ARTIFICIAL INTELLIGENCE BASED PERSONAL COMPUTER PARTS ASSEMBLING ASSISTANT

Project ID: 19-069

Project Proposal Report

H.K.S.P. Gunadasa
Sewwandi E.D.D
M.A.V.L. Gunathilaka
Tharaka K.K.S

B.Sc (Hons) Degree in Information Technology

Department of Software Engineering /
Information System Engineering

Sri Lanka Institute of Information Technology
Sri Lanka

March 2019

ARTIFICIAL INTELLIGENCE BASED PERSONAL COMPUTER PARTS ASSEMBLING ASSISTANT

Project ID: 19-069

Project Proposal Report

B.Sc (Hons) Degree in Information Technology

Department of Software Engineering /
Information System Engineering

Sri Lanka Institute of Information Technology
Sri Lanka

March 2019

Declaration

We declare that this is our own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Student ID Number	Name	Signature
IT16010390	H.K.S.P. Gunadasa	
IT15146816	Sewwandi E.D.D.	
IT16055186	M.A.V.L.Gunathilaka	
IT16054578	Tharaka K.K.S.	

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor Date

....

Abstract

Computers have evolved to a greater extent. Therefore, majority of the tasks that are performed in the industry require the assistance of Computers. Depending on the industry requirements, task of the computers differ. As a result, buying a preset computer from a shop might not be capable of performing the expected outcomes. This has made the users to assemble their Personal Computers (PC) by themselves. Currently most of the people and companies tend to follow the above practice. But it is not easy as it sounds. Finding the specified parts according to the requirements and specifications is time consuming and challenging. Because people need to find the best product for the best price, prefer having a sound knowledge of the product before purchasing (E.g.: compatibility of each parts, required parts with the available alternative options), match it with budget limitations. This is one of the common issues faced by the gaming industry. Today, laptops also play a major role in the industry. People find variety of options to select. Due to the available options people find it difficult on deciding the best laptop to purchase. AssembleMe platform is capable of providing solutions to all the issues faced just by few clicks.

Keywords: Web scraping, assembling, expert systems, neural network, price optimization, sentiment analysis, lexicon, opinion mining, comparison, power

Table of Contents

List of Figures

List of Tables

List of Abbreviations

Abbreviation	Explanation
PC	Personal Computer
DOTA	Defense of the Ancients
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

1 Introduction

1.1 Background

Initially, computers were used as a tool for calculations, but now computers help people finish many aspects in life [1]. Therefore, computers do play vital role in almost every industry. Among all the industries one of the upcoming industries is the gaming industry. Initially computer games were designed as an entertainment kit. But this industry has achieved a greater success and it is considered as one of the most profitable industries today. Computers are the main backbone of this industry.

It is not a difficult task to find a computer today. But it is a challenging task to find a computer that would satisfy the specific requirements. Therefore, the computers available in the market fail to cater to those requirements. Thus, people tend to assemble their own PC's. But it takes various components to build a PC and with the specifications, components required differ. For example, computers used for editing photos and videos is different from the computers used by a cashier.
As mentioned in the beginning majority of PC's are assembled for gaming purposes. Because most of the games available nowadays have different specifications. For example, the game DOTA requires Processor: Dual core from Intel or AMD at 2.8 GHz, Memory: 4 GB RAM, Storage: 15 GB available space. Therefore, when they assemble a PC according to a game system requirement they need to look into those aspects and decide on assembling procedure. People find it difficult to match the PC parts with each other when assembling because the PC parts have compatibility issues with one another. When it comes to compatibility, motherboard plays a major role since it has to work with components like RAM, CPU and more. Mainly it is necessary to check the socket compatibility with the processor.

Assembling a PC is a task with high complexity [2]. Information Technology experts might be capable of identifying the compatibilities and the required remedies. But it is not the same with an average person. We cannot ignore the fact, not only IT experts use computers average people starting from school level also use computers. Thus, they also prefer assembling their own PC's. Through a background analysis we found out that this Non – IT PC assemblers find it

difficult to match the compatibility and proceed the assembling. They use the help of internet, YouTube tutorials, gaming web sites to find the parts.
When purchasing a product, it is better to have options to select with. There are sites from vendors and e-commerce sites displaying the available PC parts. Some site provides both the ecommerce and vendor site together in one as well. Most of the local vendors do not reach to the online market. They believe that having the physical existence is enough for them to reach the market. This might be true couple of decades back but now it is must to have online access to the customers. Thus the need of having a common platform for products from local vendors, ecommerce sites and non-website holders is important. Because this type of platform will help them to choose the best product for the best price.

