looking for the next shopping trip.

Having people browse your site is a great thing. They are using it as inspiration and entertainment, and they will be more likely to buy if they have a good experience with your site. When people browse a site regularly, they want to see what's new and popular, and they also want to see what other people are buying. This is what makes a site stand out from the crowd. Word-of-of-mouth marketing can be done through the site's features, which allow shoppers to easily share their discoveries with friends.

Key elements for shopping are: listing of new products, easy access to new inventory, and the ability to share information about their favorites.

2.6.3 Researcher:

- Like product-focused shoppers, researchers are goal-driven and may be in any stage of their research. They may be researching various products and prices, or they may be well-informed about new features and offerings. When exploring various websites, researchers may want to make sure that they're getting a good deal.
- The goal is to turn them into buyers by making them feel like they're getting a good deal. Having a good site with clear navigation and detailed product descriptions is very important to turn potential buyers into buyers. A good product comparison site can help researchers gather important details about a product, such as its price and features. Details that matter most to researchers are those that are presented in the site's descriptions and images.
- Having user reviews is also helpful for researchers since they can gather more information by reading the opinions of other users. Researchers may also want to flag items of interest they're interested in, and they appreciate sites that allow them to save them to their cart. They may also leave a site to ponder on a purchase.
- A good research tool will help researchers make informed decisions about products and services. It will also help them avoid making mistakes.

2.6.4 Bargain Hunters:

- The behavior of bargain hunters can affect other people who are looking for the best deal. It is also known to influence other types of shoppers (Yamagishi et al., 2016).
- Websites that offer deals need to make it easy for bargain hunters to find them.
- The opportunity to turn bargain hunters into repeat customers is very important to a website's success. To attract and retain them, offer them discounts and free shipping.
- In our study, we watched thousands of people who tried to qualify for deals that required them to spend a minimum amount.
- The most important elements for bargain hunters are having a variety of sale items and displaying them alongside full-priced inventory.

2.6.5 One-Time Shoppers

One-time shoppers are people who usually go to a website to shop for something specific, such as a gift card. They do not plan on coming back to the site after buying the product or the gift card. They often have no idea that the site they're visiting carries the products they want. Site navigation is very important to them to get to the products they want and the site's selection

and inventory. Site registration is a main complaint of one-time shoppers. Most of them said that they would not return to the site and would not want to create an account.

One-time shoppers are usually focused on the site's navigation and its complete product descriptions (Bashir et al., 2021).

2.7 The necessary things an e-commerce website should contain:

There are following points which should be available in any e-commerce website such as user-friendly interface, mobile friendly interface and security. These are the key factors which increase the traffic of the customer on your website and having a secure website protects your customer data from external hacks or threats.

2.7.1 User-friendly interface:

A good user-friendly design will help people get what they want without having to type or press a search bar. Having a product review feature helps gather feedback from users and helps them make a buying decision.

2.7.2 Mobile-friendly adaptation:

High-resolution visual content, mobile friendly website and user reviews increase your customer on the site day-by-day. It provides users ease to buy, view, add and do payment from their comfort zone. Customers can do shopping while lying in their bed room, or walking during metro, even at work place. Having this feature in any website is always a plus point for business.

2.7.3 Website safety and security:

No Internet user wants to get hit by a bug while browsing the web. But, it's also important that your site is secure and has good reputation. One of the most critical factors that an eCommerce business has to consider is their security.

2.8 Optimization before and during e-commerce website development

Google's new feature, which is aimed at protecting users from bad reputations, now flags websites with slow loading speeds. This means that if a website has low load speed, it might not be able to attract visitors (Malaga et al., 2007).

The goal of SEO is to increase a website's rank in a search engine. Part of this involves adding relevant content to the site, as well as improving the meta descriptions and titles of the website. Having an experienced and competent SEO specialist on board can help you achieve this objective.

2.9 Website search and filtering functionality:

Even if your site doesn't sell anything, people still use the search bar on websites that do. An advanced feature such as a visual search can help users find what they're looking for.

2.9.1 Registration and related issues:

Some people prefer to register on an e-commerce site instead of having to enter their email address and delivery address. This is because they don't want to register on another website, and they don't want to share their personal data with anyone. You can also add a guest checkout feature if you want to avoid getting personal data from users.

2.9.2 Payment options:

Having several payment options such as credit card, debit card, other payment providing platform and cash on delivery is most suitable for all categories of customers. Lacking in different payment methods results in lack of faithfulness from the customer side, many of the time buyers abandon their shopping cart due to lack of options.

2.9.3 Shipping rates:

Surprise shipping costs is the reason why more than 50% of customers abandon their shopping carts. It could be that they didn't know the rates, or they were expecting a lower sum.

2.9.4 CMS integration:

A content management system is a tool that helps manage all of your content, including your marketing documents and visual content. It can also help keep track of all your employees' activities and provide them with the necessary information to respond efficiently to customer complaints.

2.9.5 Mobile functionality:

Over half of online transactions are conducted through a mobile device. Even though people are more likely to shop from a mobile app, having a good conversion rate is still important to ensure that your site is optimized for the mobile web.

2.9.6 A website design that matches the products you are selling:

Your website's color scheme should match or complement the products you're selling. Food-related e-commerce should use a range of colors that stimulate appetite, and the site should have plenty of white space to prevent any confusion (Osterwalder et al., 2014).

2.9.7 Good shopping cart design:

Even though web users tend to prefer simple and functional shopping cart systems, there are ways to enhance the functionality of these platforms. For instance, if a user clicks on the shopping Cart, it will ask them to register and then log in once they've finished their purchases. This method can help avoid having to look for the exact items again.

2.9.8 Proper product showcase and descriptions:

Quality content is what makes a difference in converting customers. While high-quality images and videos are important, having comprehensive product descriptions is also key to making a good impression.

2.9.9 Customer support and contacts:

According to the 2018 payment methods report, buyer prefers personalized customer support. Having a contact section on website is a must-have to stand out from the crowd. Having a phone number or email address for each contact is also a must-have in order to gain the trust.

2.9.10 Social proof:

Creating a customer feedback page is a great way to add credibility to your site and attract more customers. It could be written reviews, product unboxing, or video clips of the customer talking about the product.

2.9.11 Marketing strategy:

A good marketing strategy can help you get off to a good start in the online world. It can also help you define the website's structure and overall look. Developing a strategy early in the development process can help you identify which features will be most useful to your business.

2.9.12 Supportive articles:

Your website should have policies and documentation related to its use. These sections should be updated once it's up and running.

2.10 Approach to start developing e-commerce website:

Creating an e-commerce store will be very different from building a standard website. Aside from having a domain name and hosting, you also need to consider other factors such as creating a payment gateway and managing product orders (Jing et al., 2018).

2.11 Building an e-commerce website, the easy way:

Building an e-commerce website is like building other websites, except it involves creating a storefront where you sell physical or digital products.

2.12 Market Research and Finding Your Niche

Before you start an e-commerce business, you need to find the right product to sell. This step can help you avoid getting into an awkward situation where you sell what you don't want to sell.

2.12.1 Look for Trending Products:

One way to start making money online is by aligning yourself with products that are trending. Doing so can help you ride the wave in the short term and long term.

- **Google Trends:**

This tool allows you to analyze the past and future popularity of certain product terms.

- **Trend Hunter:**

This site features various products and niches that are currently trending globally.

- **Instagram influencers:**

These individuals are likely to promote products that they believe will sell well.

2.12.2 Align with your passion:

Ideally, these resources will help you narrow down your list to a few products or a few potential niches. Doing so will allow you to focus on what you're selling and why you're selling it.

2.12.3 Explore what's currently welling:

Once you've identified the products and niches that interest you, it's time to step up and validate them in the marketplace.

Go to the Amazon bestseller list and look for products that are related to your chosen industry or hobby. You can also use the tool Uber suggest identifying the exact keyword that interests you. This tool will give you a list of related words and their search volume.

2.12.4 Getting ready to sell:

Before you decide on the product to sell, make sure that it is light enough to ship. Doing so will make it easier to handle, and it will help you maintain better margins in the early days of your store. Creating a prototype for your product is an important step in the right direction. It lets you test out the product before committing to a long-term strategy.

2.12.5 Choosing your e-commerce platform:

When it comes to choosing an e-commerce platform, there are a lot of different options to choose from.

- **WordPress/WooCommerce:**

Content management system (CMS) WordPress is widely used for good reason. It's quite simple to use, but it's also extremely powerful and versatile because of the enormous

number of plugins available. You'll need an e-commerce plugin if you want to use WordPress to create an e-commerce website.

WooCommerce, which is free and developed by the team behind WordPress, is the most popular alternative. To ensure compatibility and access to a wide range of compatible themes, add-ons, and plugins, you'll never have to worry about compatibility. Following the steps in WooCommerce's setup wizard is all that is required to get your online store up and running.

- **Magento:**

Magento is a popular e-commerce platform, but one that requires a higher level of expertise and experience. As a result, you'll have additional alternatives for customizing and expanding your eCommerce store's capabilities. It's a lot more difficult to learn and utilize unless you're an experienced developer or have the money to pay someone who is.

- **Website builders:**

Using a website builder with built-in e-commerce features is the quickest and most straightforward option for many new eCommerce entrepreneurs. There are a lot of website builders out there that are geared toward beginners, so anyone can put together a website quickly and easily.

2.13 What are strategies to collect customer data

The rise of digital personalization has caused businesses to lose millions of dollars. To avoid this, they need to gather more data about their customers. This will help them improve their online experience and attract more customers.

2.13.1 Lower cart abandonment:

Converting more browsers into customers is a great way to increase your bottom line. Unfortunately, most online consumers are fickle.

What customer information do you need to lower cart abandonment?

- Set up a baseline and collect customer data with Google Analytics. The Checkout Behavior Analysis Report shows how customers behave when they complete their purchases. Customers behave as they complete their transactions helps track the conversion rate.

- Use tools like Hotjar and smartlook to measure the interaction between customers and your site. They will help you identify areas where your site is not serving up the ideal customer experience.
- Once you have identified the driving factors away from your site's homepage, implement tools that measure the interaction in real-time. These tools will help you identify areas where you can improve the experience for your customers.
- Show personalized content to the visitors that come in their cart. These tools like OptimMonster, convert pro, convert box can help gather data on the visitors and return them to your e-commerce site.
- Show personalized offers and discounts when visitors leave their cart.

2.13.2 Improve your product offering:

Nothing sells better than a good product. To choose better products for your e-commerce business, you need to gather the right customer information.

- Order history shows how many products were purchased each time a customer bought them. Use this data to analyze the sales of in-demand products. It does not require you to collect any additional information from the customers.
- Use tools that automatically collect social media data about a brand and what its customers are saying about it. You can then perform sentiment analysis to see if a product is loved or hated.
- If you do not already offer reviews for your e-store, then check your competitors. This is a great way to discover new potential customers.
- Feedback is very important, especially if you don't collect it. Having a good survey will help you measure how happy your customers are with the products they bought. If your couple of customers are not happy with the product they bought, then you need to think about your either product or service.

2.13.3 Personalize product suggestions

A lot of businesses rely on the recommendations of their customers to drive sales. This is a great way to keep track of all the products that are already bought by customers.

“The product suggestions are seldom personalized. And that ticks customers off. According to Janrain, 74% of people hate being shown irrelevant content in personalization attempts.”

Before you can recommend products, first look at the exact same item that the customer bought in the past. This will help you formulate a recommendation that fits to the customer's needs and lifestyle.

For instance, if a customer only has a shirt next to pants, suggest that she add a pair of skirt as well. Follow this step with some common sense and avoid making a recommendation that's based on an incorrect purchase.

A machine learning algorithm should be used to segment a product purchase into segments. For instance, if two different types of drinks are most purchased, you might not recommend one of them to the other. One-size-fits-all recommendations rarely work. For instance, if two different types of soaps are most bought, you might not recommend the same product to the same customer. Instead, suggest the products to the relevant customer segments.

