



Artificial Intelligence Based Personal Computer Parts and Laptop Recommending Assistant

Software Requirement Specification Document

Comprehensive Design & Analysis Project – 2019

B.Sc. Special (Honors) Degree in Information Technology

Project ID: 19-069
Date of Submission:

“TechRing” – SRS | Software Requirement Specification

Author:

Student ID	Name	Signature
IT16054578	Tharaka K.K.S.	

Supervisor:

.....

Prof. Koliya Pulasinghe

Table of Contents

List of Figures	4
List of Tables	4
1 Introduction.....	5
1.1 Purpose	5
1.2 Scope	6
1.2.1 Objective	6
1.2.2 Other objectives	7
1.2.3 Benefits.	7
1.3 Definitions, Acronyms, and Abbreviations.....	7
1.4 Overview	8
2 Overall Descriptions	9
2.1 Product perspective	10
2.1.1 System interfaces	12
2.1.2 User interfaces	12
2.1.3 Hardware interfaces	13
2.1.4 Software interfaces.....	13
2.1.5 Communication interfaces	13
2.1.6 Memory constraints	13
2.1.7 Operations.....	14
2.1.8 Site adaptation requirements.....	14
2.2 Product functions.....	15
2.2.1 Sign Up	16
2.2.2 Validate User	16
2.2.3 Search Laptops.....	17
2.2.4 View Laptops	17
2.2.5 Compare two Laptops	18
2.3 User characteristics	18
2.4 Constraints.....	19
2.5 Assumptions and dependencies.....	19
2.6 Apportioning of requirements	20
3 Specific requirements.....	21
3.1 External interface requirements	21
3.1.1 User interfaces	21

3.2	Performance requirements.....	26
3.3	Design constraints	26
3.4	Software system attributes	26
3.4.1	Reliability.....	26
3.4.2	Availability	27
3.4.3	Security	27
3.4.4	Maintainability	27
3.5	Other requirements	27
4	Supporting information.....	28
4.1	Appendices	28
5	References	29

List of Figures

Figure 2. 1 - High Level Architecture Diagram	10
Figure 2. 1 - Use Case Diagram.....	15
Figure 3. 1 - User Interface: Home page.....	21
Figure 3. 2- User Interface: Sign Up.....	22
Figure 3. 3- User Interface: Sign In	23
Figure 3. 4- User Interface: Result display for a Laptop Comparison.....	24
Figure 3. 5- User Interface: Display compatible product list for user budget	25
Figure 4. 1 : Activity Diagram: Laptop Comparison	28

List of Tables

Table 1. 1 - Acronyms and Abbreviations	7
Table 2. 1 - Comparison of current available systems with TechRing	11
Table 2. 2 - Use Case Scenario: Sign Up.....	16
Table 2. 3 - Use Case Scenario: Validate User	16
Table 2. 4 - Use Case Scenario: User Selection Product/ Laptop.....	17
Table 2. 5 - Use Case Scenario: View Laptop	17
Table 2.6 - Use Case Scenario: Compare two laptops.....	18

1 Introduction

1.1 Purpose

This Software Requirement Specification document contains a detailed documentation of the final year research project belonging to the group 19-069 of 2019, Software Engineering and Information System Engineering Batch.

Our main goal of preparing this document is to provide the detailed overview about the final product that we plan to develop in the end of our research project. This document mainly focuses on,

- Software Requirements.
- Project Scope.
- Project Purpose.
- Target Audience.
- Functional Requirements.
- Nonfunctional Requirements.
- Methodologies.
- References.

In order to finalize the decisions taken in each iteration, this document will be utilized throughout the software development lifecycle as a reference. Thus, this will be a useful key reference document to,

- Developers.
- Software testing groups.

In brief the purpose of this document is to provide an in-depth insight of the Artificial Intelligence based Personnel Computer parts and Laptop recommending assistant.

1.2 Scope

This provides explanations depicting the clear boundaries of the user requirements addressed in the project. Attention to both functional and non-functional requirements are given in this document.

We plan to introduce the final product of our research by the name “TechRing” to the market. More precisely it will be addressed as TechRing – Artificial Intelligence based personal computer parts and laptop recommending assistant. This is a platform available for any person who needs assistance in assembling a PC or in purchasing a laptop.

From the identified requirements we divided the main product into four components. These four components will contribute to the main aspect of recommending the best option to the customers. The components are,

- Assembling assistant
- Customer review analysis
- Price comparison & optimization
- Laptop recommender

The assembling process for personal computers is long and a complex task [1]. This is common problem faced by majority of current society. Thus, we will provide the assemble sequences customized for games. Because majority of the assemblers were from gaming community. But we are limited only for gaming customization and we plan to extend the customization based on specific purposes (E.g.: Videos editing purposes) and different software requirements.

Our platform assists in the selection of the best laptop for user requirement. We recommend the best laptop to be used in playing a particular game the user is interested. This service also provides the capability where the user can compare two laptops that they have a doubt and our platform will recommend the better of the two considering their computational power, customer review ratings and price optimization aspects. Since PCs and Laptops recommendation happen in one place it helps the users a lot. Throughout this document we will be focusing on this aspect of the platform.

1.2.1 Objective

Main objective is informed to the users what is the best laptop is, comparing different features. He/she can select same brand or two different laptop brands. Other benefits is user get suggestions.

1.2.2 Other objectives

- Recommend the best laptop from two models.
- To make a user-friendly website where the users find it easy to navigate and they find what they require easily and faster.
- To develop a system which has a high accuracy, security, efficiency, understandability and flexibility which will act as the supporting roles for the non-functional requirements.

1.2.3 Benefits.

- Users can compare and view two laptop models and he/she will be informed the best laptop from the two.
- Users can view suggestions according to compared best laptop.
- “TechRing” laptop comparison save user's time in searching the idle Laptop.

1.3 Definitions, Acronyms, and Abbreviations

Abbreviation	Explanation
PC	Personal Computer
AMD	Advanced Micro Devices
GHz	Gigahertz
GB	Giga Byte
RAM	Random Access Memory
CPU	Central Processing Unit
IT	Information Technology
POS	Part of Speech
MVC	Model View Controller
AWS	Amazon Web Service
SRS	Software Requirements Specification
HTTP	Hyper Text Transfer Protocol

Table 1.1- Acronyms and Abbreviations

1.4 Overview

This section focusses on the main goals and tasks that is to be delivered via TechRing for all the future users. By incorporating these aspects, we expect to deliver a valuable service to every user. Also, this section provides the future content of Software Requirements Specification (SRS) document.

Main Goals.