Laptops are also widely used in the industry. Today there are variety of laptops available. Different brands, models, versions and more. Depending on the requirements the laptop that is needed differ [3]. Due to the variety of options to select with cause confusions to a customer. Because they might have doubt as to which laptop is better. There are sites that provide the function where they can compare two laptops but none of the sites recommends a laptop. This makes the users to do a background checking on the laptops before purchasing. Sometimes people who does not have a reliable source of information will go to a shop and purchase a laptop that is recommended by the shop owners.

Before purchasing a part, customers prefer looking into the customer reviews. There are many open sources available where people have expressed their experiences with the products. One of the sources is Facebook. People who have the access to those sources will go through the comments and have an idea about the product. But it is not easy to go through thousands of comments and get an idea. Most of the time people will go through first couple of comments.

Below diagrams show the data we gathered using an online survey we conducted. Our main motive through the survey was to identify our target audience, the size of the audience and also their expectations.

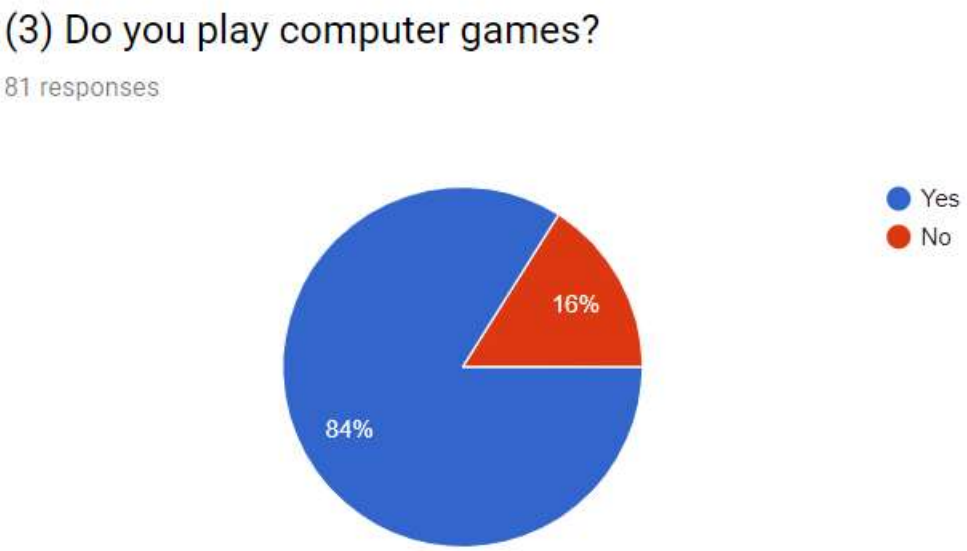

Figure 1. 1-Survey results of playing computer games

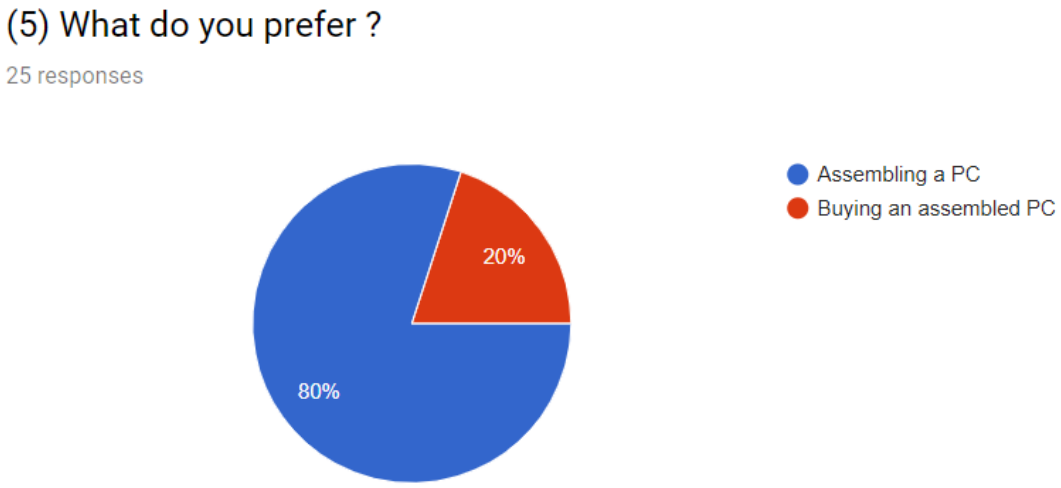

Figure 1. 2-Survey results of users' preferences on PC assembling.