2.13.4 Offer better customer service:

- Gather frequently asked questions and answers from your customers and instead of writing answers for same question again and again, it would be better to create a knowledge base or FAQ that has the most frequent answers.
- Feedback helps you measure how satisfied your customers are with their service. It also helps you improve and develop a stronger team.

2.13.5 Optimize your product availability:

Nothing makes customers more disappointed than when they see a product, they want but can't find it. Predictive analytics can help you predict when demand will rise and stock up.

- History can be a great teacher. It can help you understand how customers behave when their purchases run out. For instance, if Lona likes to drink 3 cups a day, he will typically order a new batch every 2 weeks. Similarly, Jayna likes to treat herself to a cup of coffee every 3 months.
- Holiday season and product seasonality are just some of the factors that retailers look for when analyzing their sales.

2.13.6 Improve customer retention:

Acquiring new customers is more expensive than retaining existing ones.

How can you identify loyal customers and make the most out of that data?

- Gather data on all your customers by segmenting them into three buckets: new customers, long-term customers, and churned ones. Doing so will help you determine the long-term trends of your customers.
- Surveys are a great way to identify your loyal customers and those who have stopped shopping for you. By analyzing their feedback, you can create a Net Promoter Score (NPS), which will help you measure the level of satisfaction among your customers.

2.13.7 Attract better customers:

Creating a compelling website for new customers can be challenging. Creating a compelling website that converts visitors into new customers can be challenging.

But when it comes to advertising, data gathering can be your friend:

- Facebook pixel and Google Ads are two of the most popular ad platforms that allow you to track and collect data about your users.
- How many people visited my ad and how many of them landed on my product page?
- TrackMyAds helps you monitor and analyze the performance of your ads. It also helps you fine-tune your messages and identify which ads are most likely to convert visitors.
- With Facebook and Google Ads, you can collect more customer data to improve the performance of your ads. This will help lower your costs and attract more qualified leads.
- Getting the right customer data can have a significant impact on your e-commerce performance. But it comes with multiple challenges that you must consider when it comes to data collection.
- One of the easiest ways to get started is by using a data platform that will automatically collect and store all the data that you need to extract value from your e-commerce platform.

- This tool will collect data from various digital ad platforms (clicks, banners, etc.). This tool will extract data from various social media platforms and keep track of your audience.
- With Kelola’s data collection tools, you can easily capture and store all your email campaign and conversation data.
- By moving all your sales and support data from the platform to a local database, it will allow you to control all of it.

3. Practical Overview:

3.1 Approach on building e-commerce website:

In order to build website we can go with programming languages and without programming languages approach i.e. using WordPress tool or using various programming language for frontend, backend and tools for databases.

Here we will first discuss about the WordPress tool: There are four important steps in order to start building an ecommerce website.

3.1.1 Launch your website and purchase domain:

This is where we get a new website live, on the internet. To choose website name first type name of website in the search bar. The name of website should be related to your product and doesn’t be any special character or number written in the website name. Example – websiteName.com

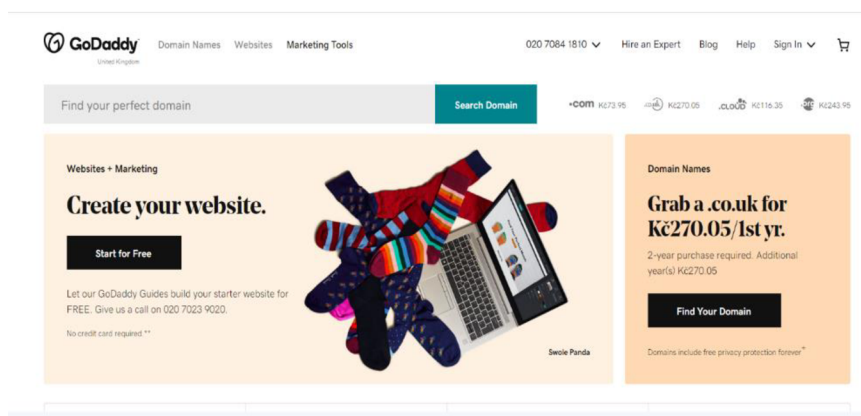


Figure- 3.1 home page of GoDaddy website

3.1.2 Getting hosting and domain:

Hosting is the place where your files of website are stored, and domain is the name of your website. There are several online portals which provides hosting and domain for a website. Example- Site Ground, Bluehost, DreamHost, HostGator, Kinsta, Hostwind, are the example to provide this facility. We can purchase plans after successful payment on the online portal and it is recommended to purchase domain approximately four to five years of plan. You can't purchase a domain for unlimited period instead of that you can do prepayment for ten to twelve years after that you again need to renew your plan. When you purchase the domain, you need to enter the domain name and your details such as email id, password and other personal details to receive all the details of the product related on provided email id. After successful payment your website will be live on internet for selected years. After getting host and domain, which was shared on your given email id, you need to verify that email in order to verify your account. Now we can install WordPress, WordPress is the tools we're going to use to build our e-commerce website, WordPress lets you build website easily without any prior coding or programming knowledge.

3.1.3 Start building e-commerce website:

Hosting is the place where your files of website are stored, and domain is the name of your website. There are several online portals which provides hosting and domain for a website. Example- Site Ground, Bluehost, DreamHost, HostGator, Kinsta, Hostwind, are the example to provide this facility. We can purchase plans after successful payment on the online portal and it is recommended to purchase domain approximately four to five years of plan. You can't purchase a domain for unlimited period instead of that you can do prepayment for ten to twelve years after that you again need to renew your plan. When you purchase the domain, you need to enter the domain name and your details such as email id, password and other personal details to receive all the details of the product related on provided email id. After successful payment your website will be live on internet for selected years. After getting host and domain, which was shared on your given email id, you need to verify that email in order to verify your account. Now we can install WordPress, WordPress is the tools we're going to use to build our e-commerce website, WordPress lets you build website easily without any prior coding or programming knowledge.

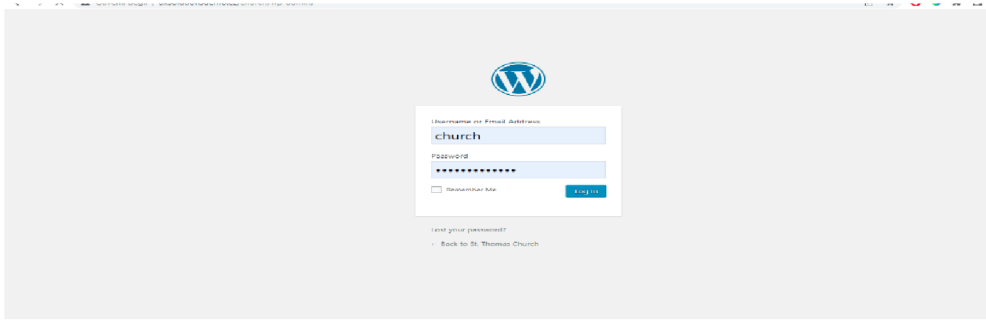


Figure-3.2 Represents WordPress Login/Signup window
[https://login.wordpress.org/]

3.1.4 Install the theme in WordPress:

When install the theme inside the WordPress, which will let import sample theme after installing and activating it, you would be able to see the different designs on which you can apply to your website. You can choose the design relevant to your product and import to your website. Now we have fully functional and working e-commerce website. After importing sample site we will be able to see product cart, checkout option and description of the product.

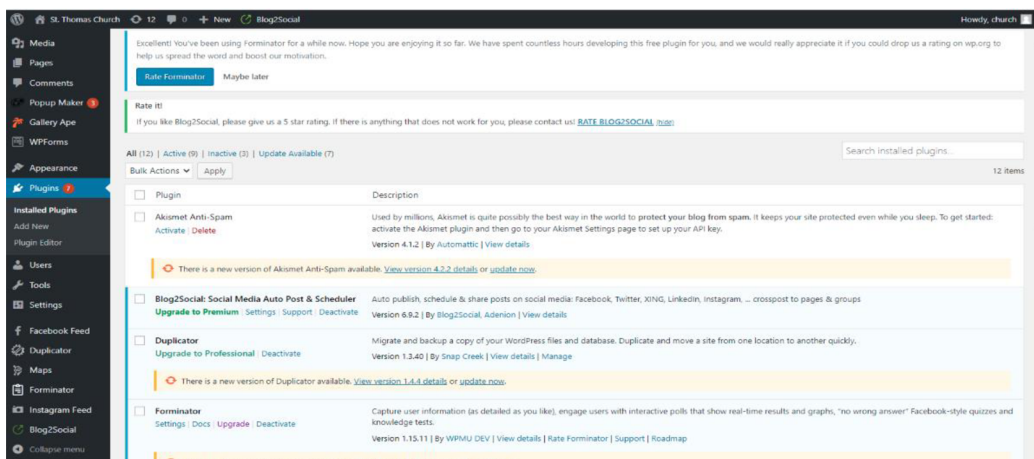


Figure-3.3 Represents the various functionality of WordPress site.
[https://wordpress.org/plugins/]

3.1.5 To start using e-commerce website:

We must first set up our store before we can use an e-commerce website. A store is a location where customers may view and purchase your stuff. Instead of sample products, our site will include our own products once we've set up our store. To begin, we must create our own product and remove the sample products; you can add and remove products using WordPress capabilities. You must provide the product name, price, description, and image when adding a new product. Using WordPress capability, you may also change the price's currency.

3.1.6 To set payment method and integrate with WordPress site:

To set it up, you need to create an account on a website called “Stripe” and official link is stripe.com. Once you create your account on this payment portal you would be able to receive payment directly to your bank account when someone will purchase the product. After creating account on Stripe, you need to submit all your details like type of business, your personal details and your bank account details where you want to accept payment from customer. After submitting all required details now we need to connect this account to our website. In WordPress, there is option called plugins. We need to install plugin on WordPress site. Again we can use WordPress functionality called WooCommerce, and search on the bar Stripe for WooCommerce and install and activate it. To make connection between e-commerce website and payment website, we need live API key. Live API key contains publishable key and secret key. Now we will copy these two keys from payment site and paste it into ecommerce site into installed plugins and do save changes. After successful setup our payment method, now our customers cannot only see our products, they can now buy them.

For payment website, we need live API key. Live API key contains publishable key and secret key. Now we will copy these two keys from payment site and paste it into ecommerce site into installed plugins and do save changes. After successful setup our payment method, now our customers cannot only see our products, they can now buy them.

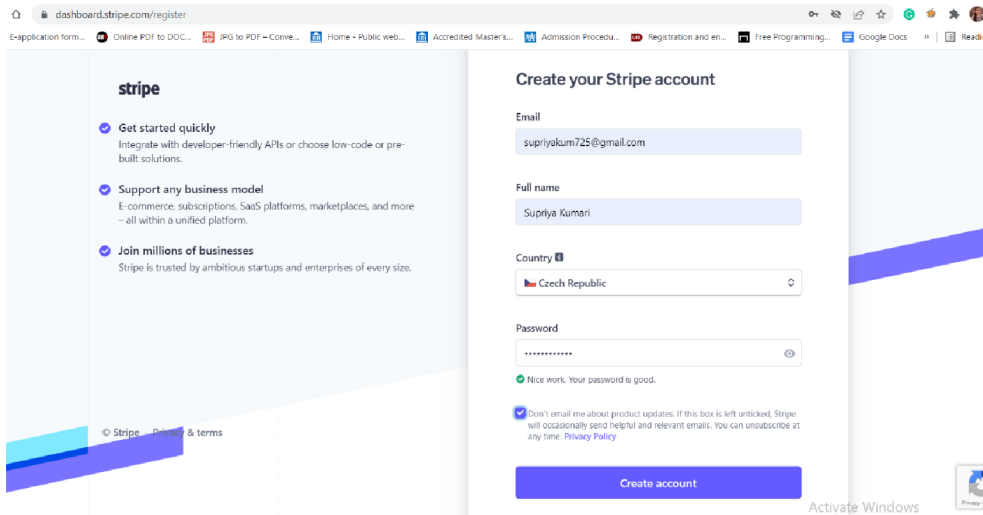


Figure-3.4 Represents the register page of Stripe payment site.
[https://dashboard.stripe.com/login]