1. To be the most reliable source of recommending tool available to find the best PC parts and laptops that suits user's requirements. Since the base of recommending tool consider many aspects like customer reviews, price and performance it comprises of high reliability.

Tasks

1. Get laptop details by calling Noteb.com REST API and save the details.
2. Implement compression algorithm for compare laptop.
3. Identifying the best laptop then generate suggestions.

SRS document will be mainly consisting of three sections. Each section will be considering different parts of the final product.

Chapter 1: This section will be explaining the core purpose of creating the SRS. This will give a detailed idea of what the final product will be capable of doing and not capable of doing in the implementation stage. Also discuss about the goals, objectives, benefits and tasks of the final output. The overview section will be demonstrating the rest of the SRS content and how the content will be organized.

Chapter 2: This describes the non-technical way of focusing the end users of the final product. The purpose of this section is to give the users a clear idea of what the system does. Since most of the end users might not be technically knowledgeable this section gives the idea of the final product. This includes Product Perspective which identifies the existing recommending assistants similar to the one that is being developed, Product Functions which includes details about the functions that are available in the developing system, User Characteristics describes the targeted user base, Constraints will discuss about the limitations that controls the developer's options, Assumptions and Dependencies includes the assumptions utilized during the designing and implementation phase.

Chapter 3: This describes the technicality of the system. This describes the system in a developer's point of view. Main purpose of this section is to provide a better technical understanding for other or future developers or maintainers of the system. Thus, this uses numerous technical terms that will be familiar to software engineers, developers and maintainers.

2 Overall Descriptions

Nowadays computers play major role in almost all the industries. Initially, computers were used as a tool for calculations, but now computers help people finish many aspects in life [2]. As previously mentioned computerd have simply become a multi tasking device. In addition to computers, laptops also come into play enhancing the portability aspect.

There are preset PC's available around the world. But people prefer assembling their PC's by themselves rather than going for a preset one. Because most of the preset PC's fail to cater the exact user requirement as they have been assembled to perform common tasks. This becomes an issue when it comes to the Gaming industry. Ten years ago, this industry is just an entertainment field. But today it is one of the highest profits earning industry. Majority of the population is Gaming community. Thus, the gamers prefer assembling their PC's by themselves. But they find it difficult to find the necessary parts, compatible parts. Simply it is tedious and time consuming for them to create the assembling plan to match the gaming requirements. TechRing has solution for this. This will assist the users in building and displaying the assembling plan once the Game name is entered. We guarantee the reliability of the recommendation that is provided.

Any customer irrespective of the products they are looking will consider the previous customer's experiences before purchasing a product. Because who better knows about the product rather than a customer who have already used the products. But there numerous social media platforms available that contains bulk information about the customer experiences in each product. In practical scenario people do not have time to spent on social media platforms and analyze them. Thus, the concept sentiment analysis is used in “TechRing”. Sentiment Analysis is important in understanding the people's opinion on matter by analyzing a large amount of data [4]. TechRing also display an analyzed graphical overview of the customer feedbacks which helps the customer to get an idea of the user experiences at a glance.

Since there are multiple vendors, brands and versions available for each PC part there might be price variations that is created. Thus, always the best product is neither the expensive or cheap one. It has to be decided through price optimization. Price optimization is the use of price elasticity of demand and the enterprise manufacturing cost per unit to create economic efficiency [3]. TechRing utilize the price optimization concepts in recommending the products for a user when they type a name of the product. This also helps the vendors to reach their customers beyond geographical boundaries.

As previously mentioned laptops also have a similar demand like for PCs. Even in laptops have different versions and brand in the market. Thus, people get confused when the want to purchase laptop. Thus “TechRing” recommends the best laptop considering the computational power and analyzed customer reviews. When the user selects the two laptops they want to compare from the two best one will be recommended. This save up the user's time of researching the laptop details and analyzing them.

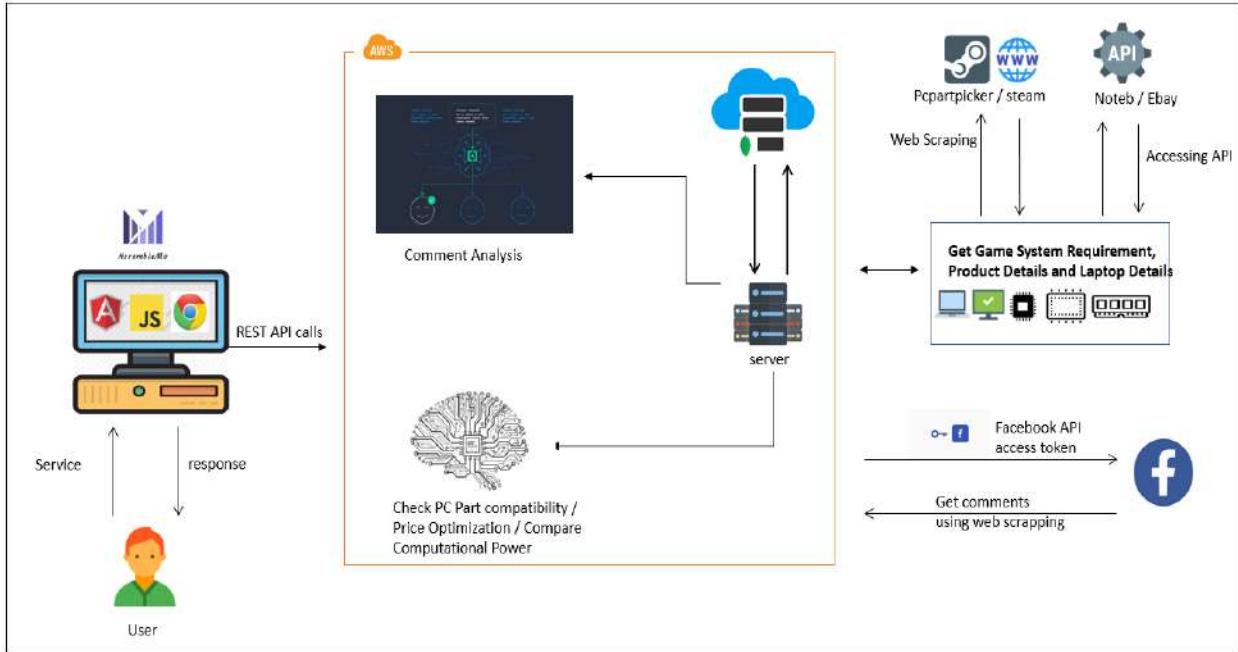


Figure 1.1- High Level Architecture Diagram

2.1 Product perspective

By analyzing and reviewing the research articles and conducting the literature review, our attention was drawn to following noticeable platforms which cater for similar requirements.