1.2 Literature Survey

The concept of having an online assistant for assembling PC's considering the requirements and the limitations is one of the challenging topics that many researches had their interests on. This is an area that is spread worldwide. Because computers and laptops are becoming a need rather than want in their lives. There were many researches conducted to what we are building. They have used many techniques, concepts, models that is useful for us as well. Some of the research problems aren't related to our area yet the concepts they have used is very useful for us.

1.2.1. Assembling Sequence

Neural networks and expert systems greatly improve the decision making and reasoning [4]. According Hou, once the assembling sequence is fed to the system through the expert system they can make decisions related to the assembling procedure. In this article they use a layered architecture to find the compatible parts starting from the final product. This step wise approach makes the process efficient and accurate.

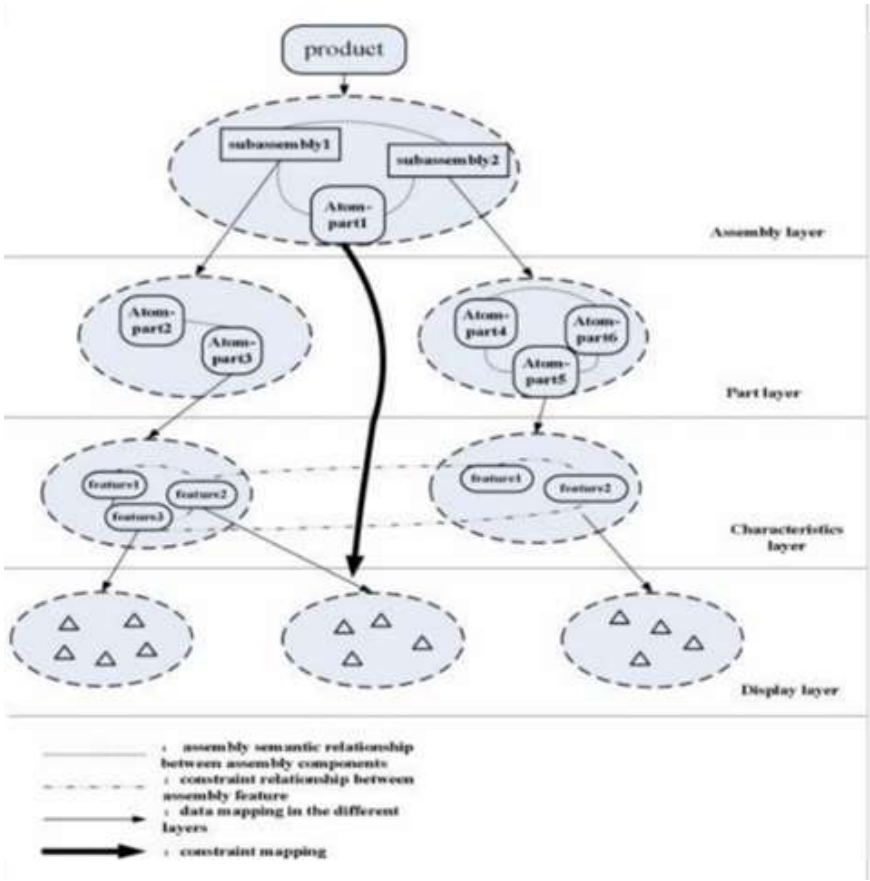

Figure 1. 3-The Structure of the product assembling model [4]

Combining the knowledge-based reasoning along with the expert system improve the efficiency and reliability of computer-based reasoning. For decision making based on uncertain factors the researches have used the fuzzy system mechanism [4].

The assembling process for personal computers is long and a complex task [2].In order for students to learn the assembling mechanisms researchers have developed applications to assist them. HALT (Hardware Assembling Learning Tool) is developed for that purposes [2].In identifying the assembling procedures they have used two main techniques known as CBT (Computer Based Training) and CAI (Computer Assisted Instructions). They have incorporated AI techniques such as Intelligent Tutoring Systems.