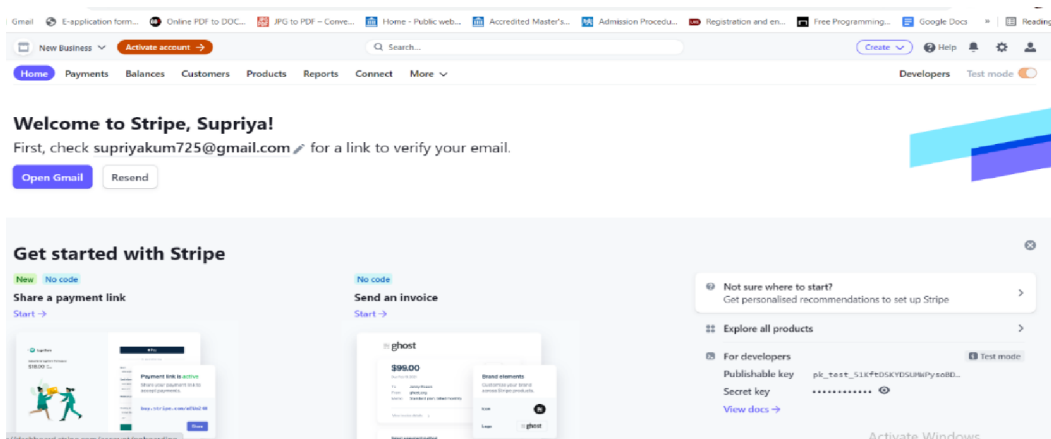


Figure-3.5 Represents home page of Stripe site.
[https://dashboard.stripe.com/test/dashboard]

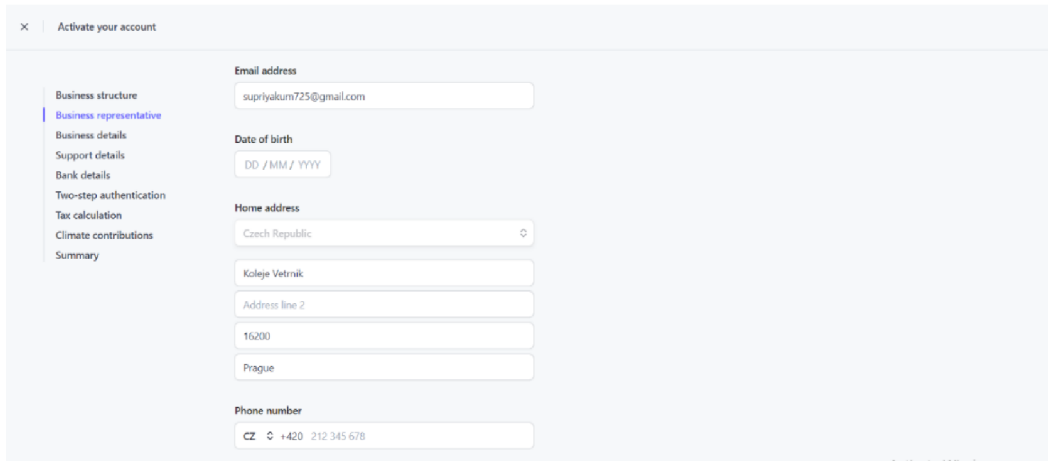


Figure-3.6 Represents activating account by going through all given options.
 [https://dashboard.stripe.com/account/onboarding/business-structure]

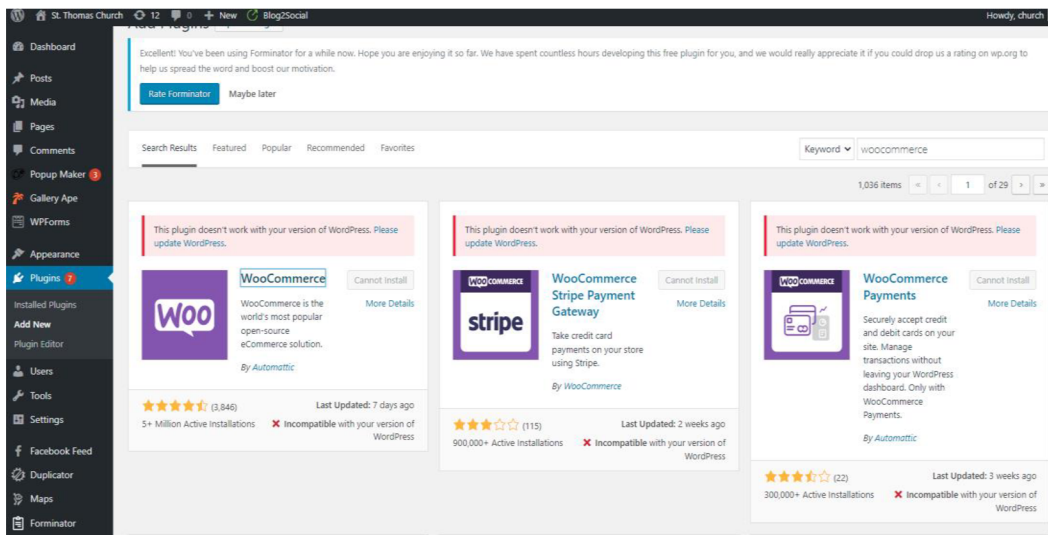


Figure- 3.7 Represents how we can integrate Stripe payment site with WordPress.
 [https://wordpress.org/plugins/]

3.1.7 How we can change look of our website:

With the help of WordPress functionality we can change content, and images on the website, we can add products on homepage and also can change logo of the website by using WordPress options and there is option to change menu as well.

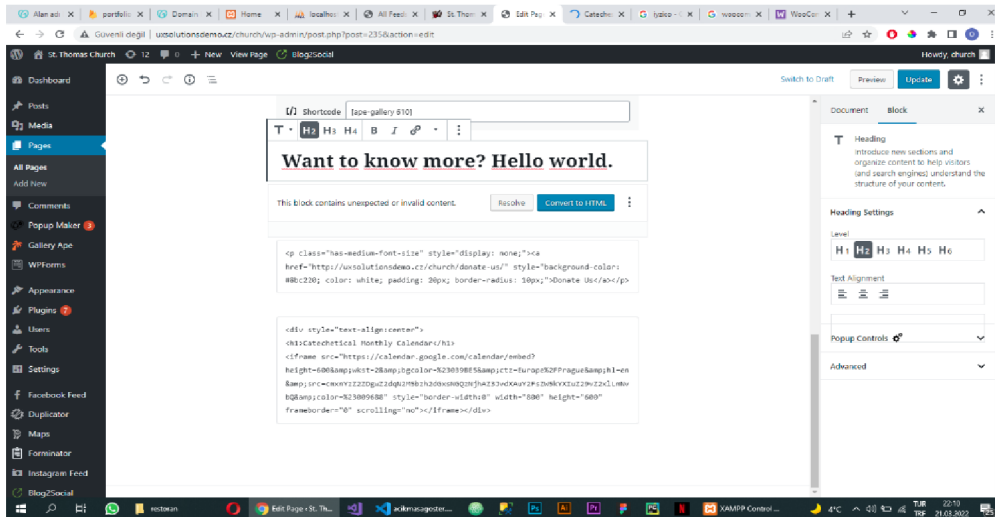


Figure-3.8 represents how we can change content of our website using WordPress Functionality.

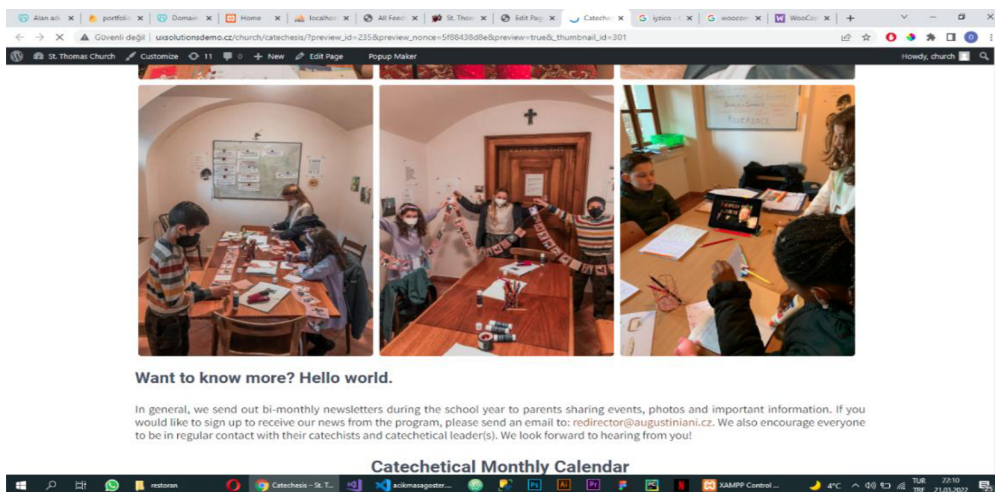


Figure-3.9 represents how we can add images as per our product category.

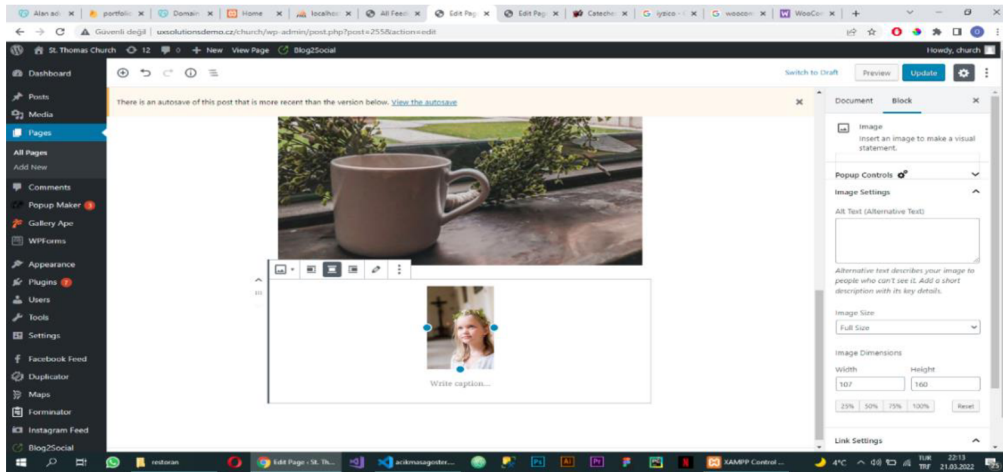


Figure-3.10 Represents the functionality by choosing, can add images from gallery.

3.1.8 Ways to know the placed order:

As soon as order has been received from the customer, the functionality used will send it directly to the registered email address. In the inbox, the two emails will show up, the first email is from the WordPress website and second from Stripe. Upon opening the first email from WordPress all the details can be found about the order including the name and address of customer and product details, in the second email, Stripe confirms that you have received payment for the respective product. This is how one can know when orders were placed by the customer and start the preparation of further steps involving delivery to customer.

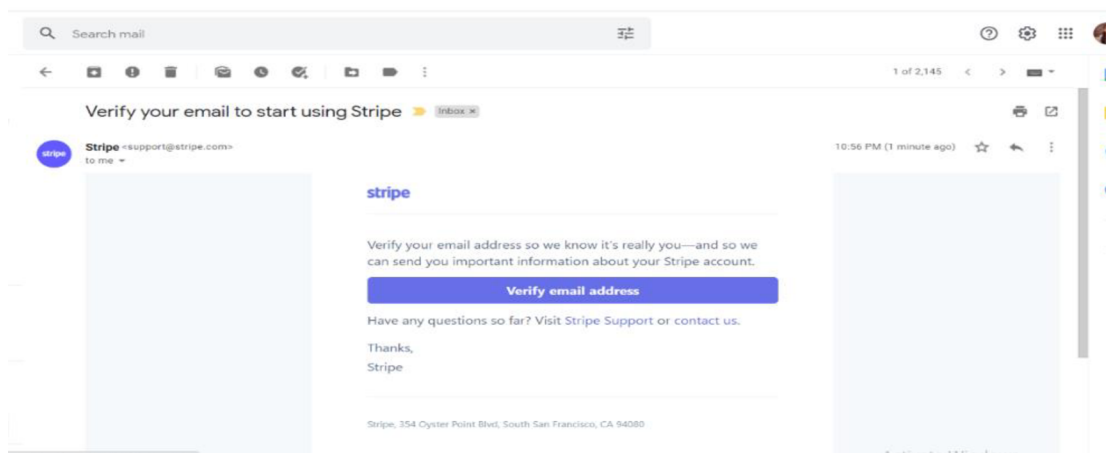


Figure-3.11 Represents email screenshot for Stripe site.