- Pcpaptricker
- Noteb.com
- Newegg.com

Above mentioned platforms assist users in finding the PC parts and Laptops for their requirements. But these differ from one another due the availability of their functionalities. Below is a comparison we conducted among “TechRing” and the above-mentioned platforms. All these mentioned features are planned to be implemented in “TechRing” in the completions of the research.

Functions	PCPartPicker.com	NewEgg.com	Noteb.com	TechRing
Select Compatible PC-Parts	✓			✓
Build PC according to a System requirement Of a Game				✓
Display prices and compare of different vendors	✓			✓
Analyze Comments and display rating based on that				✓
Recommends assemble plan according to budget	✓	✓		✓
Recommend the best PC part in a price range				✓
Notify Price Drops to user	✓	✓		✓
Laptop comparison			✓	✓
Recommending the best laptop				✓

Table 2. 1 - Comparison of current available systems with TechRing

As presented in above table, none of the current platforms are capable of providing a generalized solution to the users. It is either they provide suggestions to PC parts or laptops. But these sectors go in together. Thus, having a platform as TechRing is vital.

TechRing platform is designed to overcome the main problem many PC assemblers face. That is having a reliable source to get a PC assembling plan for the user requirements. Even though the current platforms suggest the suitable PC parts individually they do not have an integrated platform which will consider the compatibility of whole set of PC parts and build a PC assembling as needed. TechRing will be designed to overcome this issue. At the moment our functionality will be limited to in building the PC plan according the Game requirements.

Most of the site display the customer reviews as it is. Even in the above mentioned platforms, they either display the comments the customers have posted on their sites or in another social media platforms. In noteb.com as the reviews they just display the blogs that are available on the internet. Users find it difficult in getting an overview of the product through such sources. Thus “TechRing” will provide an analyzed overview of the comments, showing the percentages of positivity and negativity of the comments. In order

to identify the nature of the comments, sentiment analysis will be conducted on the extracted comments. For this NLP toll kits will be utilized along with the deep learning techniques. Comments will be accessed Real Time. Thus, the comments will be extracted via the selected social media platform using Web Scraping when it's required. Users find this display of the reviews much more effective in making their purchasing decisions rather than referring to paragraphs.

Comparison is one of the functionalities that most of the platform provide. But these sites don't recommend the best from the comparison. Users find it less effective having a detailed overview of the functionality comparison. It will be much more effective if the users can have functionality comparison along with a recommendation as to what is most suitable or ideal from the compared ones. This can create a huge impact to the users. None of the platforms fails to recommend the idle laptops based on the game specifications. Thus “TechRing” having this feature will stand out from the available platforms.

2.1.1 System interfaces

“TechRing” will be using below mentioned interfaces.

- Spring Boot REST API
- Noteb REST API
- OAuth 2.0 API

2.1.2 User interfaces

The final product of “TechRing” is a web application. Detailed description of the user interfaces will be described in Section 3.1.1. Main user interfaces in “TechRing” are as follows,

- Web Application
 - Home Page
 - Register
 - Login
 - Individual PC parts page
 - System build page
 - Build for game requirement page
 - Build for budget pages
 - Laptop Comparison page
 - View Laptop details page
 - Laptop compare result page
 - User profile page
 - Vender profile page

2.1.3 Hardware interfaces

In order to run “TechRing” without any trouble there are hardware requirements that need to be available. Below are the hardware requirements we have identified that need to be available during the designing, implementation and testing phases.

- Desktop Computer / Laptop
- 64-bit (x64) Dual-core 2.4GHz or faster processor
- 2 GB RAM
- Windows 7, 8 or 10

2.1.4 Software interfaces

These software and frameworks will be utilized in developing the platform.

- Software
 - Windows 10 Operating System
 - Robo- Mongo (MongoDB)
 - Spring Tool Suite 4
 - Visual Studio Code
 - Anaconda Navigator
 - Jupiter Notebook
 - Adobe Photoshop
- Frameworks
 - Spring Boot
 - Angular

2.1.5 Communication interfaces

- For data transmission between server and the client web app need to use internet or Wi-Fi connection to the devices.
- HTTP protocol is used to communicate web server and the client devices.

2.1.6 Memory constraints

- To deploy the web app need 2GB RAM and 10 GB space in server machine
- 1 GB RAM is recommended for the run the client app in the browser
- For client requests server machine is expected to use less than 1 GB RAM and 10 GB of HDD space.

2.1.7 Operations

- Login to the System
- Sign up
- View and edit profile
- Compare computational power of a laptop and select best laptop

2.1.8 Site adaptation requirements

- From the initial user interaction, User Signup session appropriate guidelines should be provided to assist in the user registration process.
- Prior to using “TechRing” user devices should have access to internet. This is necessary to communicate with the server.
- Platform should be designed focusing on easiness and friendliness user will experience when using “TechRing”.
- User must always input accurate and valid details to the platform when using “TechRing”
- Outputs, solutions and recommendations should be displayed in a meaningful and accurate order.

