TECHRING

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

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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.

Main goal of preparing this document is to provide an in depth analysis of the functional and non-functional requirements of 'Price Comparison and Optimization' function which is one of the sub objectives of the final product. Detailed description of the technologies and the research background of the system will be provided. This document mainly focuses on,

- Software Requirements.
- Project Scope.
- Project Purpose.
- Target Audience.
- Functional Requirements.
- Non-functional 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. Therefore, this will be a useful key reference document to developers as well as quality assurance engineers.

1.2   Scope

When purchasing PC parts, prices and features of the products are very important. Users are more concerned of the price. This document provides explanations depicting the clear boundaries of the user requirements addressed in the 'Price Comparison and Optimization' function. Details of both functional and non-functional requirements are given in this document.

'TechRing' is the product name of the final outcome of this research. Any person who wishes to purchase PC parts as well as laptops and any company who are willing to sell them, can use this platform. This is more like Artificial Intelligence Based Personal Computer Parts and Laptops Recommending Assistant.

The assembling process for personal computers is long and a complex task [1]. This is common problem faced by majority of current society. In purchase of the products one of

the main considerations is the Price. Our platform will provide the assistance of having an assembling plan according to the optimum user budget. All the suggestions we provide for user requirements will be displayed in an order where the price optimization is considered. Therefore, the product display will not be in ascending or descending order but in the best possible way. We also have the option where the users will get notified when there is price drop of a product they were searching. To be more customized we provide the facility where user changes the price ranges at which they are looking the product.

1.2.1   Objective

Analyze the PC parts requirement the user has along with their limitations such as budget and recommend the most suitable products for them by utilizing the price optimization and sentiment analysis techniques.

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. Provide the best assembling plan for people who plan to assemble their PC's by themselves. This will save the time users have to spend in searching for the compatibility and suitability of the components.
2. To reduce the burden of people in finding the PC parts and assembling plans aligning with their budget limitations.

Tasks

1. Develop build sequence to identify the compatible pc parts.
2. Get a list of sorted products considering their features. Customers will be able to identify the best products in a product list.
3. Analyze the compatibility of products and get a list of products to assemble a PC for the optimum budget plan of user selected price.
4. Identify and send a notification to users if a price drop has happened for a selected product.

Chapter 1: This section will be explaining the core purpose of creating the SRS. This will give a detailed idea of what the one of main sub objectives of the final product will be capable of doing and not capable of doing in the implementation stage. Also discuss about the goals, objective, benefits and tasks of that. 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. 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 developers 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. Ten years ago, this industry is just an entertainment field. But today it is one of the highest profits earning industry.

Since there are multiple vendors, brands and versions available for each PC part there might be price variations that is created. Therefore, 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.
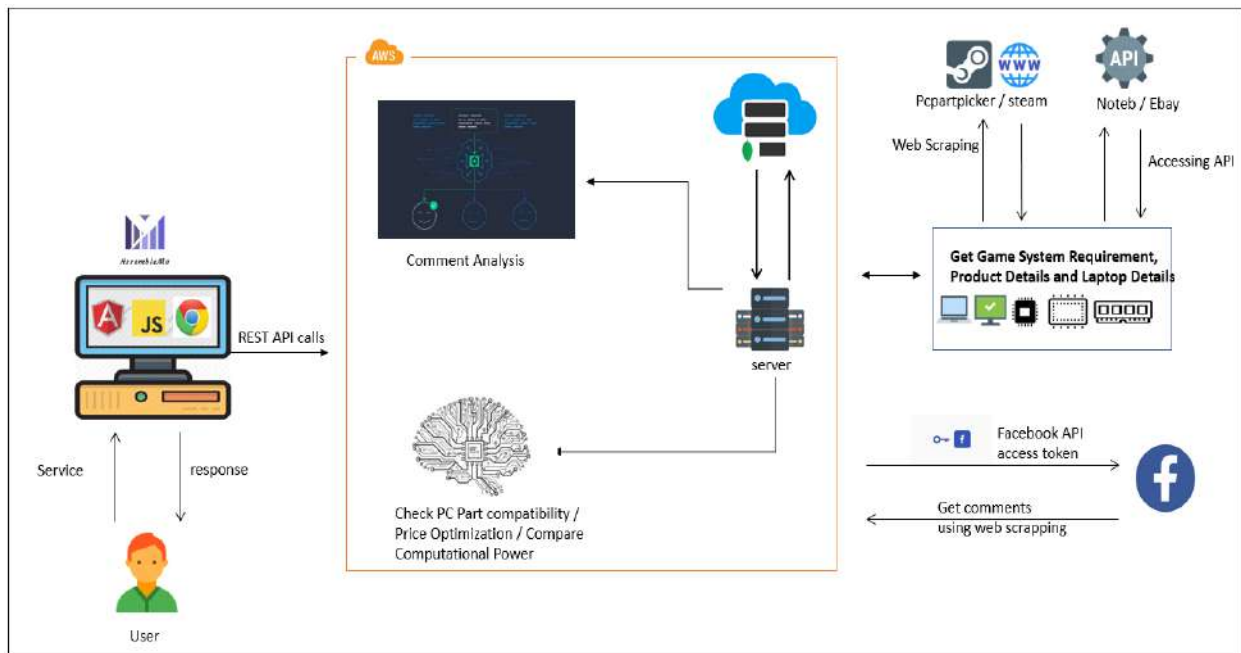

Figure 1.1- High Level Architecture Diagram

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.