3.2 Ways to e-commerce website from scratch using languages:

There are following sections comes when we start building any website: Frontend, Backend and Database. These three are the basic for any website development.

Frontend: for frontend website programming, we can use HTML, CSS, JavaScript, Bootstrap as a framework, Angular and Vue Js. Html provides body for the website and CSS responsible for look and feel of the website. For backend we have plenty of programming languages by using we can create backend section of the website. There are few languages like Java, PHP, Python, C, C++, Golang, Ruby, Scala etc. For databases we can we Microsoft SQL, PostgreSQL, MongoDB, AWS, Microsoft Azure, and Apache Cassandra.

In this literature we will mainly focus on Html, CSS and Bootstrap for the frontend, Java for Backend and Apache Cassandra for Database.

3.3 Why to choose above technology stack for development:

Developing any website from scratch provides ability to maintain and optimize the website properly. Html and CSS are very friendly language and by using these technologies results a nice looking website. There are few frameworks by using we can enhance the looks of the website and can have fully responsive website.

Java is an old and most demanded programming language because of its functionality and special properties of OOPs concept. Java is not only an object-oriented programming language, it is also a set of technologies that make software development more rapid and resulting applications more robust and secure. For years Java has been the technology of choice because of the benefits it offers:

- Platform independent
- Ease of use
- Complete library that speed up application development
- Security
- Scalability
- Extensive Industry support

(Budi, et al., 2011)

Cassandra is a fully distributed, masterless database, offering superior scalability, and fault tolerance to traditional single-master databases. Cassandra offers a uniquely robust and expressive interface for modeling and querying data. Apart from the following features,

Apache Cassandra has a large user base including some top technology firms such as Apple, Netflix and Instagram, who also provide open-source features. It is being actively developed and has one of largest open source communities with close to 200 contributors and over 20,000 commits. Cassandra has no single point of failure for reading or writing data. Each piece of data is replicated to multiple nodes, but none of these nodes holds the authoritative master copy. All the nodes in a Cassandra cluster are peers without a master node. If a machine becomes unavailable, Cassandra will continue writing data to the other nodes that share data with that machine and will queue the operations and update the failed node when it rejoins the cluster. This means that in a typical configuration, multiple nodes must fail simultaneously for there to be any application - visible interruption in Cassandra's availability.

(Yarabarla, et al., 2017)

There are three main features in database concept called CAP theorem: Consistency, Availability and Partition Tolerance. These are key requirement which you can keep in mind while choosing your database. But at the same time, you can't choose all three key points, you must sacrifice one. Either you can go with 'consistency and availability' or 'availability and partitioning' or 'partitioning and consistency' you can choose according to your application need. For traditional databases like RDBMS, consistency is the key aspects, and it provides availability as second requirement. If you are okay with sacrificing availability and wants to go with consistency and partition tolerance, we must use database like MongoDB, HBase and Redis. While if your application requirements are partition tolerance and availability, go with database like Cassandra, CouchDB, DynamoDB, Riak.

Let's say if you have records of 1 to 10, it is easily manageable, but when you have records nearly 10 billion, you can't store data in one physical table or in one physical machine, even though you might have capability of storing everything, if you reading share and writing. What happens in traditional RDBMS, so in the first there will be a key and then this key has to be searched first, the first operation is you have to do scan huge files and records of particular user, you have everything in one place, scanning that terabytes of records and say 1 billion of records technically will be challenging. So the idea is instead of storing everything in one place in same table, the records can be stored at multiple places.

So we distribute the data and say 1- 3 to one machine, 3 - 4 to second machine and 5 - 6 to third machines and so on. You have chunked or sliced all the records into different physical pattern and distributed them into many physical machines, where you have the smallest setup data section instead of handling everything in a bigger set that is what partitioning is and to do partitioning, there are different techniques what we used to use prior to all this No-SQL offers. People used to have application shards, where application will figure out which server and which location your data should go. Partitioning means you divide your data into smaller chunks instead of working on bigger record set.

Requirements to use Cassandra:

To use Cassandra, basic knowledge of NoSQL technology is required, also Cassandra is very effective database as it is highly consistent to write operations. It is very granular and are replicated according to replication factor so that the data becomes highly available as well on the replication nodes and therefore simultaneous read operations are consistent.

Cassandra is very effective in following scenarios:

- Big data(Billions of records of data have rows and columns)
- Very high velocity random reads and writes.
- Flexible sparse/ wide column requirements
- No multiple secondary Index needs
- Low latency

Use cases:

- E-commerce inventory cache use cases.
- Time series/ Event use cases
- Feed based activities/ use cases

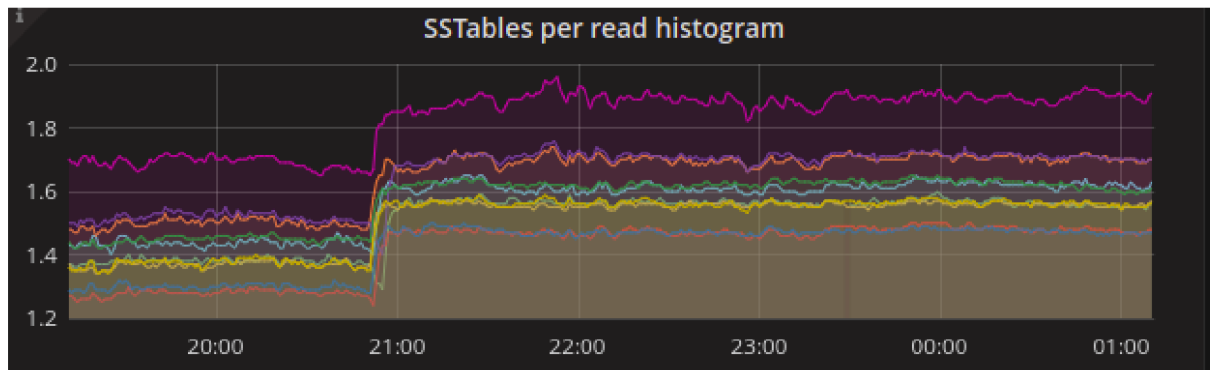


Figure-3.12 Represents monitoring of application using Cassandra read monitoring matrix.

This graph represents the monitoring of data by Cassandra reader. At different period of the time we can monitor our data to see the traffic on the website and which node having higher read request. In the above diagram 3.12, it's clearly visible the change of strips after few intervals of time. Increment in the strips within certain period show the traffic on application. Using the performance matrix of Cassandra tool, we can analyze the load on the application. This load could be occurred due to two reasons- either multiple batch run at one time or actually customer hitting your application and increasing the traffic. Cassandra read monitor matrix helps to monitor the application and also we can recognize that on different node different traffic is coming, by knowing the information on various node we can analyze the read request coming from different resources. When API called in back end, you can know the number of read and write request and different node in order to manage database. This monitoring tool make the database more manageable and easy to deal with billions of data coming per minute.

3.4 IDEs that can be used for website development:

There are several common IDEs where one can write front end and back end code both like Visual studio code, IntelliJ Idea, Eclipse various other. Here IntelliJ community version has been used to build a website and it is available free of charge. Below is the description about how to install IntelliJ and set the environment for java in your local system.

Below chart is showing system requirement for IntelliJ Idea

Requirement	Minimum	Recommended
RAM	2 GB of free RAM	8 GB of total system RAM
CPU	Any modern CPU	Multi-core CPU. IntelliJ IDEA supports multithreading for different operations and processes making it faster the more CPU cores it can use.
Disk space	2.5 GB and another 1 GB for caches	SSD drive with at least 5 GB of free space
Monitor resolution	1024x768	1920x1080
Operating system	Officially released 64-bit versions of the following: <ul style="list-style-type: none"> • Microsoft Windows 8 or later • macOS 10.14 or later • Any Linux distribution that supports Gnome, KDE , or Unity DE. 	Latest 64-bit version of Windows, macOS, or Linux (for example, Debian, Ubuntu, or RHEL)

A
G

Figure-3.12 Details of system requirement for IDE.

[<https://www.jetbrains.com/help/idea/installation-guide.html#requirements>]

Here is the link to install IDE in windows operation system:

<https://www.jetbrains.com/idea/download/#section=windows>

Community version is free to use, one can pay for ultimate version of IntelliJ to work with more functionality. One can download the .exe file as per the device storage. After downloading just click on next and next and it will install in the system easily.

To write code in java, system should have JDK and JRE installed. To download in windows- here is the link [jdk-8u202-windows-i586.exe](#)

Above is link for java version 8 which is a most stable version among all the versions of Java or we can download different version according to our requirement. After downloading, double click on the downloaded .exe file to install in your system.

It will install JDK and JRE in for C drive by default or one can choose location as per the device storage. Inside the C drive there is program files folder, inside that folder one can see auto generated java folder, inside that folder one can see installed JDK and JRE with their version. This is sequence of file that have to be followed -> C->Program files-> Java-> jdk1.8.0->bin.

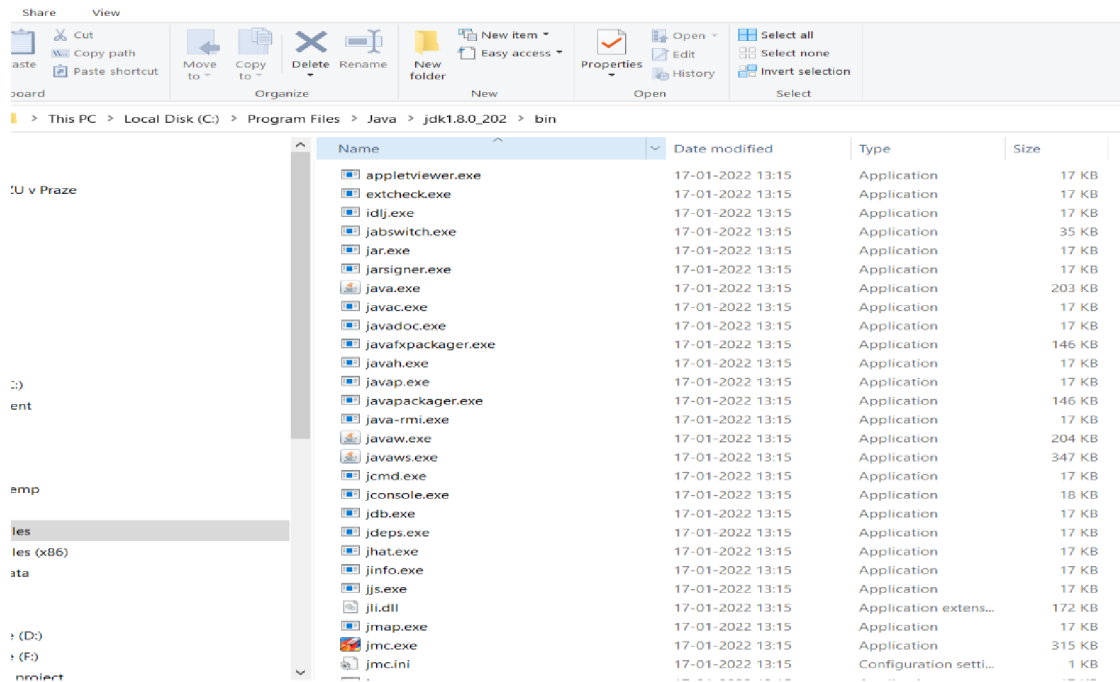


Figure-3.14 Showing destination folder of install JDK & JRE.