One of the most difficult task is identifying the 3D objects. Thus it is necessary to have a precise description of the 3D object and matching algorithm to identify the each object [5].The Theory of Recognition by Components (RBC) explains how human visual system identify objects by decomposing object parts [6] [5]. One of the most appropriate model that was used was the "Superquadric model". This model is capable of describing the parts considering primitive shapes with finite number of parameters which consists of rotation, translation and global deformation [7].

1.2.2. Comparison Mechanism

According to Krithika and Keerthana, they have compared the two processors considering the computational power. In this to get the computational power of each they have considered the CPU, RAM and motherboard of each component and done the comparison. By comparing the computational power they have estimated the efficiency. Thus based on the efficiency, power and cost the comparison is conducted [8]. "It is a common practice to compare different computational power of different models of computation" as Udi and Nachum [3] describes. As they have analyzed they use two standard methods for comparison. Approach C (Containment) and S (Simulation). For an efficient comparison these two approaches need to work in harmony. In brief,

- **Approach C** is finding the best one based on number of functionalities available.
- **Approach S** comes into action because approach C is not always applicable. This method uses a more detailed analysis of the functions by stimulating each function computably.

1.2.3. Price Comparison and Optimization

Today there is a high competition within and between heterogeneous retailer groups. Therefore, Cenak Kocas has designed a model to provide an understanding about the market. In this model they investigate the changes that happens in the market and decide on the online price changes [9].

Lucene is one of the popular full text libraries available. This can implement data indexing and retrieving [10]. In Jianxia and Huang's theory they have developed a system with Lucene apache libraries and web crawling to compare prices of products. This proposed system has proved to be efficient by the experiments that are conducted. Their system can conduct price comparison on online products so that they will display the possible products available for them. Figure shows the mechanism that is used by them.

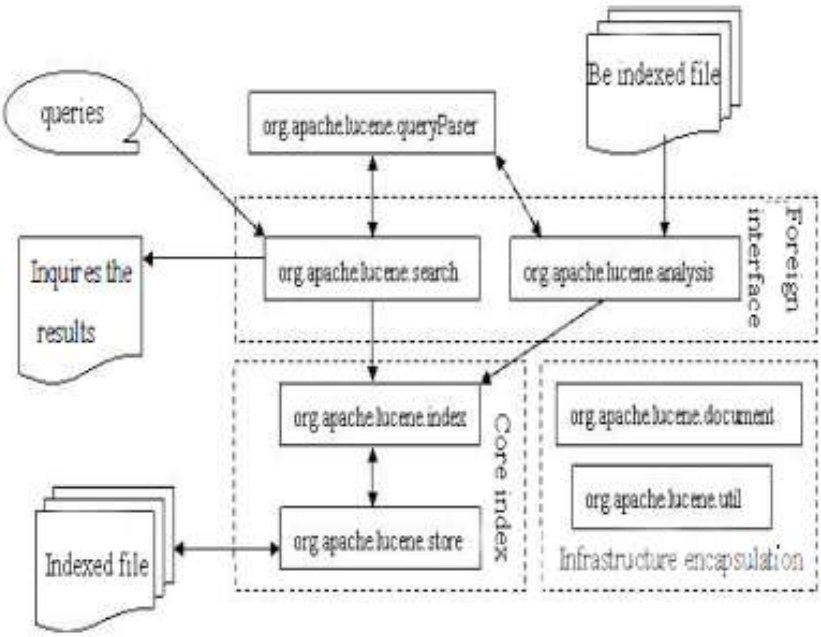

Figure 1. 4-Lucane Model Diagram [10]

The market is characterized by rapid variability and high mobility. Therefore it is important to do a prize optimization for the market. Alexey Zalozhnev has done optimization of prices and production volumes using information on the price elasticity. He has calculated price elasticity of demand for each product to identify the model. Price parameters and base period prices is used to determine the profit maximizing prices. [11]

Pricing optimization can be the basis of adequate manufacturer pricing policy. Reasonable prices will contribute accordingly to the promotion and adaptation of products that are especially important for variable and flexible ICT market.