- PCpartpicker
- 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	✅			✅
Pick best products in a product list				✅
Recommend assemble plan according to optimum budget	✅	✅		✅
Display prices and compare of different vendors	✅			✅
Notify Price Drops	✅	✅		✅

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. But these sectors go in together. Therefore, 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.

2.1.1   System interfaces

"TechRing" will be using below mentioned interfaces to complete 'Price Comparison and Optimization' module.

- Spring Boot 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 for optimum user budget
    - 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
- 1 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 application needs 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
- Get compatible PC part list for customer budget
- Compare and select best price for a product
- Analyze and provide the better products in a product list
- Notify price drops to users.

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

Price Comparison and Optimization

- Search Products
- View product details
- Sort products in a list according to their features
- Sort products in a list according to their features
- Get PC parts to build a PC for the optimum budget plan
- Get notifications for price drops
- Update product details
- Update prices
- Login
- Register

<<include>>
<<include>>
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User

Vendor
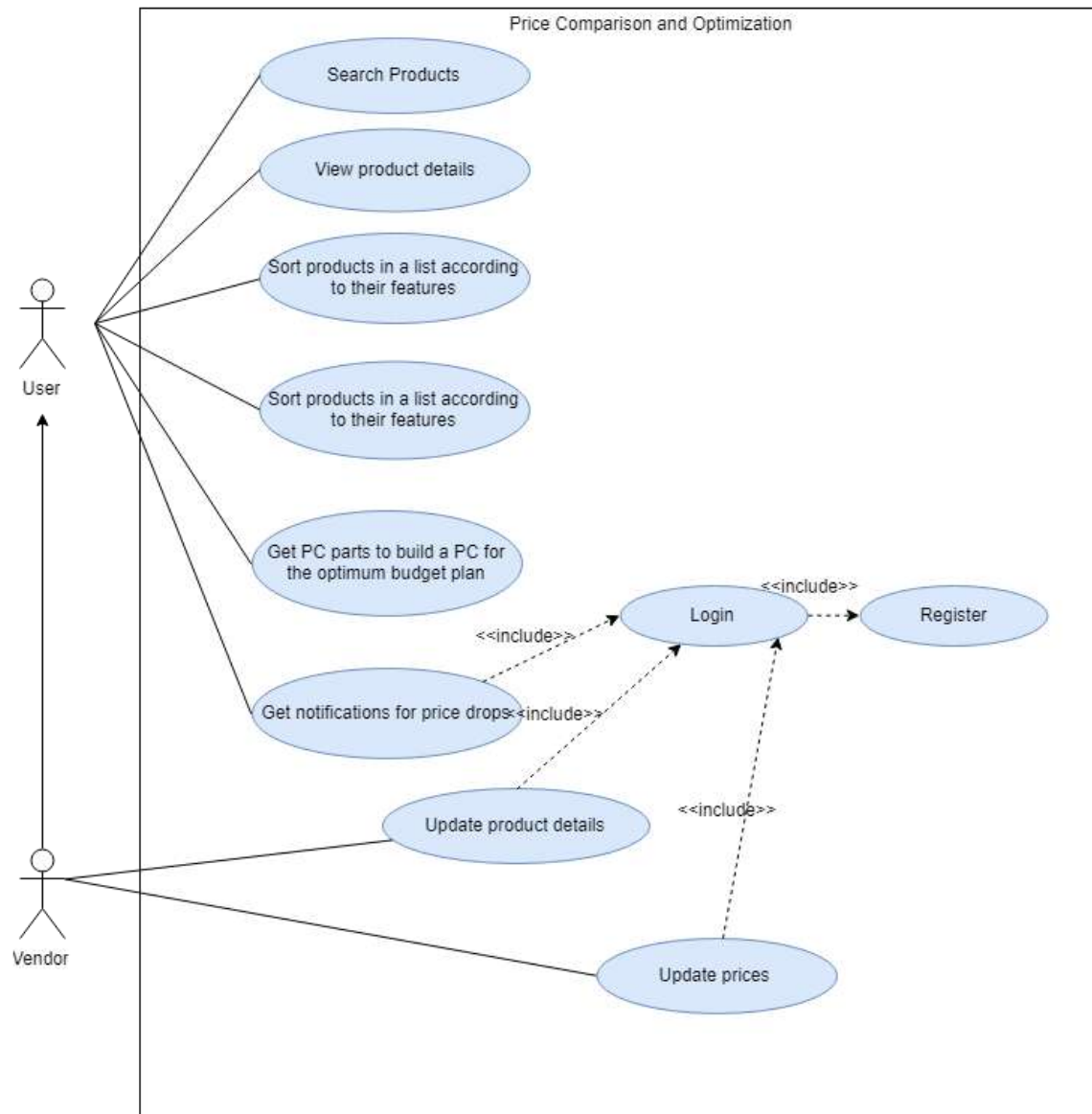
Figure 2. 1 - Use Case Diagram

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
Main Flow	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(Sign in)