To set the environment for java go to JDK folder where one can see bin folder open that bin folder copy that complete location. Now edit system Environment variable is required, to open that window one can search it in task search bar. The window of system environment variable will open and there can be similar window like in figure-31.6

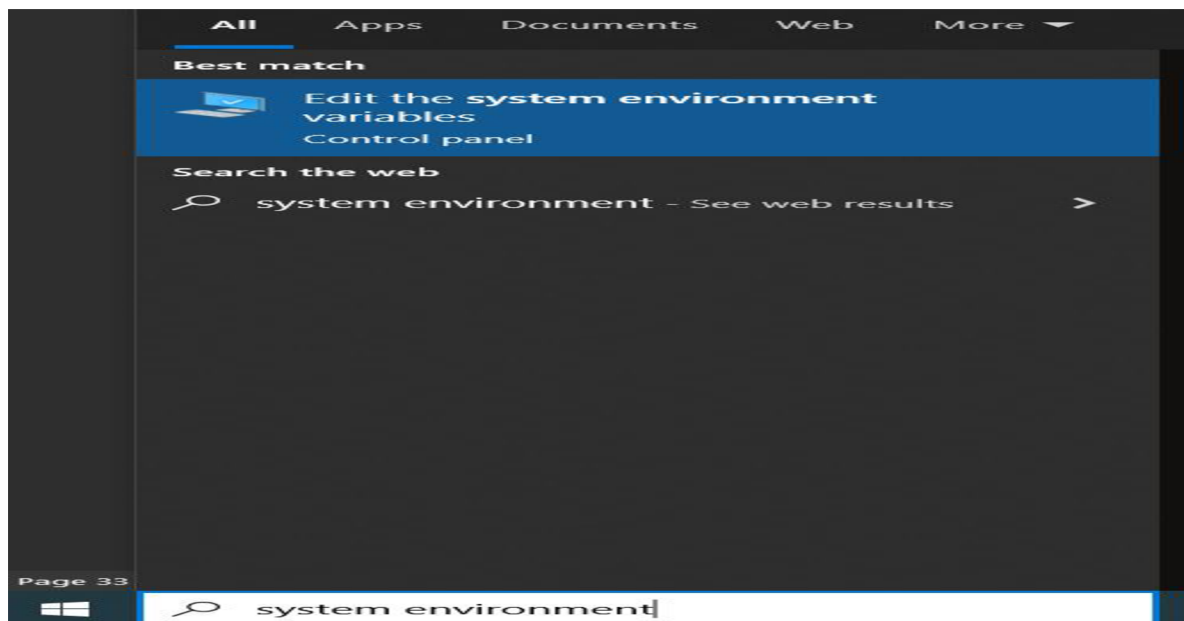


Figure-3.15 shows editing of environment variable of set JDK path

Now go to Advanced then click to the below option Environment Variables.

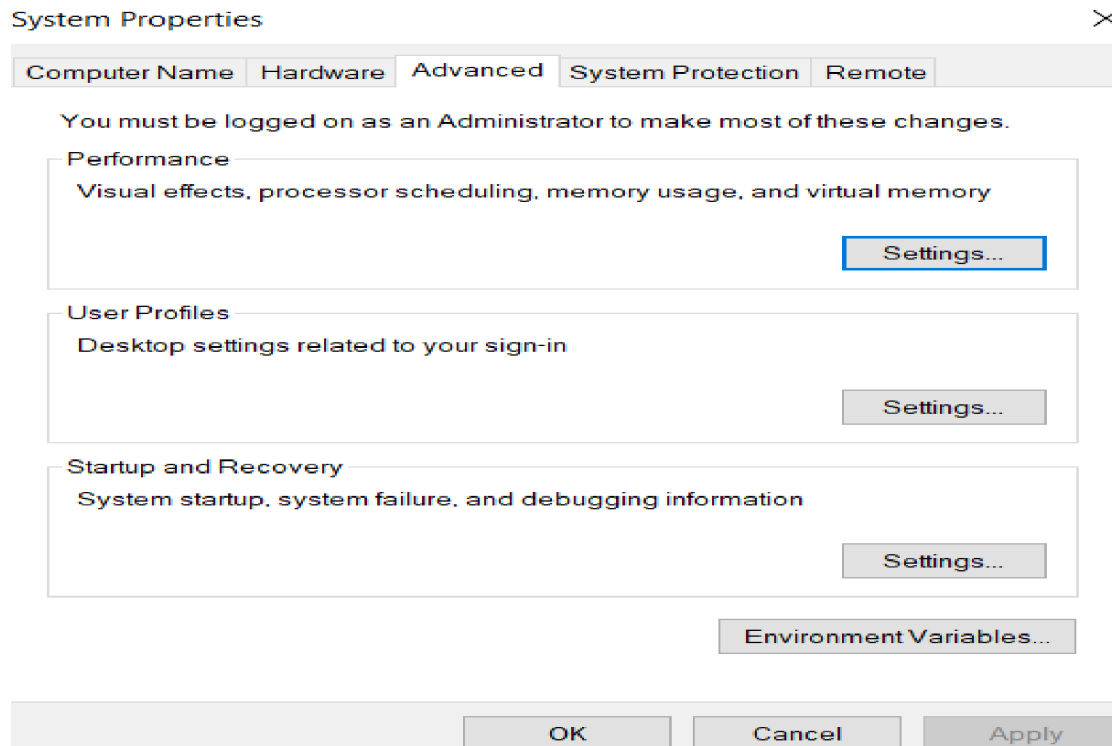


Figure-3.16 Window of system environment variable.

After clicking to the advanced option you will see the open window having user variable and system variable. Here with have to deal with system variable to set JDK path. In the future, this JDK will be requirement for many programming languages and various tools. You can keep this JDK version in your system forever if you decided to deal with various tools and technologies in your future. You can change or reinstall different version of JDK as per your requirement of site. Now go to System Variables section click on new to set path for JAVA_HOME and paste copied path of installed JDK i.e. - C:\Program Files\Java\jdk1.8.0_202 and paste it in open window in place of value, while the name of java home should be same in the format as mentioned above.

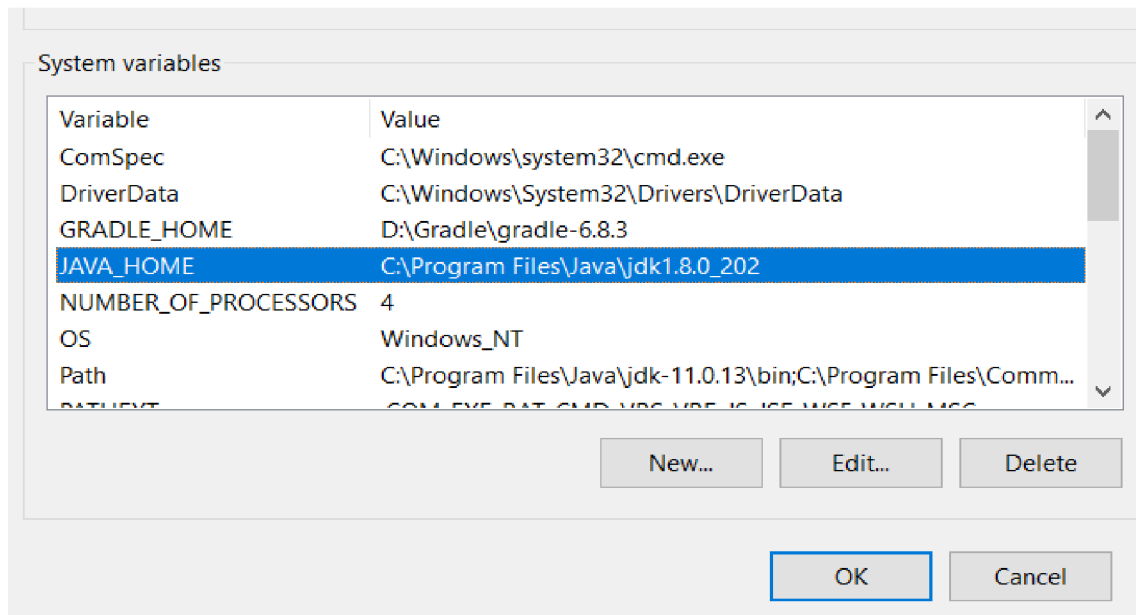


Figure-3.17 Set JDK bin and JAVA_HOME path.

Now click now Path in the System Variables window. To set the path of JDK bin click on edit. The Path window will open, click on new and paste the copied path of JDK bin location i.e. - C:\Program Files\Java\jdk1.8.0_202\bin. Then click on Ok, again on Ok and then finally Ok to set the environment for java. You can use multiple version of java in a single machine. Java 8 and Java 11 are most stable versions of java. Many big enterprises use either java 8 or java 11 for their production and development work. When you are editing location of JDK bin path, only you have to press on move up option by deciding which version you want to use for development. Top most path will be recognized by system and that will set as java version in your local system.

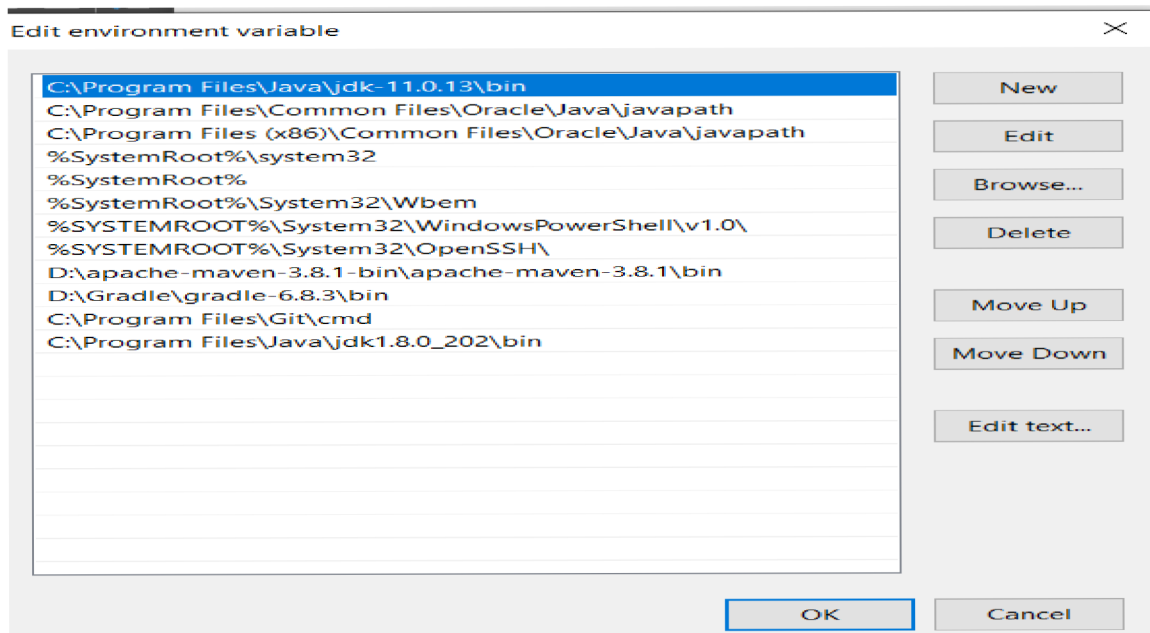


Figure-3.18 Adding path folder to environment variable.

Now it's time to check if we have install java version correctly or not. To check open CMD and the write following command 'java -version' and click on enter. You will see the instruction like below in the image.