2.2 Product functions

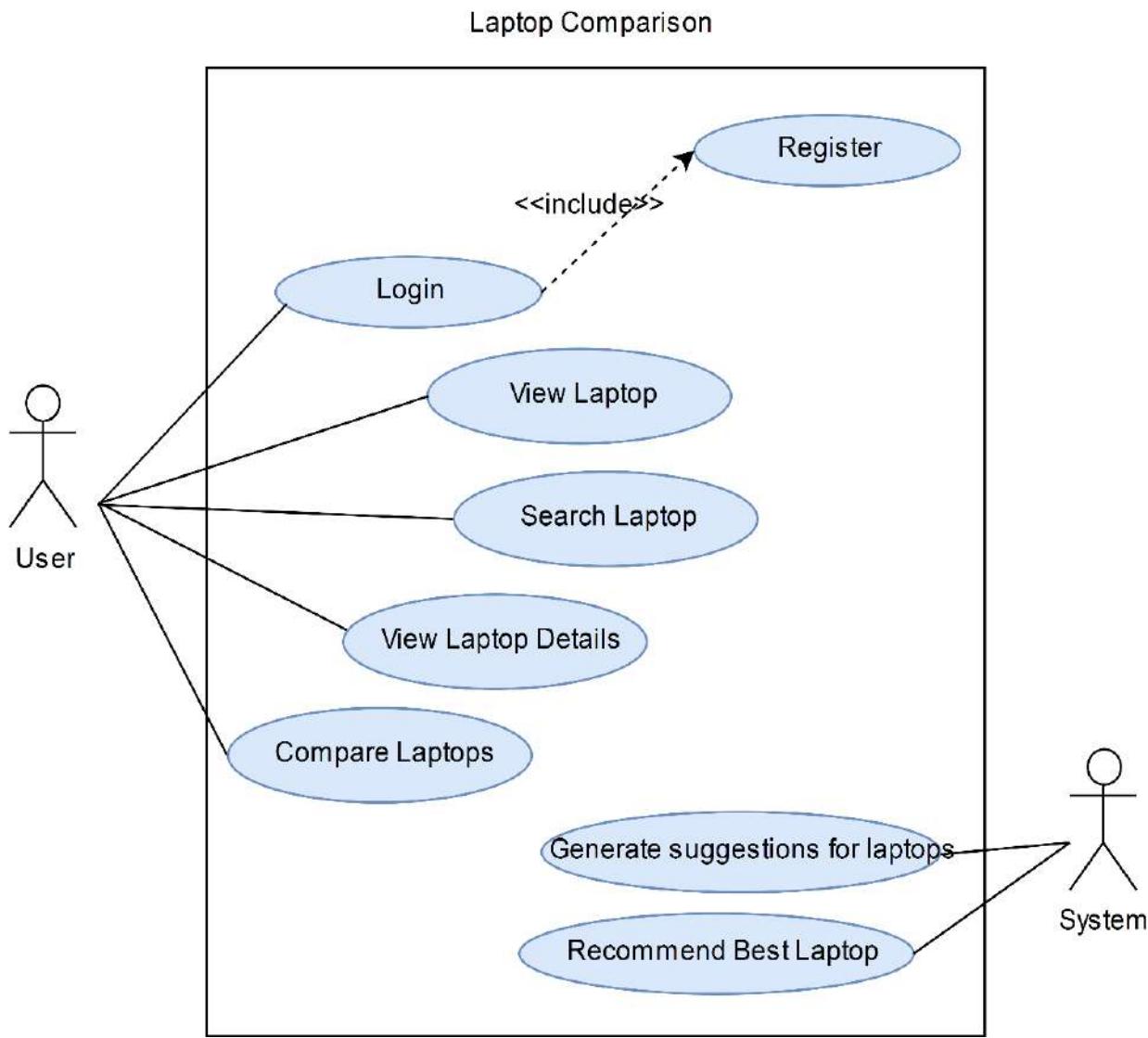


Figure 2. 1 - Use Case Diagram

2.2.1 Sign Up

Use case Name	Sign Up user
Description	Sign up to “TechRing” to get more services from our platform
Actors	Site visitors/ users / vendors
Pre-conditions	Valid Email, unique username, valid password
Main Flow	<ol style="list-style-type: none"> 1. User visit the site. 2. Navigate to sign up page 3. Enter the required details 4. Show registration status and navigate to home page
Post Conditions	Display registration status and send email
Extensions	3.a 1. If user enter invalid details prompt errors and attempt again to enter valid data

Table 2. 2 - Use Case Scenario: Sign Up

2.2.2 Validate User

Use case Name	Validate user
Description	Validate user who already signed up with “TechRing”
Actors	users / vendors
Pre-conditions	Users should have a “TechRing” account
Main Flow	<ol style="list-style-type: none"> 1. User visit the site. 2. Navigate to sign in page 3. Enter the username and password 4. Details verified by the system
Post Conditions	User log in to the account successfully
Extensions	3.a 1. If user provide invalid details, then prompt error messages

Table 2. 3 - Use Case Scenario: Validate User

2.2.3 Search Laptops

Use case Name	User selection of products/laptop
Description	System identify user requirements based on the user's selection
Actors	Site visitors/users
Pre-conditions	Name/ keyword that is already existing is entered by the users.
Main Flow	<ul style="list-style-type: none"> 1. User visit the site. 2. System allow the user to choose the option either PC part/ laptop. 3. System identify the key words/tags in the name entered to the system by the user. 4. System checks for matching record in the database. <ul style="list-style-type: none"> 4.1 Display of matching products will be displayed to the user. 5. Step 2 will be repeated by the user until they find a product they wish.
Post Conditions	Display of matching product list to the users.
Extensions	3.a 1. Unavailability of matching record from the database will result a notifying the customer about the unavailability or asking to reenter the name.

Table 2. 4 - Use Case Scenario: User Selection Product/ Laptop

2.2.4 View Laptops

Use case Name	View Laptop
Description	Users can view different types laptop.
Related requirements	Internet connection
Actors	Site visitors
Pre-conditions	User should access through tech ring.com
Main Flow	<ul style="list-style-type: none"> 1. User visit the tech ring web application. 2. Click button compare laptop at the top nav bar. 3. Select brand of laptop at left side bar 4. User redirect selected laptop brand page 5. System display laptops
Post Conditions	Display user selected laptops

Table 2. 5- Use Case Scenario: View Laptop

2.2.5 Compare two Laptops

Use case Name	Compare two laptops
Related requirements	Laptop one, Laptop two
Description	User can compare two laptops which he/she selected, then he/she can inform which one is best laptop among them.
Actors	Site visitors
Pre-conditions	User should two laptops model, it can be same brand or different brand.
Main Flow	<ol style="list-style-type: none"> 1. Select first laptop 2. Select second laptop 3. User click compare laptop button 4. User redirect new page 5. System display best laptop and suggestions
Post Conditions	Display user selected laptops
Extensions	3.a.1 system will display “please select two laptops”

Table 2. 6- Use Case Scenario: Compare two laptops

2.3 User characteristics

“TechRing” is an online assistant which will assist anyone who is looking for a PC part or a Laptop to purchase. Our user base consists of an age gap starting from 10 to 60yrs and more. The reason for having such a huge user base is that all most everyone needs a computer or a laptop to function daily. We have categorized our user base as below,

- Students.
- Gaming Society.
- Employees.
- PC parts and Laptop Vendors.
- Ordinary People.

Basically “TechRing” will provide assistance for anyone with both expert and average technical knowledge personnel in making purchase decision for both PC parts and Laptops. In addition, our platform help people in need of proper guidance for finding compatible PC parts to assemble their PC’s matching their requirements.

2.4 Constraints

One of the common constraints for any user of this online assistant is the availability of Internet. Since the system needs access online data apart from the data from the database and the output of the system will be provided via a web portal Internet connection for the functioning of “TechRing” is a must.

- Software Constraints.
- ‘TechRing’ is a web application so that using any web browser which supports relevant Javascript, should be able to access the site. Mobile devices should also be able to access the website because of the responsiveness. Python use for machine learning algorithm to analyze user comments, price optimization, Compare computational power and recommend best laptop and suggest the PC part using build sequence.
- Time Constraints
Final product should be produced by October 2019.
- Data Constraints.