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	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   Recommend Best Products

Use case Name	Recommend the best products in a product list.
Description	Get a sorted product list according to the features of products.
Actors	Customers
Pre-conditions	Relevant data should be there in the database.
Main Flow	1. User searches a product. 2. User get the product list. 3. User selects the option and get the sorted list according to product features.
Post Conditions	Display the sorted product list.

Table 2. 4 - Use Case Scenario: Recommend best product

2.2.4   Build PC for Optimum Budget

Use case Name	Build a PC for the optimum user budget and recommend the PC parts.
Description	Users are able to get a list of products to build a PC and where they can purchase them for the optimum budget plan after they gave a price range.
Primary Actors	Customers
Pre-conditions	User has to give a price range.
Main Success Scenarios	1. User gives a price range. 2. User gets a list of product details to build a PC for the optimum budget plan.
Extensions	2a. If the price range is not enough to build a PC, system shows nothing.
Post Conditions	Display a product list.

Table 2. 5 - Use Case Scenario: Build PC for user budget

2.2.5   Notify Price Drop

Use case Name	Notify customers the price drops.
Description	Customers are able to track the price drops and system will notify them if that happens.
Primary Actors	Customers
Pre-conditions	User has to login to the system.
Main Success Scenarios	1. User selects the price tracking option of that product. 2. If the price drops to users' expected budget, system notifies them.
Post Conditions	User gets an email.

Table 2. 6 - Use Case Scenario: Notify Price Drops

2.2.6   Compare PC Part Prices

Use case Name	Compare PC part prices
Description	Customers are able to compare different vendors prices for same part
Primary Actors	Customers
Pre-conditions	User needs to select the PC part for compare prices
Main Success Scenarios	1. User visit the individual parts section on "TechRing" 2. Select the part that he need to compare the prices 3. System show the prices from different vendors and show the best price for the part
Extensions	2.a 1 System will show error if you enter invalid details

Table 2. 7 - Use Case Scenario: Compare PC part prices

2.3   User characteristics

"TechRing" is an online assistant which will assist anyone who is looking for a PC part 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.
- Employees.
- PC parts 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 systems needs to 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.

- 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. Some of data will be updated manually by the system administrator or vendors. 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.