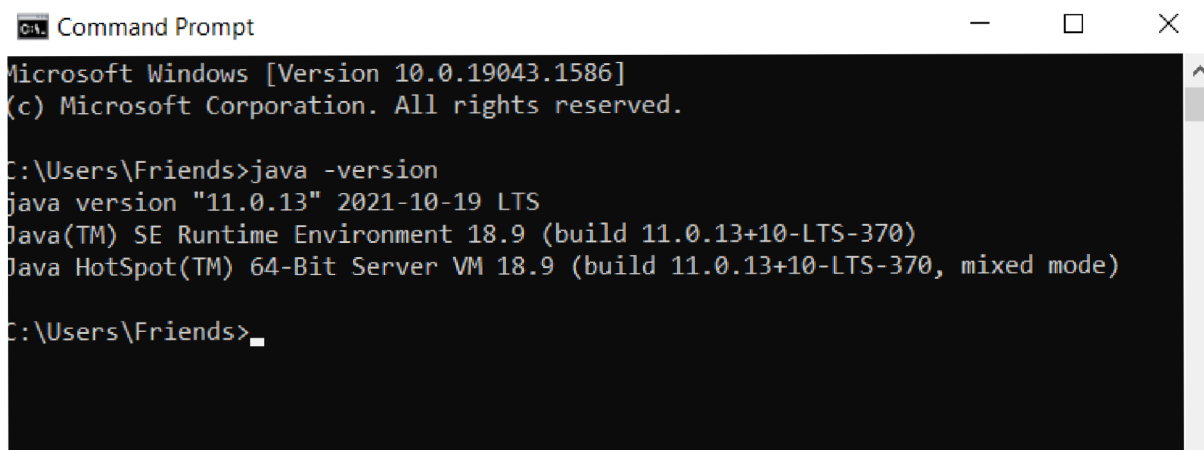


Figure-3.19 CMD showing install version of java.

3.5 Installation of Cassandra:

The first requirement to install Apache Cassandra in the system is to have preinstalled java JDK. Go to given link <https://cassandra.apache.org/download.html> select previous stable version and click on version specified 3.11.12

Releases



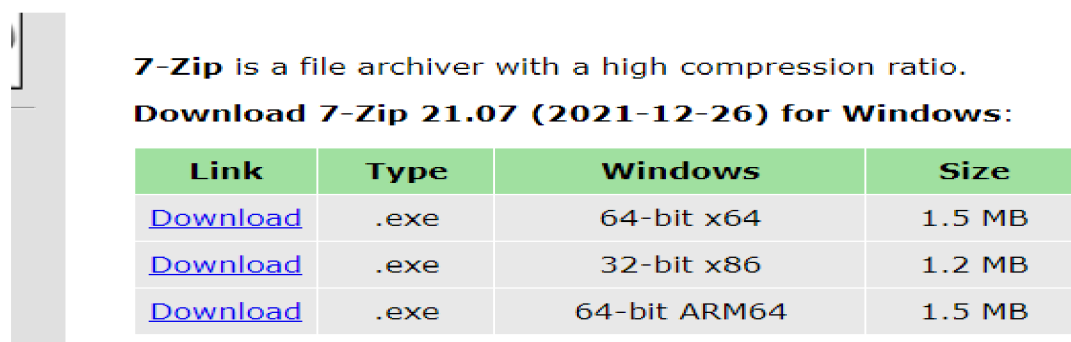
Previous Stable Version
Download the latest Apache Cassandra 3.11 release
Released on 2022-02-08
Maintained until 4.2.0 release (May-July 2023)
3.11.12
(pgp, sha256 and sha512)

Figure-3.20 official web page of Apache Cassandra.

After that it will download .tar.gz file. Link is mentioned below:

<https://dlcdn.apache.org/cassandra/3.11.12/apache-cassandra-3.11.12-bin.tar.gz>

Download the zip file and unzip it using 7-zip tool option. If you don't have 7-zip you can download using following link: www.7-zip.org and click on .exe file for windows according to system configuration.



7-Zip is a file archiver with a high compression ratio.
Download 7-Zip 21.07 (2021-12-26) for Windows:

Link	Type	Windows	Size
Download	.exe	64-bit x64	1.5 MB
Download	.exe	32-bit x86	1.2 MB
Download	.exe	64-bit ARM64	1.5 MB

Figure-3.21 CMD Version of 7-zip tool used for extracting zip files.

Now extract the .tar.gz file two times using 7-zip and then you will get folder apache-cassandra 3.11.12 in your local directory. To check if it's working properly or not. Open

command prompt in the cassandra bin directory and type 'cassandra' as command on CMD and press enter like below image. If you are getting multiple lines on cmd and at last installed successful then your cassandra has been installed successfully.

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19043.1586]
(c) Microsoft Corporation. All rights reserved.

D:\apache-cassandra-3.11.12\bin>cassandra_
```

Figure-3.22 On CMD, run cassandra command to check installation.

After that you can see the node status that your node is connected or not. Again on the command prompt on same bin directory type nodetool status and press enter, you will get all details about connection.