There will be two sources of data. Set of data will be stored in the databases. Data will be stored using MongoDB. These details will be updated manually by the system administrator. Other set of data will be extracted real time since the system needs to access the updated data content.

2.5 Assumptions and dependencies

Assumption

- The details that are provided by the user to the system will be names and details already available in the market.
- The device has access to the Internet before accessing “TechRing”.
- Individuals who access “TechRing” possess considerable computer literacy to operate and use functionalities that are offered in the platform.

Dependencies:

- Users’ accessing devices must be connected to the Internet prior to the use of “TechRing”.
- Users’ should visit the site via a web browser in order to experience the services provided by “TechRing”.

2.6 Apportioning of requirements

The first release of “TechRing” consists of the functions that are mentioned in the section 1 and 2. In section 1 and 2 more focus is given to the overall description about the system and its requirements. Section 3 is focusing on the requirements that needs to be followed in designing the final product.

It is possible to modify “TechRing” by expanding the services provided by the online assistant. Currently the PC assembling plans are built only according to the game specifications. But in future we can expand this function in to other areas like video editing, drafting, designing and more.

Moreover, we can allow the users a separate section where they can express their views about the product in “TechRing” itself.

3 Specific requirements

3.1 External interface requirements

3.1.1 User interfaces

User interfaces are the access points for users. The interface layout determines the friendliness of the platform. Lesser the number of interfaces more user friendlier the software will be.

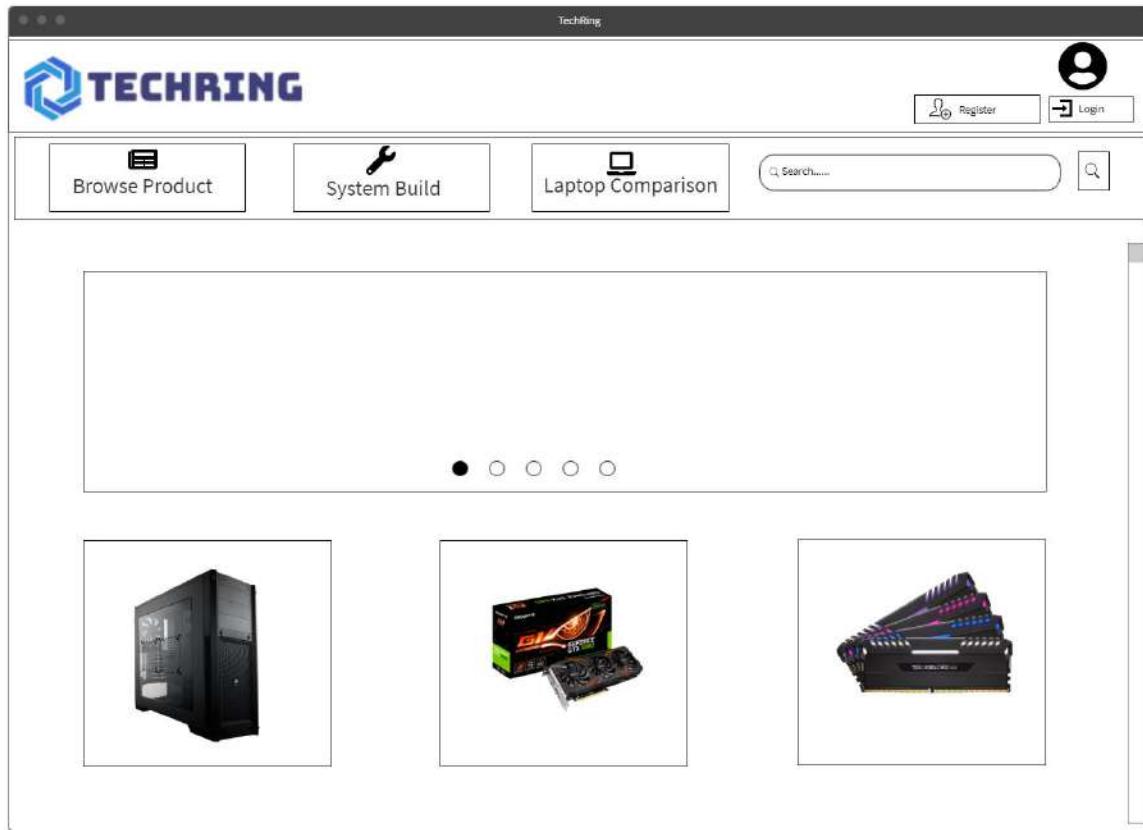


Figure 3. 1 - User Interface: Home page

When the user visit “TechRing” through a web browser the first interface they interact is displayed in Figure 3.1. This interfaces provide the user with access points which will direct them to their next step depending on their requirement.

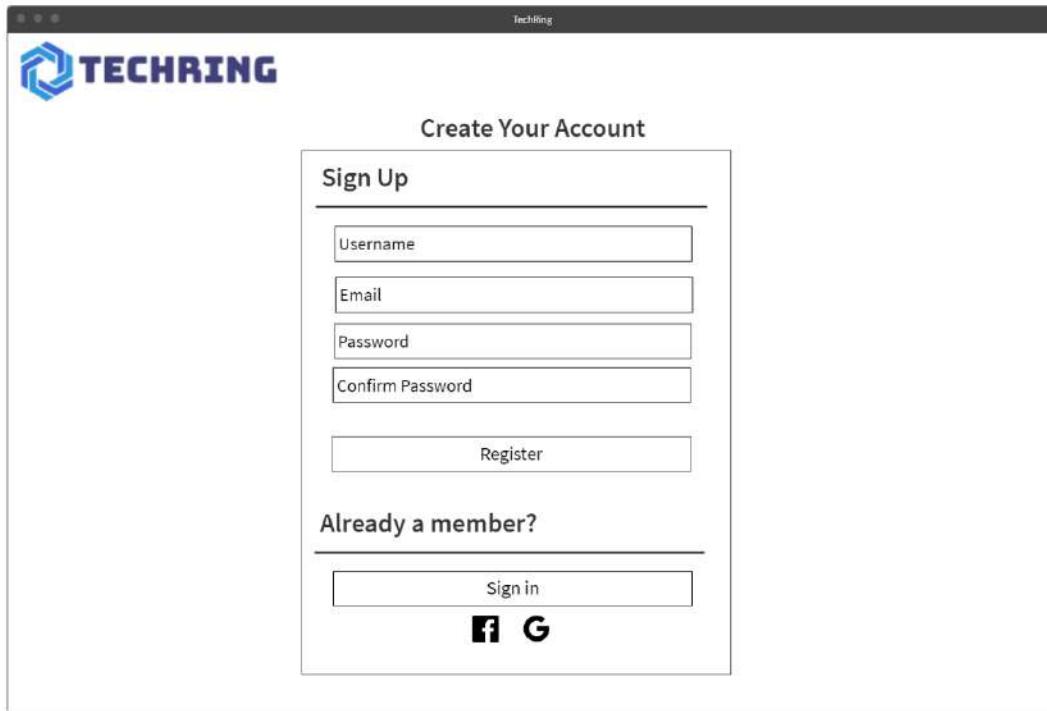


Figure 3. 2- User Interface: Sign Up

This is the Register interface. Non-registered user can get registered with “TechRing” through this interface. User can register either by providing the required details to the system or they can register using their Facebook or Gmail accounts.