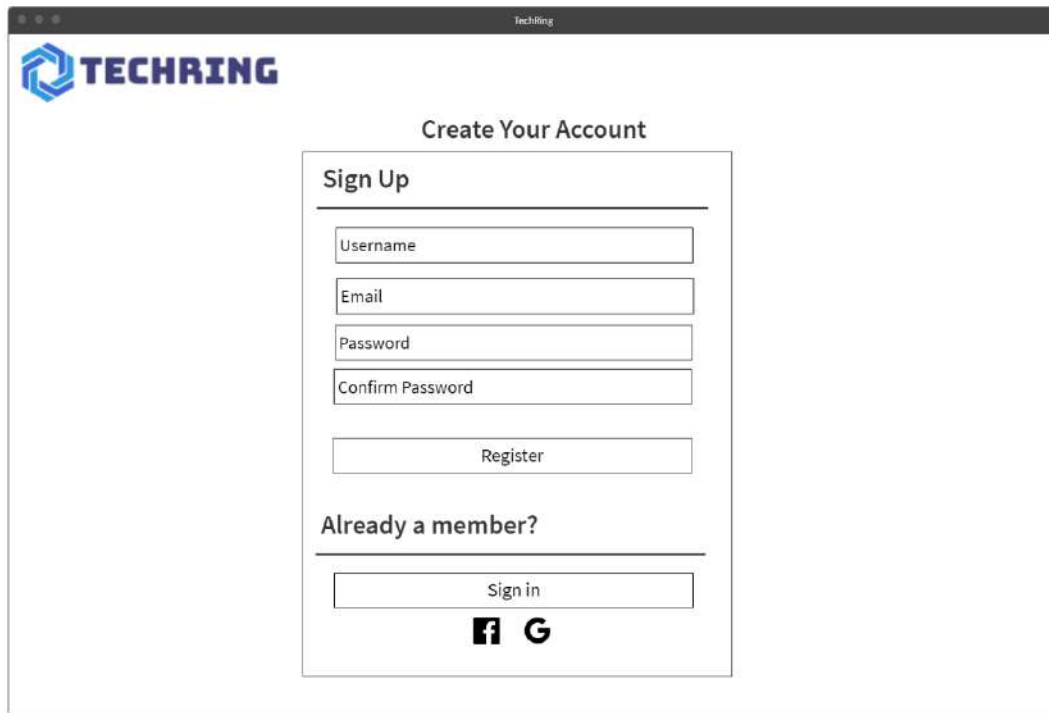# 3 Specific requirements

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.
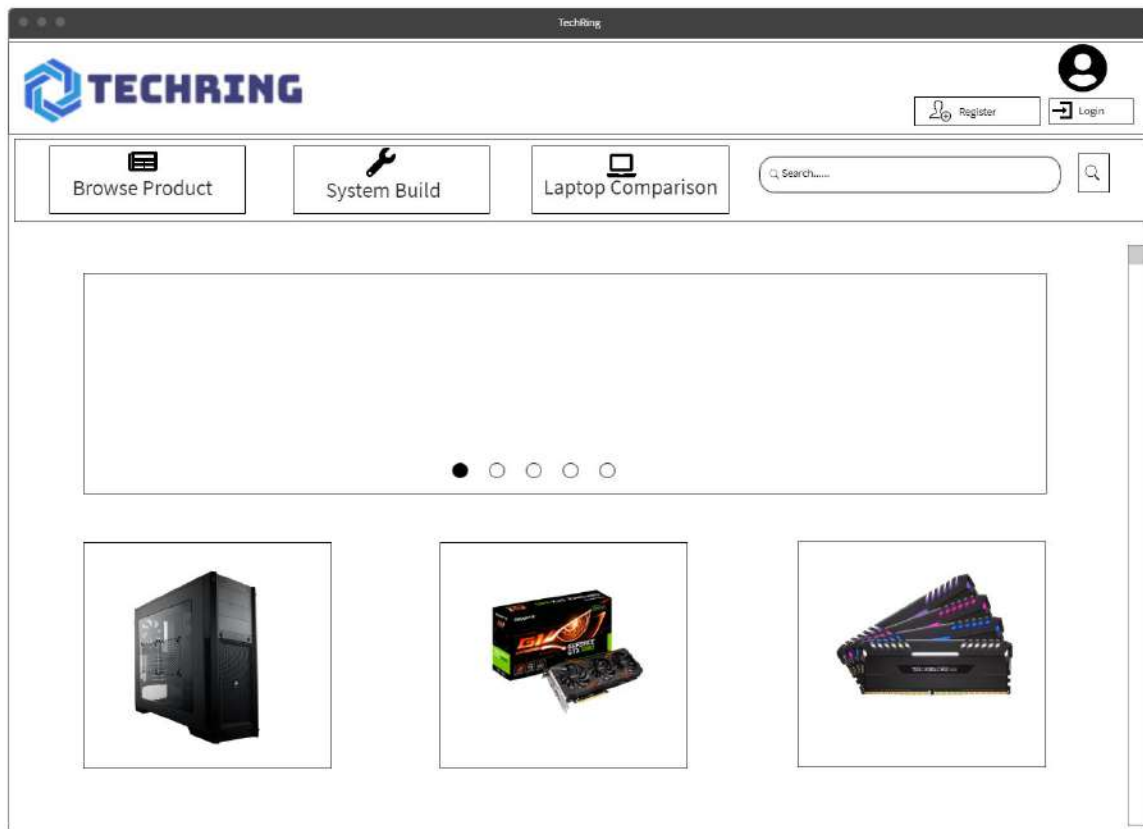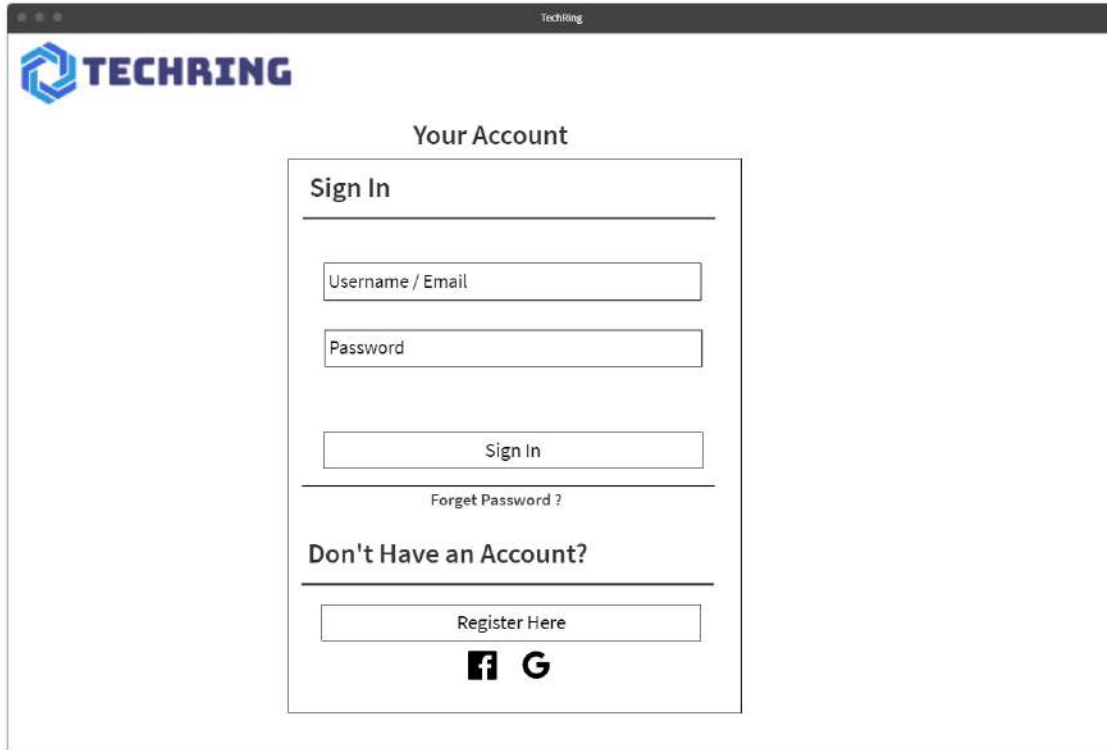