1.2.4. Sentiment Analysis

Sentiment analysis is one of the main areas that is becoming popular in the society. This method is very useful in many of the areas. This is also known as opinion mining, sentiment mining and sentiment extraction [12]. According to Zeenia Singla sentiment analysis can be considered as a "computational study of extract subjective information from a text". Online reviews are becoming very important since they have become a measurement in quality of businesses. According to Andreea Salinca we should use a large data set for analysis and Yelp Data set provides a large review database. Also, according to this article to improve the efficiency of analysis they use two feature extraction methods and four machine learning models for automatic review analysis. The customer review analysis helps the manufacturers to identify the unrealized potential as well. Therefore, it is useful not only to the customers but also for manufacturers. Online reviews of e-commerce giants like Amazon, Flipkart has large review bases. Thus, the Big Data commerce came into role with them. These parameters help in taking profitable and accurate decisions for a business [13].

To proceed in the review analysis, they have used multiple approaches. In summarizing text Minquin Hu and Bing Lu divided the process into three tasks [14]. Namely,

I. Mining comments based on product features.
II. Identifying the opinion sentence in each review and decide whether it is positive or negative.
III. Summarize the results.

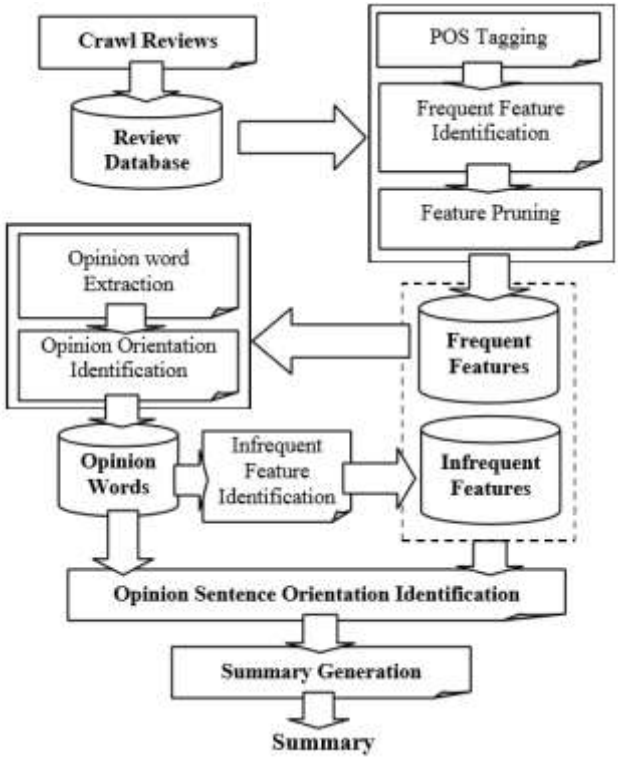

Figure 1. 5-Model for Feature-based opinion summarization [14]

Part of Speech (POS) Tagger is one of the common and efficient methodologies that is used for sentiment analysis. This method identifies the nouns, adjectives, adverbs and verbs in a sentence. Below is one of the Machine learning process that is used for an efficient method to analyze the comments [15].

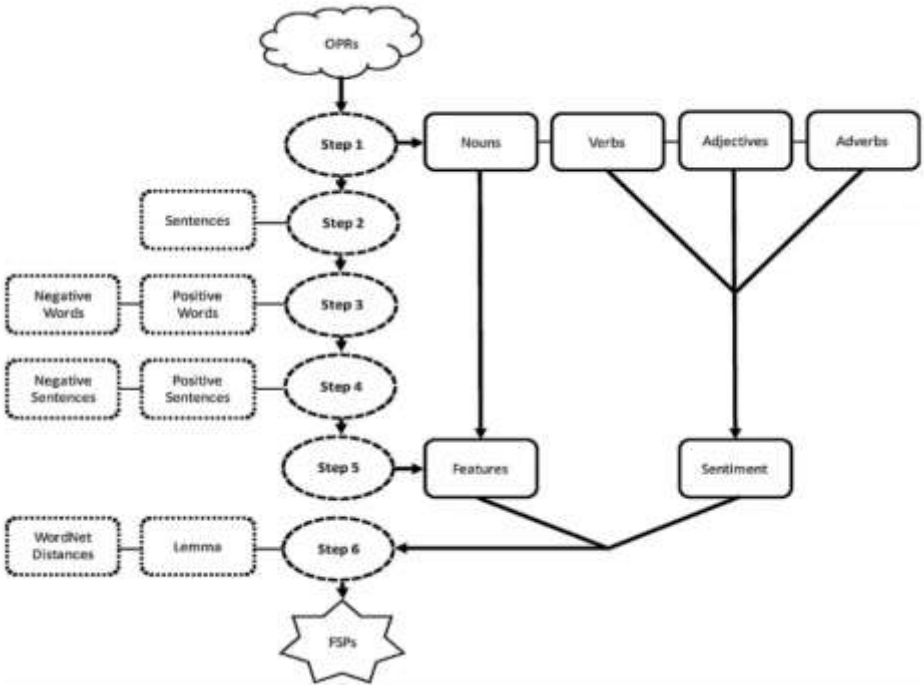

Figure 1. 6-Cognition process [15]