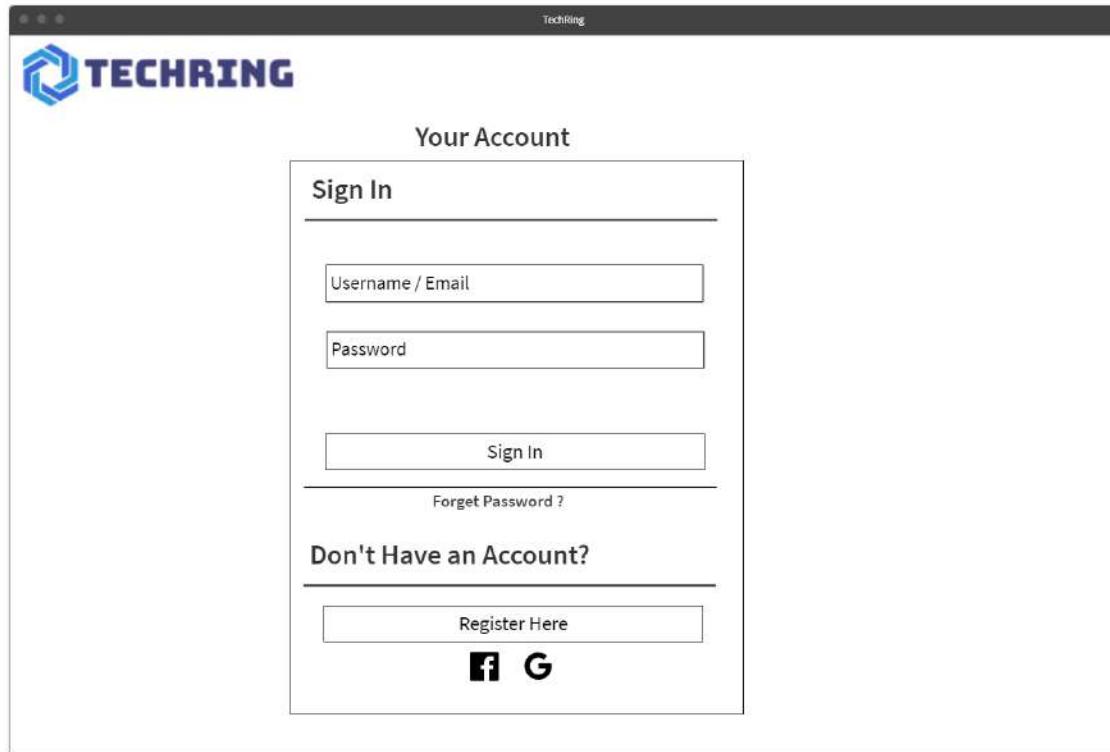


Figure 3. 3- User Interface: Sign In

Above figure is the sign in interfaces. For any registered user can enter their username and password and sign in to the platform. If the user has not registered there is option to direct the user to Register interface (Figure 3.2). If the user does not remember the password the option to reset the password is also provided.

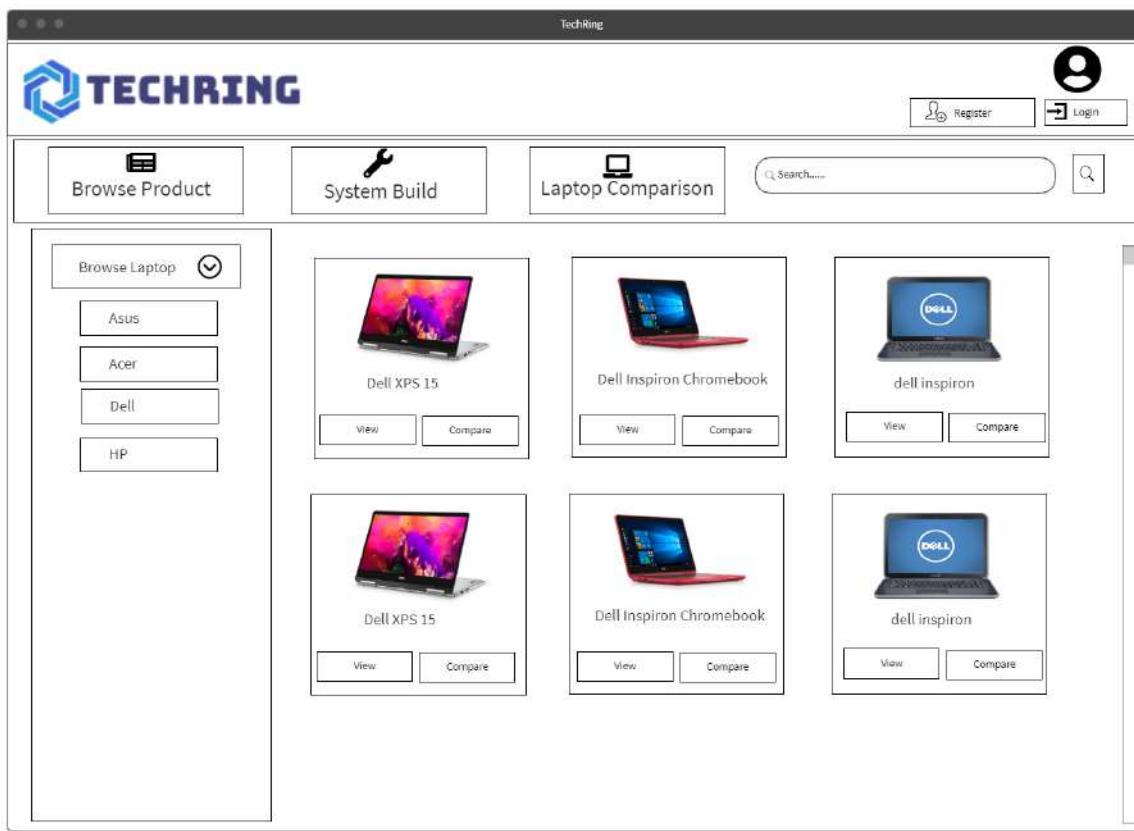


Figure 3. 4- User Interface: Browse Laptop

This is the Laptop Comparison interface. When the user clicks on Laptop Comparison option they will be directed to this interface. Users are given the two options view product details or compare. Users can sort laptops brand vice using the drop box in the side.