Figure 3. 1 - User Interface: Home page

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.
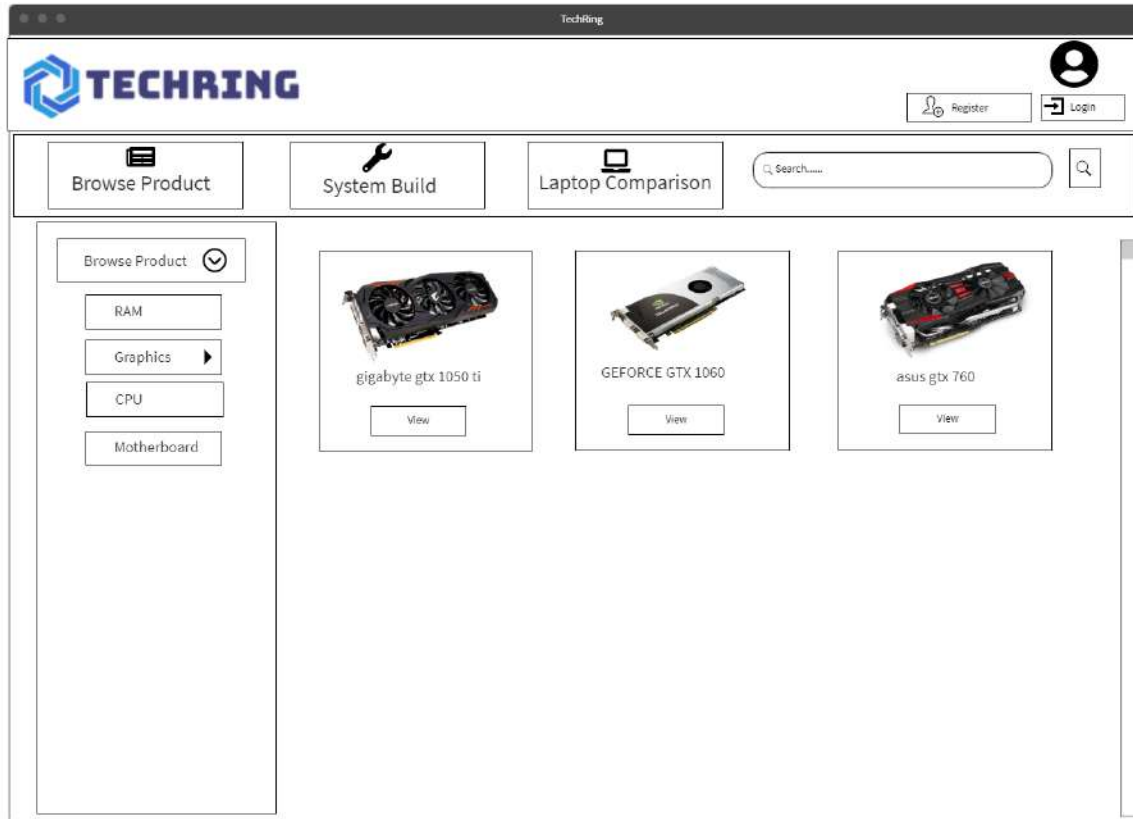
Figure 3. 4- User Interface: Product categories browse page (Graphics)