```
Datacenter: datacenter1
=====
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
-- Address      Load          Tokens      Owns (effective)  Host ID                               Rack
UN 127.0.0.1    70.78 KiB    256         100.0%            05014de5-ec5c-4a30-bcfb-c953ad138d29  rack
```

Figure-3.23 on CMD, run command nodetool command to see the connection with nodes.

3.6 Tools that used to analyze and search high volume data:

There are various tool for analyzing and filtering the data at the larger extent. Below mentioned tool can be used for scaling of application. There are two type of scaling: vertical and horizontal scaling. Vertical scaling is type of scaling which increase the performance of machine by replacing them while horizontal scaling is that which the performance by adding

parallel node. Below, there are few tool which can be used for monitoring, analyzing and filtering the data to increase the property of the application or website.

3.6.1 Elasticsearch:

Elasticsearch is a full-text search engine that's primarily used for searching. It can also be used as a NoSQL database and analytics engine. Elasticsearch is basically schema-less and works in near-real-time. It has a RESTful interface, which helps us to interact with it easily from multiple interfaces. Elasticsearch supports different ways of importing various types of structured or unstructured data; it handles all types of data because of its schema-less behavior, and it's quite easy to scale. We have different clients available in Elasticsearch for the following languages: Java PHP Perl Python .NET Ruby JavaScript.

Its query API is quite robust and we can execute different types of queries, such as boosting some fields over other fields, writing fuzzy queries, or searching on single or multiple fields, along with field search. Applying a Boolean search or wildcard search aggregation is another important feature of Elasticsearch, which helps us to aggregate different types of data; it has multiple types of aggregations, such as metric aggregation, bucket aggregation, and term aggregation.

(Srivastava, et al., 2019)

3.6.2 Logstash:

Logstash is a data pipeline that can take data input from various sources, filter it, and output it to various sources; these sources can be files, Kafka, or databases. Logstash is a very important tool in Elastic Stack as it's primarily used to pull data from various sources and push it to Elasticsearch; from there, Kibana can use that data for analysis or visualization. We can take any type of data using Logstash, such as structured or unstructured data , which comes from various sources, such as the internet. The data can be transformed using Logstash's filter option, which has different plugins to play with different sets of data. For example, if we get an IP address in our data, the GeoIP plugin can add geolocation using that IP address, and in the output, we can get additional information of geolocation, which can then be used in Kibana to plot a map. The following expression shows us an example of a Logstash configuration file: `input { file { } } filter path => "/var/log/apache2/access.log"`

(Srivastava, et al., 2019)

3.6.3 New Relic:

New relic tool is used for performance checking and tracing of a software application. It can track any digital data using this tool to improve your system performance. Optimization of the system and finding out the root cause can be performed by analyzing all data, build chart and dashboard by performing query language. Below in the figure 3.24, it can be observed the first appearance of new relic tool and we directly search in the tool search bar for monitoring the application and it does complete job for us and help us to analyze about our application in very deep manner. I have attached few graphs, those graphs represent different state and health of application, it explains how the back end service behaves and how healthy you application is.

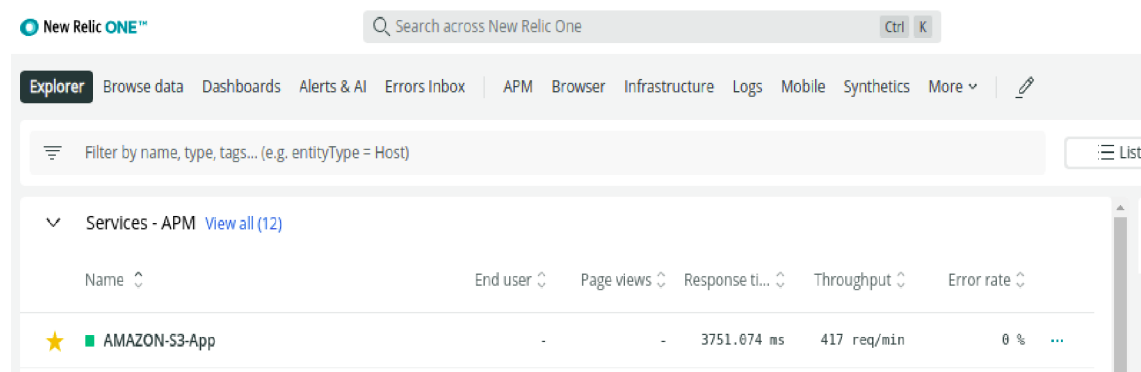


Figure-3.24 Represents the New Relic tool.

Web transaction time is the time which gives the information about the request processing time and that's how many minutes required for one request to complete at a time. This diagram shows the request on the website in specific period. In graph horizon side explaining the time interval and vertical side showing the speed of request on the application. Blue color of graph represents time taken by program in its execution, green color represents external calls on the website while blue color represents total execution time required in processing the complete system.



Figure-3.25 Represents web transaction time.

This diagram showing the throughput of the request on the application. Throughput, means work done per time, i.e. how many request coming per minute. It is showing between 12:35 am – 12:40 am the request was high and the average request per minute is 2.85

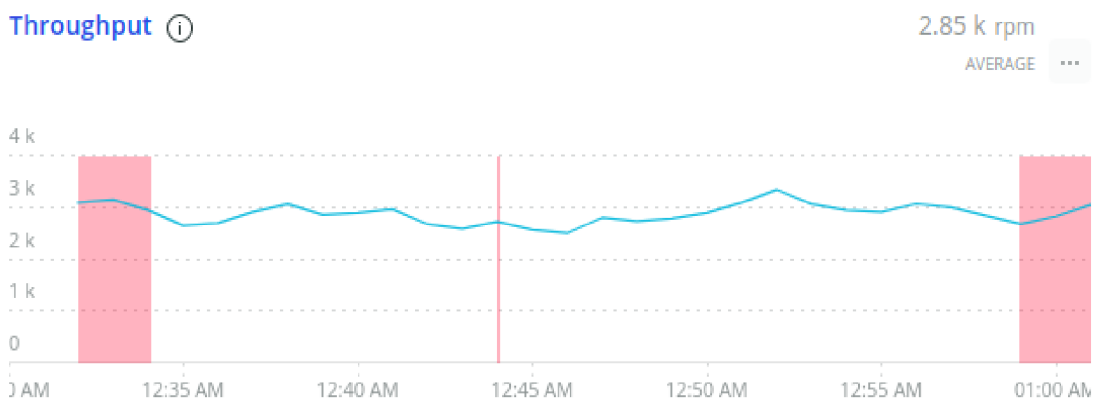


Figure-3.26 Represents throughput time.

This is the external service collected by using API on the new relic tool. It represent all the services used by the software. By using timeout it monitor the website and their services. Blue part in the graph showing highest request on the application due to high curve and green part consuming highest request among all while pink part of the graph showing less consumption of request on the application. Complete appearance you can see in the figure 3.27.

Top external services

by time consumed

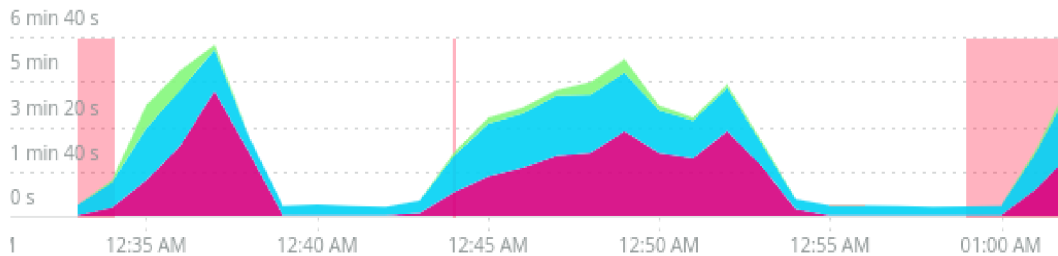


Figure-3.27 Represents top external services.

This graph showing the performance of garbage collector. In java Garbage collection collector plays important role in memory management. Programmer doesn't required to perform cleanup activity to increase the performance and speed up the system. Java has built-in functionality of garbage collection to optimize the application. The architecture of garbage collector reside in JVM and on JVM web applications run. JVM stands for java virtual machine which differs according to different machine. Garbage Collector tells how the application run means about its behavior and how the application utilizes the memory. GC has their main space young space, survivor zero (s0) and survivor one (s1). These three spaces in the garbage collector manages the memory and enhance CPU performance by taking care about us used objects. These unuse objects first go through these three spaces and as per their participation it resides in the main memory or other goes to hiding memory and ends its life or kill itself. In diagram 3.28 is complete representation of working of garbage collector for any application.

Garbage collection CPU time

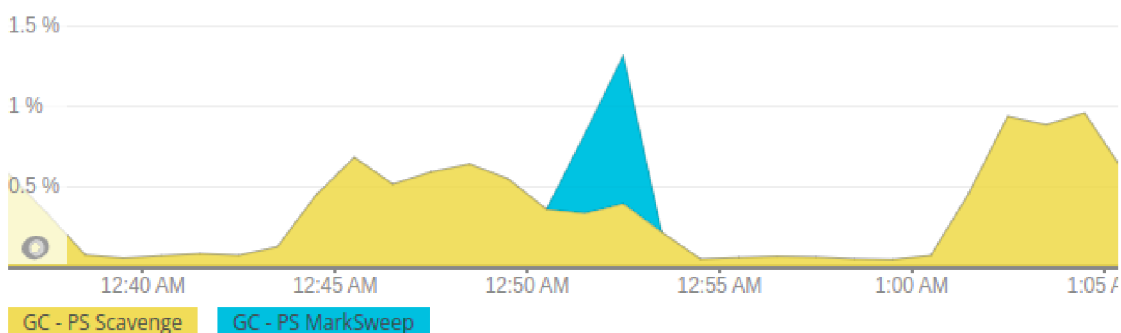


Figure-3.28 Represents top external services.

Heap memory is the area where your most important files are stored and it's a permanent memory location which keep all records and data until the application is alive. In the image the blue line showing the max heap, yellow line for committed heap while red line represents used heap. This graph represents the monitoring of data by Cassandra reader. At different period of the time we can monitor our data to see the traffic on the website and where the activity required we monitor as well. Figure 3.29 is clear visual of utilization of heap memory.

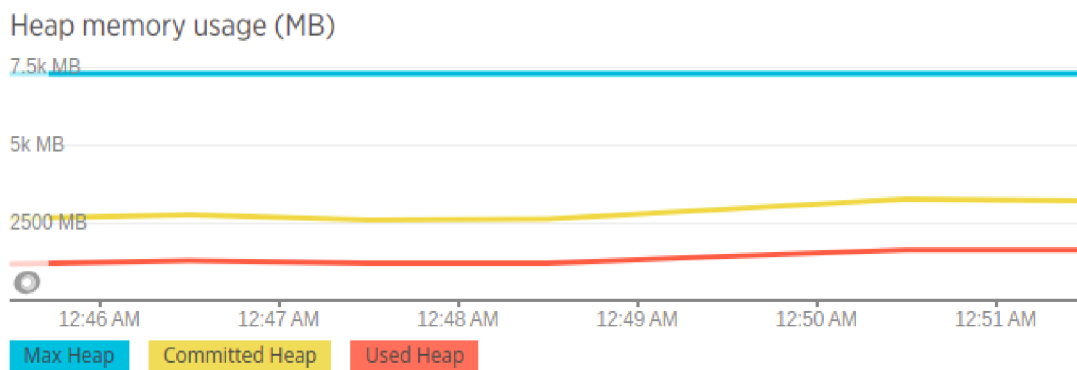


Figure-3.29 Represents heap memory uses.

3.7 Maintenance of e-commerce website:

For any business, simply having a website isn't enough. You must execute regular maintenance activities on your e-commerce site in order to develop your business. Whether it's a website or everyday home items, everything need regular maintenance if you want to keep them in good operating order. Various aspects of the website require maintenance.

3.8 Categories where e-commerce website maintenance required:

- Maintenance for security.
- Maintenance of Marketing.
- Maintenance of Storefront.

3.8.1 Maintenance for Security:

Having a secure website as much important for customer and website owner. Hacking or threatening became a common problem or issue in today's digital world. Keeping your data safe is big challenge for every entity and it could be possible only when you keep doing cleanup activity i.e. maintenance of website, otherwise hackers can hack the customer's data and can use for their own business use.

- **Backup of website:**

Keeping backup for your website is good practice so that when there will be system failure, administrator can have your different replica of their customer's data. No e-commerce website can offered to lose their customer data, it could be highly expensive for them, so it's really important that every e-commerce website should keep their backup for their customer data. It is one of the most important part comes under maintenance.

- **Maintainability of Security Patches:**

Security patches could be big threat for e-commerce website when we download it. We should strictly keep in mind, whenever we download patch security should active on website on that time. There are many providers who provides software as service but you should always note one point if you are aware of your website security, that service provider follow complete rule and pass all authentication criteria of you website in order to save your data from hacks.

3.8.2 Maintenance of Marketing:

Marketing has always been a strong medium for any business. If you want to see your e-commerce website rising day-by-day, you should have really nice marketing content and influencers. Adding a content on your website leaves impression of your product and about your business. You should have updated and attractive content for your site, in order to brag attention of your customer and make consistent on your website for longer period of time.

- **SEO as an important role:**

If your website is not according to search engine optimization then you are losing your customers. You should add content and links in such manner so that SEO can catch your

website in 1st customer search about the product you are offering by this you can increase traffic on website. SEO plays vital role for any website's growth, you cannot ignore the importance of it. SEO works on algorithm so that it can pick the search keyword or link mention on your website and it's also really helpful for customers for as well to navigate through purchase successfully without any hassle.

- **Updated content and regular notification:**

As mentioned earlier, having updated content grabs attention of every customer and if you want more attention of e-commerce site you can put regular discount of your product. Only having a updated content will not increase the load on your website, you have to send the message or email to your customers regarding your offers and new arrivals so that they will keep updated and do shopping regularly. You can post about your offers on various social media so that everyone should have information about your upcoming and new updates.

3.8.3 Maintenance of Storefront:

Having a website that collects data about your customers will allow you to gather valuable information about them, such as their location and how they found you. Having a good site with clear navigation and detailed product descriptions is very important to turn potential buyers into buyers. Word-of-mouth marketing can be done through the site's features, which allow shoppers to easily share their discoveries with friends. The behaviors of bargain hunters can affect other people who are looking for the best deal. One-time shoppers are usually focused on the site's navigation and product descriptions.

- **Updated product range:**

Over half of online transactions are conducted through a mobile device. Regularly adding new products to your website automatically increase the customer traffic on your website otherwise people will get bored and start to find other options as a shopping site. Your updated products should always increase the customer's interest even though they came for only visit, your new collect should invoke customers to do window shopping.

- **Promotions on various platforms:**

There are many options where brand owner can do promotion. These days many social media sites offer room for promotion, like Facebook, Instagram, even on these days many people use WhatsApp status option for promotion. YouTube is most popular place to promote your products and increase your customers.

- **Ecommerce Maintenance Costs:**

Even though web users tend to prefer simple and functional shopping cart systems, but for maintenance it's not bad to pay even too much amount, consequently it will increase your site growth. As per google data, it generally costs \$500 to \$300 for large e-commerce websites, however it can vary from different organizations and could be less for small start-up or growing organization.

3.9 Benefits of e-commerce website maintenance:

The advantages of applications having regularly maintained site contains Faster purchasing process, setting up a store and product listings, Reduced expenses, Cost-effective marketing, best google ranking, SEO preference(when search for keyword related to your contents appears on top of web page), traffic of customers, popularity of your brand as a result growing economy for your business.

3.9.1 Decrement of leaving cart as it is:

Consumer satisfaction and client trust sites have a significant impact on customer loyalty. Customer will not leave their cart without successful purchase, if they find to navigate on site simple and easy they will not leave their cart without buying if they have selected something or they liked. According to research, people sometimes stop buying from online because they see hurdles in complete payment process. It could be anything like entering address, not taking credit card payments or not receiving payment from third party payment app like PayPal or Google Pay.

3.9.2 Better user experience:

Having user reviews is also helpful for researchers since they can gather more information by reading the opinions of other users. Researchers may also want to flag items of interest they're interested in, and they appreciate sites that allow them to save them to their cart. They may also leave a site to ponder on a purchase.

3.9.3 Security of website:

The Security of website as important as customers. Not having a secure website could be a curse for any brand owner, even for small level e-commerce sites because hacker or cybercriminals knows the fact that most of small organization sites are not secure like large scale organization can cause sensitive data lose as result losing the trust of customers. Imagine if card details of your customers could get hacked due to not proper security of site. Many hackers use SQL injection and Cross side scripting to hack your customer's and sensitive data from database.

3.10 Demerits of unmaintained e-commerce website:

E-commerce website helps every business to increase their customer and economy. However if the website in not under maintenance, the purchasing process goes down day-by-day, setting up a store and product listings, Reduced expenses, Cost-effective marketing, worst google ranking, less SEO preference(when search for keyword related to your contents appears on top of web page), lesser traffic customers on site, defamation of your brand as a result decreasing business economy.

3.10.1 Regular threat for hacking:

They represent a significant component of the country's e-commerce market.

The goal is to learn where a user looks when they first land on a home page so that we can identify key points of interest and focal points. The search for a specific pattern that reflects the differences between the attitudes of web pages and the reasons why people favour one site over another is also an important consideration.

3.10.2 Unaware from updates in the future:

There are following points which should be available in any e-commerce website such as user-friendly interface, mobile friendly interface and secure. These are the key factors which increase the traffic of the customer on your website and having a secure website protects your customer data from external hacks or threats.

3.10.3 Web browser will not consider as a safe site:

Traditional businesses and institutions are turning to e-commerce to help them break down geographical and temporal barriers, allowing them to provide a more customized service to their customers. E-commerce has spawned a slew of innovative new businesses as a result of these efforts. E-commerce and the software that supports it have changed dramatically over the last four decades and continue to do so.

3.10.4 Google will rank as a poor site:

Despite the fact that e-commerce is no longer just about online purchasing, the majority of e-commerce solutions are focused on developing web stores. E-commerce platforms that allow developers to access and process commerce data from any application are the primary goal of the founders of this company. To put it another way, e-commerce is the practice of purchasing and selling items online. Internet marketing, electronic payments transfer, and mobile commerce are just a few of the many advantages of doing business online. Direct-to-consumer online retail buying using mobile applications, websites, and even voice assistants, chats, chatbots, and so on. Sellers participating in online marketplaces where many transactions involve third parties.

3.10.5 Traffic on website will decrease gradually:

Developers will be able to utilize this implementation as a starting point for creating their own custom online stores. In 1979, British inventor Michael Aldrich developed teleshopping, an early type of online shopping in this technique, a telephone connection was used to connect the television to a shopping transaction programmer. In 1984, Jane Snowball became the first-ever online home shopper, purchasing goods from the Tesco store in London. The aim of this thesis is to develop and optimize E-commerce web application. The advantages of applications contain Faster purchasing process, setting up a store and product listings, Reduced expenses, Cost-effective marketing and advertising, The ability to adapt to changing needs of the

clientele, There are no height restrictions, Product and cost comparisons are also included, increased responsiveness to the needs of customers and the market and there are a variety of ways to pay.

3.11 Options for website maintenance:

- Hire freelancers.
- Hire a web maintenance team or consultants.
- Rely on the in-house marketing team.