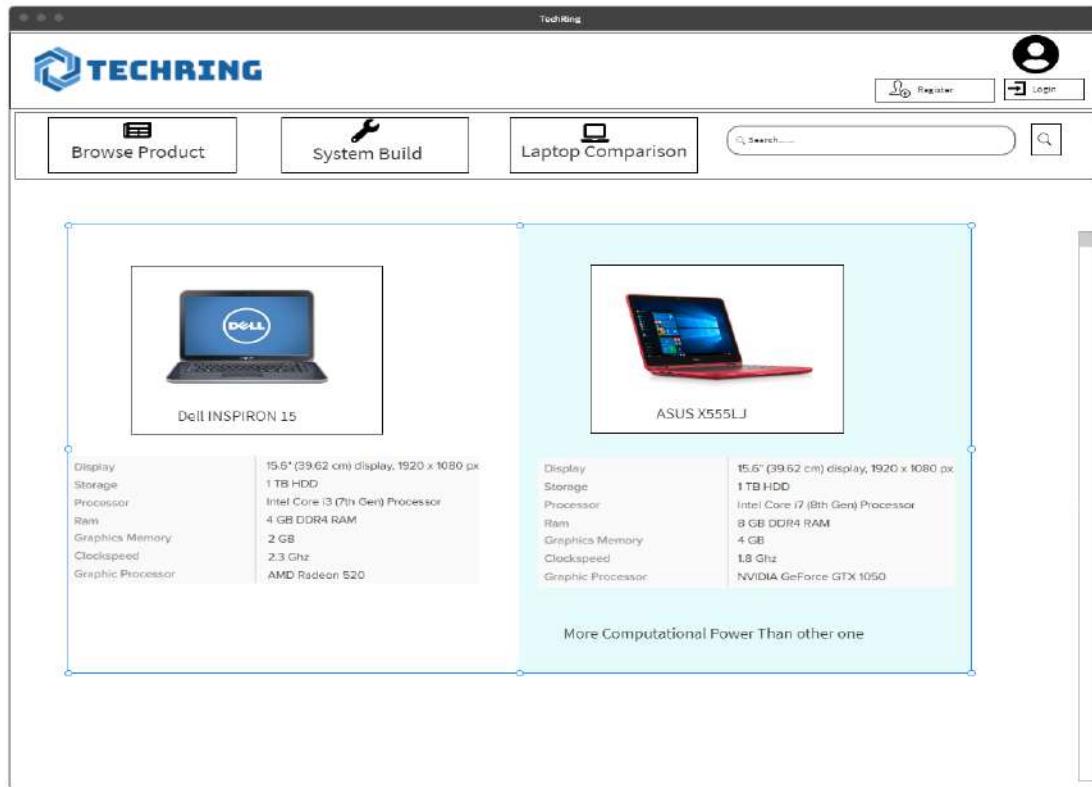


Figure 3. 5- User Interface: Result display for a Laptop Comparison.

Once the user selects the option, compare in Figure 3.4 and select two laptops to compare they will be directed to the above interface, Figure 3.5. This shows the comparison results of each model and recommended laptop will be highlighted in light blue color.

3.2 Performance requirements

Server should contain following requirements after “TechRing” deployed. Application should be run on the server to connect clients without any distraction.

- Server should be able to response quickly to client
- Application need minimum 1 GB RAM and 20 GB hard disk space to run efficiently
- The server should handle the traffic without failing
- Server should be able to response user 24x7 to maintain reliability of the system

3.3 Design constraints

Responsiveness - Responsiveness is a critical feature of a website. Some people use the website on a computer or on a laptop. Some people use it on a mobile phone. Sizes of the screens are different from each other. Therefore, it is necessary to create the same website for different sizes of screens. ‘TechRing’ will have the ability to run on a computer as well as on a mobile phone without any confusion of the web content. When the size of the screen changes, the proposed website will change according that.

3.4 Software system attributes

3.4.1 Reliability

Reliability is measured based on the capability of a system or software’s ability provide the services to the users without a failure for specified period of time. One of the major factor that affect the reliability of a system is the complexity of the system. The system developers and designers should use the appropriate model carefully. Because the best model will not be the ideal model for the situation.

The proposed platform will be developed with capability to deliver a reliable and efficient service to the end users. Algorithms used in “TechRing” will generate highly accurate results to the users. As the latest technology is used these results will be produced with in less time.

Since data handling will be done by the server there will be less crashing probability. Yet failures might occur due to server issue or connection failures.

“TechRing” will be capable of supporting any device small, medium or large. Thus, user can access our site with the device they are using.

3.4.2 Availability

Availability of a system should have the focus on simplicity and user's purpose. “Uptime” of the platform is the main focus under availability. In this situation “TechRing” is hosted on AWS that is ensure the availability of the system and it balance the load and the traffic by the inbuilt load balancer. So that availability of the system will increase because of the AWS. As a result, the website will remain operational when and where the user needs it to be available.

3.4.3 Security

Security of the platform is the ability of the platform to withstand the unauthorized access and harmful digital threats. The system needs to be built with the appropriate security levels to ensure user's data is secure.

System has different level of user roles they have different accesses to the system those should be maintain properly otherwise some users can access to the confidential data in our system. There is a login function and when a user logs in to the system, a token is generated, and it is used to identify each and every person. Therefore, the system is protected from unauthorized access.

Security mechanisms that is to be implemented will be,

- Intrusion security
- Data encryption

As mentioned, the platform development should consider the levels of security initiated considering the sensitivity of the data we collect, and user level access allowed. The database should have a high-level structure which could prevent a system crash or a data loss.

3.4.4 Maintainability

System should be developed with the capability of adapting to changes, rectify the bugs which should be done in the preventive maintenances and support future changes. The system will be developed supporting high maintainability since many improvements are will be added in to the new system in the future.

One major risk the “TechRing” faces is the changes of web content of targeted websites. “TechRing” gets most of the data by web scraping. When a targeted website changes the content of its site, scraped data can be false. To prevent from that, ‘TechRing’ will have modifications and be able to adapt according to the situation if it happened.