This is the Browse Product page in Figure 3.5. There is an option where the user can select the product category from a drop-down list. Once user selects a category related to the product will be displayed.
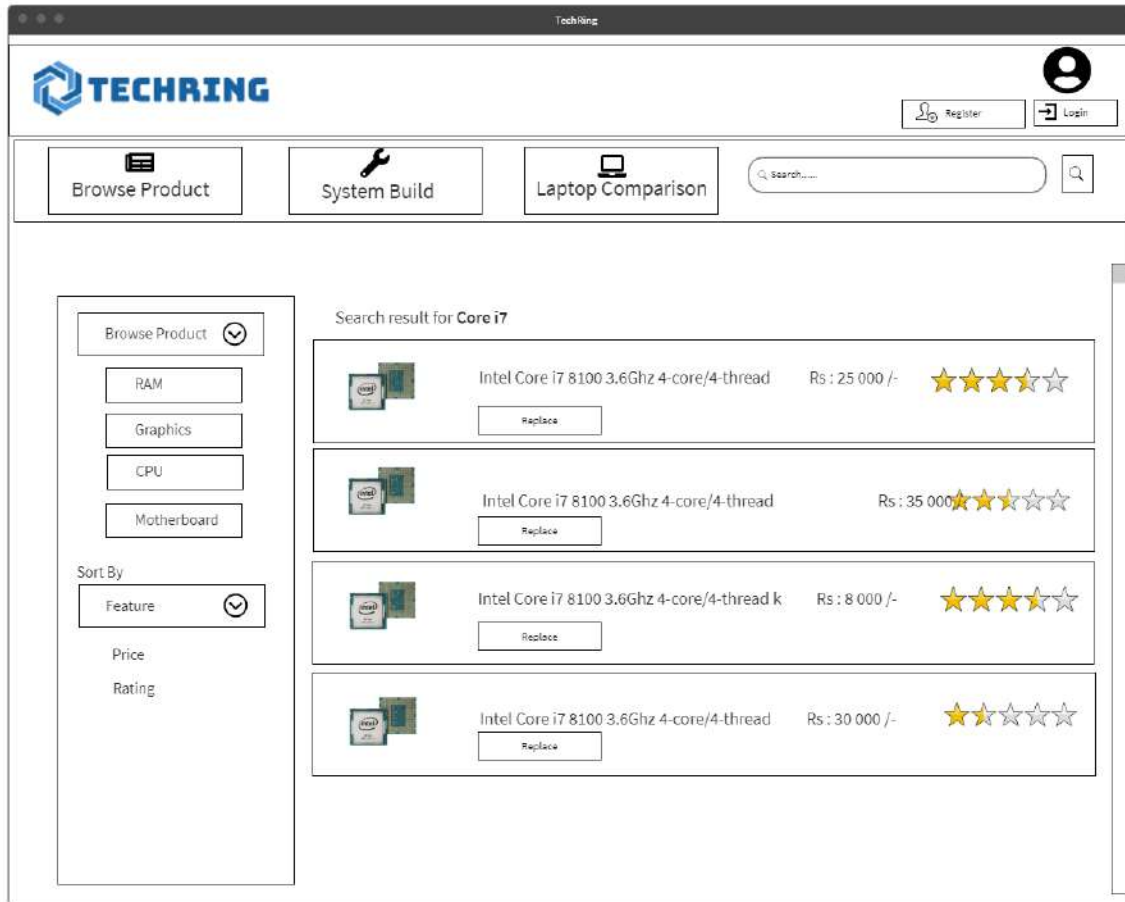
Figure 3. 5- User Interface: Display Search Results