3.12 Optimization of e-commerce website:

Optimization of website means representing your website in way that customer feel like mesmerized and whenever they visit your site, their visit become their purchase from your website. Optimization helps website to grow in many areas of its content. Every field of website related to need should have regular optimization, such as content, SEO, security, looks and appearance, availability, price, easy to use for every age of person, mobile-friendly, cart, payment, shipping, regular email notification. If a single customer moved back from your site without doing any shopping that means you have still task to optimizes your website.

There are various tools where you can use for your website optimization and using modern technology we can find the room required for optimization. Collection of your customers data are the vital information for any website. There are various advance technologies like Big Data, Machine Learning and Artificial Intelligence are the technologies which are mostly used for perform analysis on data to improve the performance of website to its high extent and become popular among your customers.

These days people, whenever do shopping either from store, they necessarily compare or check price of that product either they are getting on good and discounted price product or not. In the digital era, you can find every details from internet and by using their search keywords you can know the requirement of customer from real world. It will not be any predication or manipulated information you can easily rely on it for your content update and adding products to site in order to provide the first service. You have to work regularly on your website optimization and maintenance so that every search will land to your site and at the last become customer satisfaction.

3.13 Tracing and analytics tools:

Name of the tools used for website optimization:

- Moz
- Varvy
- Pingdom
- Ahrefs
- UbbberSuggest
- LucidChart
- Wayback Machine
- Screaming Frog
- Broken Link Checker
- Olark

Above mentioned tool will act like how we think and do experience for any online site. The only difference is we can do huge data calculation and chances of getting error can be increased if we manually. These tools are really helpful to do analysis on behalf of you with your raw customer's data. These automation tools will help your customers regularly connected to your e-commerce site by sending regular notification to their emails or contact number as the mode of registration on your website. These tools will boost your site sell by sending the customized notification to the customers. These tools analyze based on store customer's data and find out product according to age group, gender and interest.

These tools also works on the search history in order to recognize want you want based on your search and show the products similar to that search. Optimization tools are really helpful automated tools helps to grow your e-commerce site at high level and increase your business revenue. This is a good practice of using automated tools for your site as per your requirement. Many companies like Amazon, Flipkart, IKAY, Kaufland, Tesco, Albert, they used their customer data to analyze their customers need.

Above mention companies offers their company card for free of cost and give discount on that card because they collect customers data that what they are buying regularly and what are the items in high demand, they also analyze about the price of the product that if some items which is on discounted price are sold out or not if there are some quality issues in product. They

collect whole data through membership card so that they can know the actual requirement of customer from real world experience. The similar things many businesses having ecommerce site can do in order to collect data and utilize for sale grow. By this you can help customers to buy the items they wants and it is a good practice to work on mostly customer's requirement instead of thinking to increase your sell only.

3.14 Website area required for regular optimization:

We have to categories the area where actually optimizations are required instead to wasting time and money on unnecessary things. To finding optimization area is also a kind of optimization it will save your time and provide you right working direction for right field.

There are few sections where performing optimization will be big boost for your site:

3.14.1 Work on pages content:

The content on your site should be relevant and updated according to current fashion and demands. Whatever product you choose for your e-commerce site it should be updated and new as per customer's point of view. Always search for new things, what you can add to your site with reasonable price. If you put price for your product high you can lose your customers for sure because whenever people decide to buy something they first search on internet, it is proven in many search and if you mark your product price more that market value people will never buy and you can lose traffic on your website. It is completely up to business owner if they want to keep prices high for product.

3.14.2 Website loading speed should be fast:

When customer hit on your website, your website should be fast enough to not take time more than few seconds. If you expect from your customer that they should wait for minutes to load your website, then you are wrong. Your customers will start searching some other alternatives for your website, which is very bad for any ecommerce site. In today's high speed internet era, no one wants to wait for single seconds. They need as much fast as you can provide and this feature can help you to hold your customers on your site and convert them to buyer from visitors.

3.14.3 Site compatible for mobile, tablets and all other devices:

If your e-commerce website is friendly to every set of device, then you are no right track of growth. Mobile by name is quite handy and friendly for traveling. In order to utilize time and for sake of easy to use many users use mobile phone for their most of the tasks and if you can help them to provide mobile friendly shopping website, they will be more happier than anything. In the current world, everything can be done by using mobile phone and if your site wouldn't support mobile version then your website is already out of gallery.

3.14.4 Site should be responsive:

Building a responsive website is as important as any other aspects. Without responsive website, your content will not appear in way you designed and this will be completely your lose if you did something but you are not getting benefit from your work. Responsive website leaves nice impression of your website on customer's mind and they will come again to buy products from your site. Mouth talk is most important media of marketing if the customers who visited to your site experience good they will tell to friends and family members and recommend to visit your site which a nice gain for you without investment.

3.14.5 Appearance of landing should be impressive:

Landing pages should be as attractive as you can design but in a decent way. First impression is last, that phrase applies here and if your website content can grab attention of your customers that means they can convince to buy products, even you can convert the visitors to buyers. I mentioned many times about the price of product which is most important deciding factor, keep product's price as minimal as possible.

3.14.6 Products personalization option:

Providing a personalized item saves time and also you wouldn't get lost because of huge options. If customers know their requirement your website should have feature to help and provide them personalize product in order to save time and also invites customers multiple times to buy.

3.14.7 Easy purchase flow for every age group:

Now-a-days every age group passionate for using internet and if your website can provide room for every age group would be huge customer collection. Your website should have

quite decent flow of purchase. To adding items in cart, checkout, payment, shipping address every flow should be simple and easiest for increase the customer's traffic.

3.15 Website with optimization:

There are huge benefits of having an optimized website. Optimization and maintenance are the two regular actions for a growing and healthy website. Below points encourage website's owner to do regular optimization for e-commerce growth.

- SEO will show your website on first search if any one do search similar to your product.
- Gain popularity which will also be advantage to grab other customer's attention.
- Less number of customers leave their cart without purchase.
- Transaction will increase on your website.
- Higher number of customer traffic on site.
- Rating from google will be high.
- Marked as trusted website.
- Growing economy

3.16 Website without optimization:

Not performing optimization on your e-commerce website will lower down your site image and consequently lower the gain and economy of your business.

Below are the loss any website owner can face if they don't have optimized website.

- SEO will not show your website on similar product related search or maybe last option in the web page.
- No one knows about your site and your product, as a result you will lose customers and drag down your business.
- Maximum number of customers leave their cart without purchase.
- Transaction will decrease on your website.
- Lesser number of customer traffic on site.
- Rating from google will be poor.
- Marked as untrusted website.
- Economy will drop down.

3.17 Optimization Tips:

- Use search key as a normal people does. These most frequent and common key value pair would be advantage for your website.
- Build and design website from customer's perspective.
- Add nice and relevant images as content for your website.
- Release regular offer for products on your website.
- Provide proper description for product such as materials used and in some cases manufacturing date and expiry date.
- Good and safe shipping facilities so that product will still safe after delivery.
- Always cares about customer's genuine reviews and try to improve as much as possible.
- Your website should have all payment mode such as credit card, debit card, Google pay, PayPal payment options.

3.18 Optimization from software perspective:

If your website is not according to search engine optimization then you are losing your customers. You should add content and links in such manner so that SEO can catch your website in 1st customer search about the product you are offering by this you can increase traffic on website. SEO plays vital role for any website's growth, you cannot ignore the importance of it.

SEO works on algorithm so that It can pick the search keyword or link mention on your website and it's also really helpful for customers for as well to navigate through purchase successfully without any hassle getting benefit from your work. Responsive website leaves nice impression of your website on customer's mind and they will come again to buy products from your site. Mouth talk is most important media of marketing if the customers who visited to your site experience good they will tell to friends and family members and recommend to visit your site which a nice gain for you without investment.

These tools also works on the search history in order to recognize want you want based on your search and show the products similar to that search. Optimization tools are really helpful automated tools helps to grow your e-commerce site at high level and increase your business

revenue. This is a good practice of using automated tools for your site as per your requirement.

3.19 Transaction/payment optimization:

Payment facility is one of the most important key element in maintaining the e-commerce website, failing in this area could cause a vast damage to the business and could halt the whole operation resulting in loss of customer trust. Responsive payment gateway leaves a nice impression to the customer's mind and they will come again to buy products from the website.

Mouth talk is most important media of marketing, the customers who visited to the website have a great experience, they do the part of free marketing by telling friends and family members and recommend to visit the website which a great opportunity on business improvement.

3.20 FAQ- frequently ask question section:

This section of website plays important role for the growth of the website and also tells where the improvement required, landing pages should be as attractive as you can design but in a decent way. First impression is the main impression, that phrase applies here in great sense and if your website content can grab attention of your customers that means they are convinced to buy products, even you can convert the visitors to buyers. I mentioned many times about the price of product which is most important deciding factor, keep product's price as minimal as possible.

Your content will not appear in way you designed and this will be completely loss if you did something but you are not getting benefit from your work. Responsive website leaves nice impression of your website on customer's mind and they will come again to buy products from your site. Mouth talk is most important media of marketing if the customers who visited to your site experience good they will tell to friends and family members and recommend to visit your site which a nice gain for you without investment

3.21 Additional content for clear overview of product:

By providing clear description and quality of product one can gain the trust in customer eye, it is good practice to add video related to that product. Your content will not appear in it was

designed and this will be completely loss if you did something but you are not getting benefit from your work. Responsive website leaves nice impression of your website on customer's mind and they will come again to buy products from your site. Mouth talk is most important media of marketing if the customers who visited to your site experience good they will tell to friends and family members and recommend to visit your site which a nice gain for you without investment. This Section of website plays important role for the growth of the website and also tells where the improvement required, Landing pages should be as attractive as you can design but in a decent way. First impression is last, that phrase applies here and if your website content can grab attention of your customers that means they can convince to buy products, even you can convert the visitors to buyers.

4. Conclusion

Having fully functional e-commerce website is a vital stairway for growth of the businesses. Fully sophisticated and well design website will help to secure very reliable and loyal customer and it also helps in creating new insights for business development. Having fully functional website attract more reliable customer and provide opportunity to be more creative with your marketing strategies therefore, having only offline marketing and single point of sale would not result in further growth.

It is inappropriate to assume that creating an e-commerce website is easy however it is a well-known fact that in order to build a website with all features, functionality, details with advanced technology which fulfil all the requirement of a customer depends on expertise in this background. You have to invest not only money but time and lot of efforts with patience as well to analyze the real world requirement of customers. Creating website via WordPress and e-commerce plugins would be a best option and more affordable for businesses in early phase as I have explained in details in my thesis however in order to build a full functional website according to product niche and customer experience, it is more sustainable to build it from scratch by using code or by taking help from professionals in this area.

The most important aim of e-commerce business is to attract customer by maintaining full functional website so that they can easily access and get the product as per their need, therefore, having a sophisticated and well organized website drives the business in more profitable way. Building an e-commerce website could be similar to developing other types of website however it includes the complete overview from physical marketplace properties in virtual manner and indicating customer's perspective. Designing and developing a website for brand growth would be more beneficial if customer's necessity were the main focus.

In this thesis, customer's requirements and needs were also mentioned based on research and few widely suggested resources. This thesis is a collection of my own expertise and performed research in e-commerce website development area from unevenly distributed resources.

In the practical part, contents are based on gathered information during practical work in company and from my own analysis. Description of tools are mentioned not based on any assumption but the practical use.

It has been mentioned the significance of java programming language over other programming language for certain set of requirements and about Cassandra database and its uses. There are explanation of many tools which can be used for analyzing and tracing the application. This document has highlighted the main building blocks of the e-commerce website.

The future use of this thesis work would be writing code for customized e-commerce website by using all the theoretical and small practical work in this document. It is helpful for the beginners who has strong interest or wants to build their career in development field. The motive of the thesis was to save the time of users, so that they wouldn't get lost in scattered world of internet. As I have mentioned to provide customized and personalized things for customers, I tried to do same for e-commerce website development, maintenance and development so that any user who decides to proceed in this area wouldn't get off-track rather take an help of this document to move further.

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2. List of symbol and Abbreviation

Acronym	Meaning
B2B	Business to Business
SSL	Security Socket Layer
CMS	Content Management System
KPIs	Key Performance Indicator
CSS	Cascading Style Sheet
JRE	Java Runtime Environment
JDK	Java Development Kit
OOP	Object Oriented Programming
IDE	Integrated Development Environment
RDBMS	Relational Database Management System
AWS	Amazon Web Services
EDI	Electronic Data Interchange
SQL	Structure Query Language