By considering the readings it was clear that similar concepts have being used in different areas. Even though some concepts are from different fields the mechanisms that are used can be incorporated in our research as well. Because these mechanisms. Techniques and concepts produce similar outputs as AssembleMe. Considering the requirements and knowledge we gathered from the articles there are no prevailing online assistants that provides assembling plans and budget. Thus we believe this assistant will be one time solution for many of the problems faced by people in assembling and finding suitable parts.

1.3 Research Gap and Research Problem

Through the data we gathered from research articles, observations, surveys and online sources it was clear that most of the sites have seldom approaches to provide solutions to the customers. With the rising demands for computers and laptops necessity of a platform which can provide solutions for customer problems is a must.

There are sites that are built for selling PC parts. Some sites display products/parts that belong to one vendor and some sites do display products from multiple vendors. There are some vendors who do not have online platforms as well. Therefore, this is a disadvantage for both the customer and the vendor. The customers might lose a chance of purchasing a product for a much cheaper price than expected. Because same product might be available for lesser price with another vendor. Figure 1.7 shows that majority of people prefer having an option to compare the prices.

The vendor might not be able to reach the customers who cannot visit them physically when they are not available online. One of the main reason local vendors are reluctant to reach the online market is due to the lack of technological knowledge and they feel safe within their comfort zone. But when we spoke with them, it was clear that they also want to join the online market if someone can provide the required guidance.

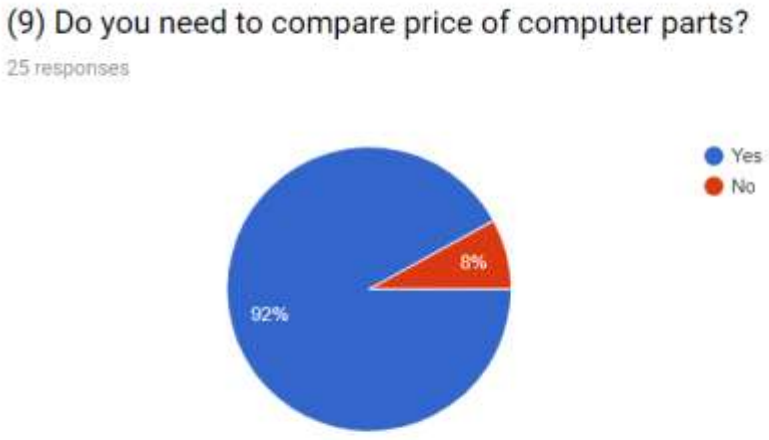

Figure 1. 7 -Survey results of computer parts price comparing

Through the survey we conducted we got to know that people use different methods to find the compatibility of parts. Mostly, online resources are widely used. They have to access these

sources separately and get the required details. Below figure show the most common methods people use in order to access the necessary details.