After user select the Product type from Figure 3.4 They can search the product either based on price or ratings. Once the user select ratings above figure (Figure 3.5) will be displayed. Product list is displayed in descending order of the ratings each product received.
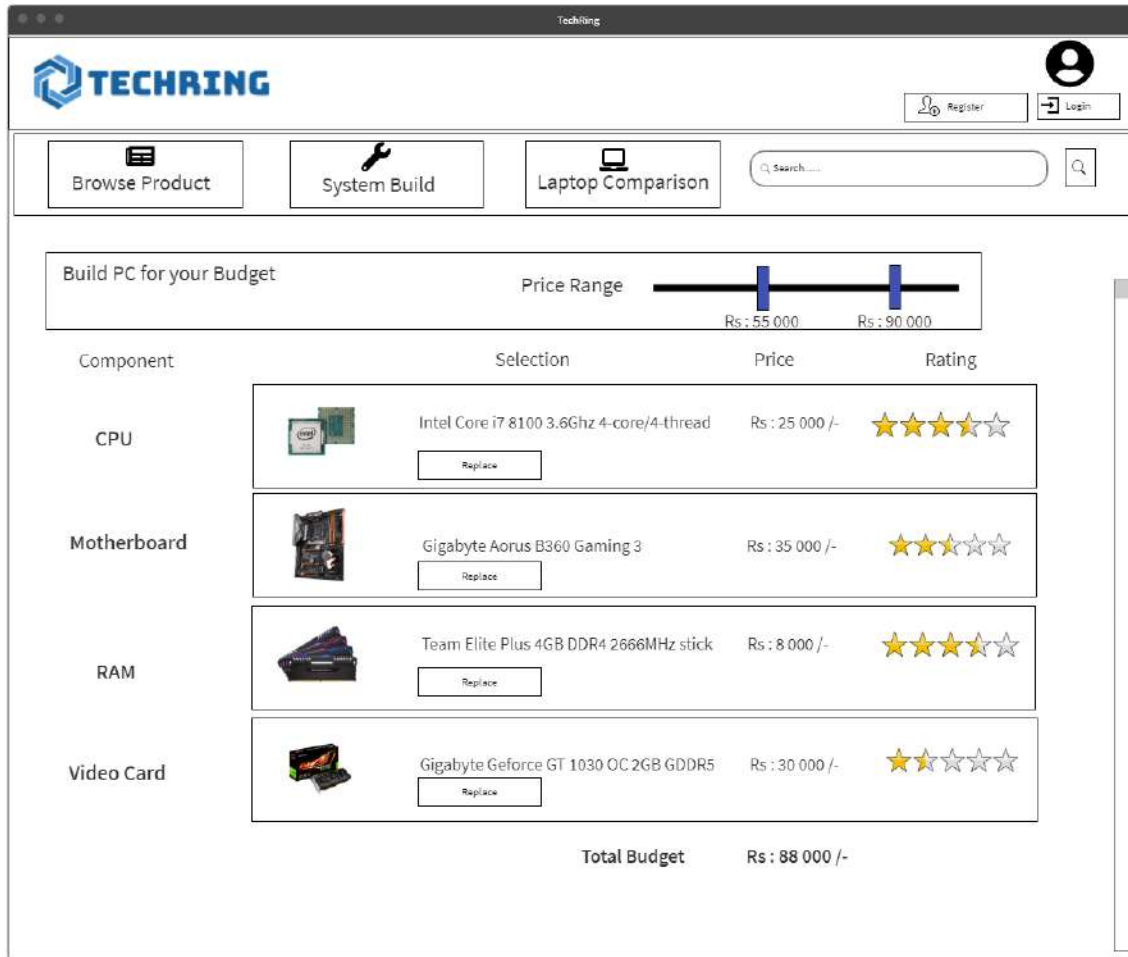
Figure 3. 6- User Interface: Display compatible product list for user budget

After selecting the system build option and giving a price range, users will get a product list.

Figure 3. 7- User Interface: Display Item details

After selecting a particular product users will be redirected to this page and they will get product details of that product.

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.
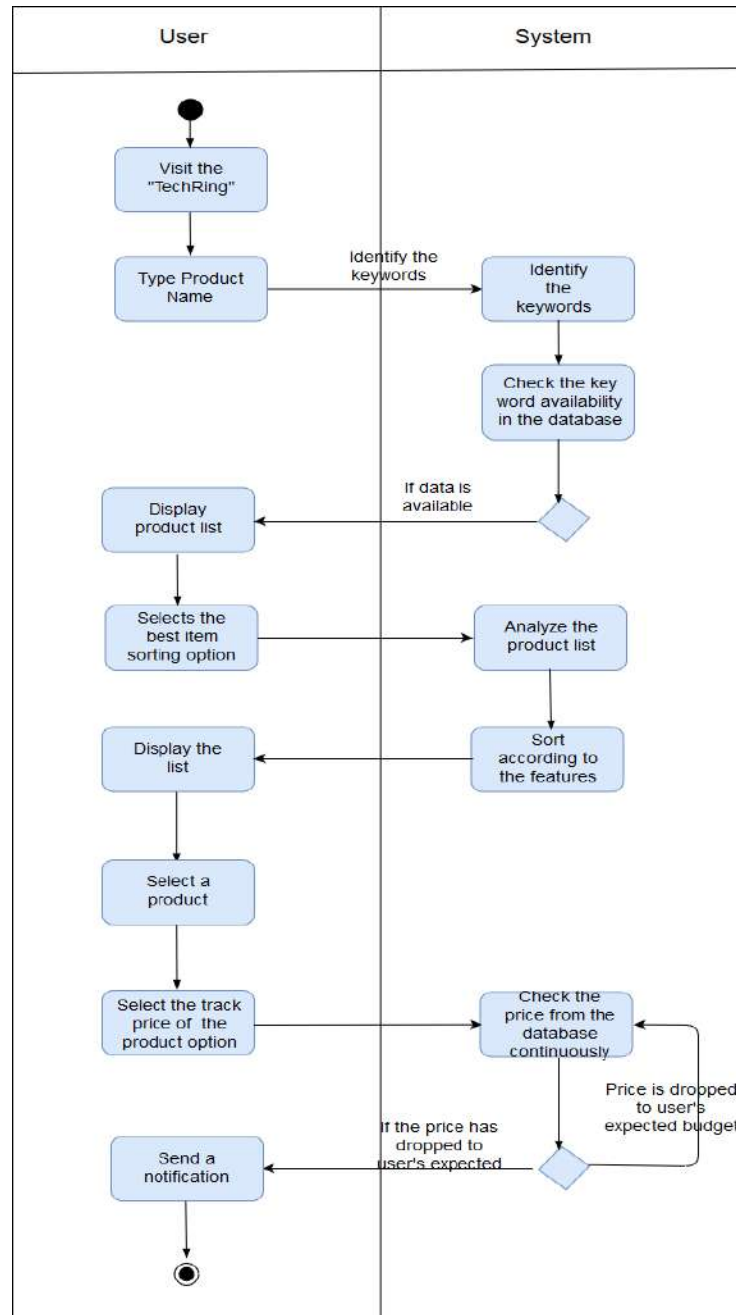
4 Supporting information