3.5 Other requirements

Performance – Performance is an indication of the responsiveness of the website to execute any action within a given time interval. Everyone likes to get responses quickly as possible without any problem in order to save their time. Some functions of the proposed website

connect with online data and analysis of those data will be done at real time. Therefore, performance of the website would be a critical point in the website. In order to increase the performance, latest technologies are used to create the website.

4 Supporting information

4.1 Appendices

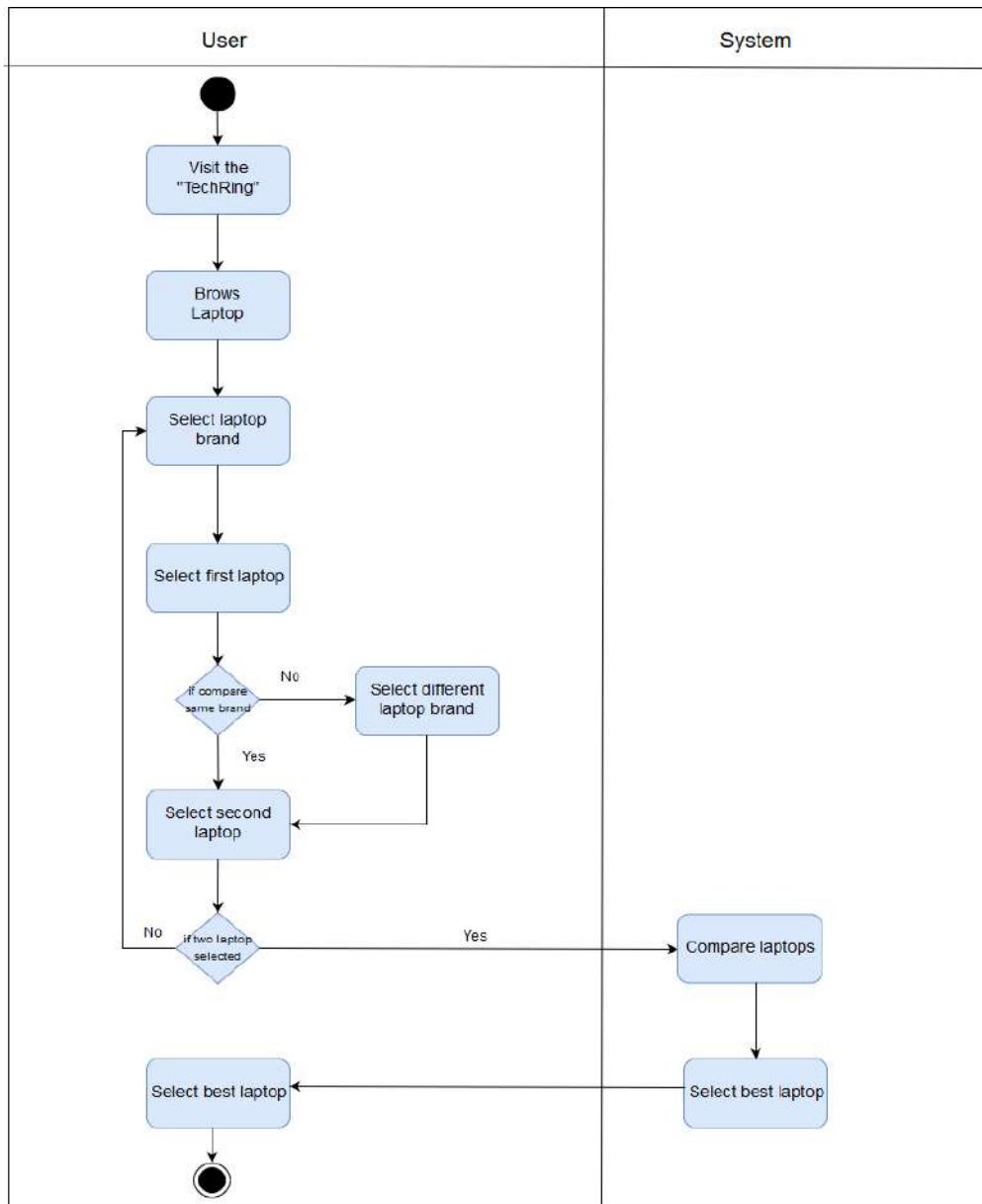


Figure 4. 1 : Activity Diagram: Laptop Comparison

5 References

- [1] F. N. Leo Rizky Julian, "THE USE OF WEB SCRAPING IN COMPUTER PARTS AND ASSEMBLY PRICE COMPARISON," 2015.
- [2] S.-T. Tan, "Multimedia Based PC Assembly Learning Tool," 1996.
- [3] N. D. Udi Boker, "Comparing Computational Power," 2015.
- [4] W. Hou, X. Li, Y. Jin and J. Wu, "A Study of Intelligent Decision-Making System Based on Neural Networks and Expert System," 2013.
- [5] P. J. B. a. R. C. Jain, "Three-dimensional object," vol. 1, 1985.
- [6] R. T. Chin and C. R. Dyer, "Model-based recognition," vol. 18, 1986.
- [7] a. R. B. F. Solina, "Recovery of parametric models from range images : the case of superquadrics with global deformation", Vols. vol:1, vol 2, 1990.
- [8] K. N. Kirithika B, "Comparison of Intel processor with AMD processor with Green Computing," 2013.
- [9] C. Kocas, "Online price competition within and between Heterogeneous Retailer Groups," 2004.
- [10] R. H. Jianxia Chen, "A price comparison system based on Lucene," April 2013.
- [11] A. Zalozhnev, "The ICT Products Prices and Quantities".
- [12] A. Salinca, "Business reviews classification using sentiment analysis.,," 2016.
- [13] S. R. S. J. Zeenia Singla, "Statistical and Sentiment Analysis of consumer product reviews," 2017.
- [14] B. L. Minqing Hu, "Mining and Summarizing Customer reviews.".
- [15] A. L. Robert Ireland, "Application of data analytics for product design: Sentiment Analysis of online product reviews," 2018.
- [16] Y. N. A. O. I. O. BabolaT. Issac, "Assembling a Desktop Computer System with Built Uninterrupted Power Supply.,," 2017.

- [17] Y. 2. LinghuiLiu1, "ApplicationofAgileMethodintheEnterprise WebsiteBackstageManagementSystem," 2012.
- [18] A. J. M. Kamaljeet Kaur, "Applying Agile Methodologies in Industry Projects: Benefits and Challenges," 2015.
- [19] J. D. A. a. O. B. Shvetha Soundararajan, "A Methodology for Assessing Agile Software Development Methods," 2012.
- [20] [Online]. Available: <http://jaspervanderhoek.com/wp/methodology/agile/pursuing-a-fully-agile-software-lifecycle/> [image].