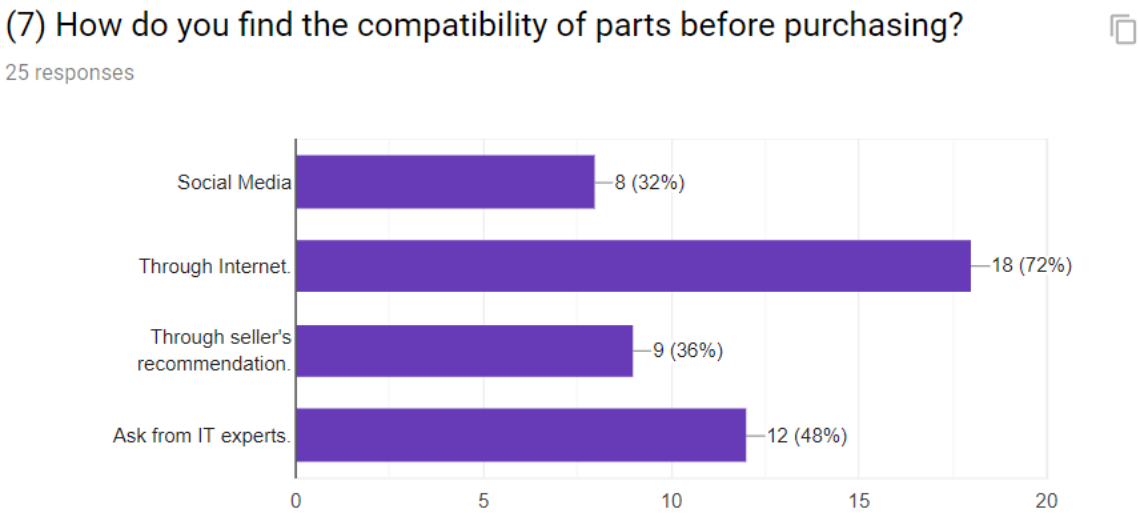

Figure 1. 8-Survey result of how people check information about PC parts

There are variety of Laptops in the market. When selecting a Laptop these options confuses the customer because they have many functionalities incorporated with one another. Most of the sites which sell laptops have the option where people can compare two or more laptops. But none of those sites recommend the best laptop from them. So the user is left with the compared functions and choose the best one as they believe. Through the survey we were able to gather factors users mainly consider before purchasing a laptop.

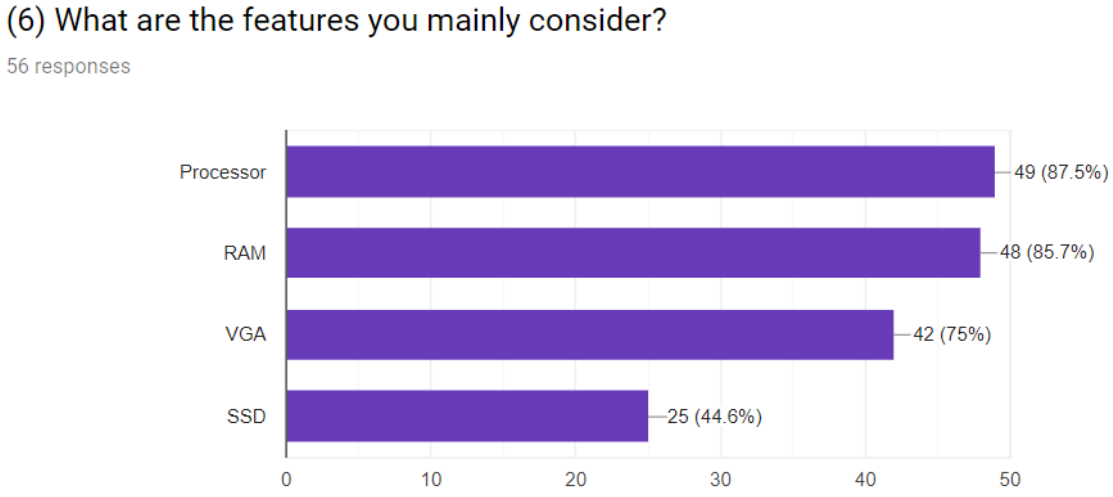

Figure 1. 9-Survey results of features user mainly consider in a laptop

By going through many of the research articles several approaches were conducted in order to analyze the comments made in the social media. Reason for us to consider this area is customers look into the customer reviews done for products before purchasing. Therefore, this area is important for PC parts and Laptops. Most of the sites either display the comments that were placed by their previous customers or there are Facebook pages that contain customer reviews for products. Customers have limited access for an analyzed customer overview for the products (E.g.: Number of people satisfied with the product).

Functions	PCPartPicker.com	NewEgg.com	Noteb.com	AssmbleME
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	✓	✓		✓
Notify Price Drops to user	✓	✓		✓
Laptop comparison		✓	✓	✓
Recommending the best laptop				✓

Table 1. 1-Comparison of current available systems with AssembleMe

2 Objectives

2.1 Main Objective

Main objective is to provide an online assistance for people who wants to assemble their PC's by themselves for different purposes and also to empower the users with information related to purchasing laptops and PC parts. The system analyses the requirements through extracting data using web scraping and provide the user with information.