4.1 Appendices

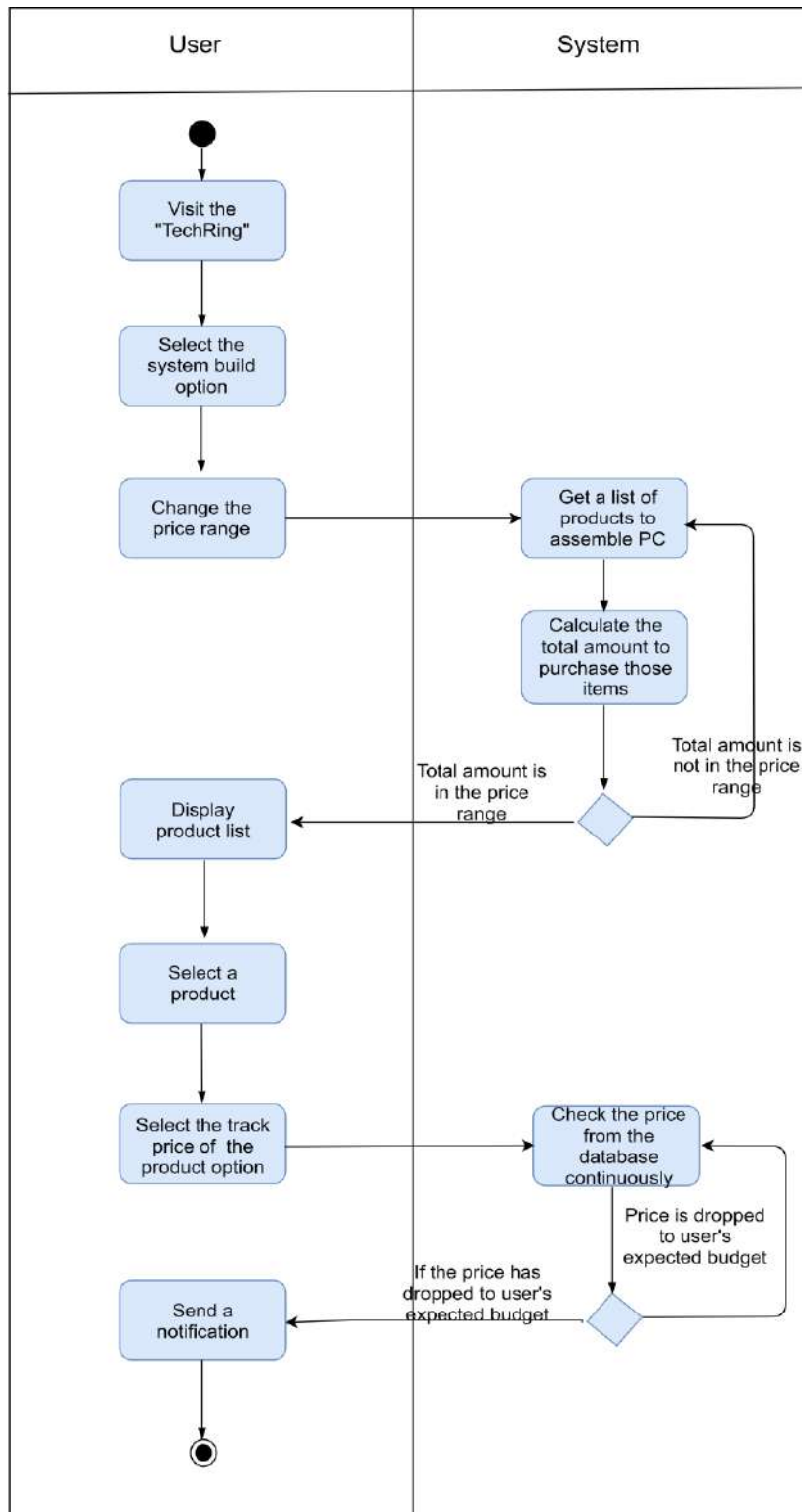*Figure 4. 1: Activity Diagram: Search and sort product list*

Figure 4. 2 : Activity Diagram: Get product list for user budget

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 Computaional 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, "Assemblin a Desktop Computer System with In-Bult 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].