2.2 Specific Objective

- **Designing an Algorithm to generate an assembling plan based on the user Requirements.**

Most of the computer games have specification and these specifications are mentioned indifferent gaming websites. When a user visits our platform and type the game he or she is interested, our platform will display the set of PC parts that are necessary. If they are searching for a part or parts to assemble a PC, our platform will provide the necessary details as requested.

- **Enabling to display the products (PC parts) from both local vendors and in e-Commerce sites.**

For each PC parts there are suppliers both in local and foreign market. Our platform acts as a common base for both parties. When the user searches a part, our platform will display the vendors who are supplying the product and the rate at which they are providing.

- **Design of an algorithm to generate an assembling plan according to a budget.**

Mostly different vendors provide different rates for the same part. Sometimes there might be alternative parts cheaper than the part they are looking to purchase. But due to lack of awareness they might miss those products.

Therefore, in our platform we will provide a plan which includes the parts that needs to be used to assemble a PC according to the user's budget. User will enter the budget and the required specification. We will recommend the parts they need to purchase within the budget. We also recommend the vendor they need to select in order to be with their budget.

- **Designing an algorithm to pick the best PC part in a price range.**

Most of the time cheapest product is not the best product. Users want to get the best product as well as the cheapest product. In order to do that, this system will have the ability to analyze the product features along with user feedbacks and the price. After analyzing, customers will get the best PC part in that price range.

- **Generating a comparison between two laptop options selected by the user.**

Users have a difficulty in choosing a laptop due to the similar features available in different brands. When the user type two laptops they are looking we will provide a functionality comparison of the two laptops in the same interface. This representation will provide a clear idea about the features.

- **Recommending the best laptop to work with.**

Laptops can be graded based on the computational power and that is one of the main feature users look into before purchasing a laptop. Thus, our platform will use a separate grading algorithm to decide on which laptop is best from the selected options.

- **Display a summary of the customer reviews on the particular product.**

Customers who have purchased the parts will post their experiences in social media platforms. There are Facebook groups for this purpose. But these pages do not have an overview of the comments.

We will access those comments and analyze them. After that, these comments will be categorized as positive expression and negative expressions. Through an algorithm a count of those categorized comments will be taken. Finally, we will display a summary of the customer feedback.

3 Methodology

AssembleMe is an online assistant which provides below solutions,

Provide assistance to assemble a PC.

Allow users to compare laptops.

Recommend the best product/part to purchase.

Analyzed customer social media comments.

In addition to the above mentioned functions there are sub functionalities in each, which provides a comprehensive solution to the user. Necessity to assemble a PC varies according to the user requirements. Solutions we provide should match their requirements. This is important to computer game players. Using web scarping we will retrieve the specifications of the games through the gaming sites that is available [1]. Then using a machine learning algorithm, we will compare the specifications and available parts with us. Another algorithm is used to check the compatibility of the suggested part when creating the plan [16]. Then we will display the compatible part to the user. This can be further developed in to creating assembling plans for building PC's for video editing.

Laptop comparison can be modified into recommending the best laptop from the options. Features of the laptops will be extracted from the sites and stored in a cloud database. When a new model arrives to the market our database will be automatically updated. Computational power is a common practice that is used to compare different models [3]. One of the criteria that we consider in comparing will be the computational power in our algorithm. Then the same algorithm will be used to compare the other aspects and will produce a grade based on them. Based on the analyzed functionalities the efficiency of the model will be decided and the most efficient model will be recommended to the user [8, 17].

In building a PC according to the budget our algorithm will be considering both the compatibility of each part and their prices. Compatibility will be mainly considered based on the mother board socket compatibility of other parts. In this function price optimization technique is used to recommend the best product for them to choose. In this technique from the available vendors we will display the best product they need to purchase. The best product will be selected considering number of products sold, customer reviews and ratings provided in the

sites we are accessing. In this section the product we recommend might not be the product with the lowest rate. It will be the best product/part available in the market at the time. Another algorithm is used to detect when there is price drop of the products. This function is further extended where customer can insert a price they are looking. Then our system will keep track of that price and when the price drop to the customer's price or below notification will be sent via our system.

Customer reviews that are published on social media platforms (Eg: Facebook) will be accessed real time. Comments will be filtered according to the product tags from the selected Facebook groups [12]. An algorithm will be used to categorize these comments into positive or negative comments. Then a count will be taken and a summary will be displayed for each product based on the analyzed comments.

3.1 System Architecture

The system architecture is shown in figure 3.1

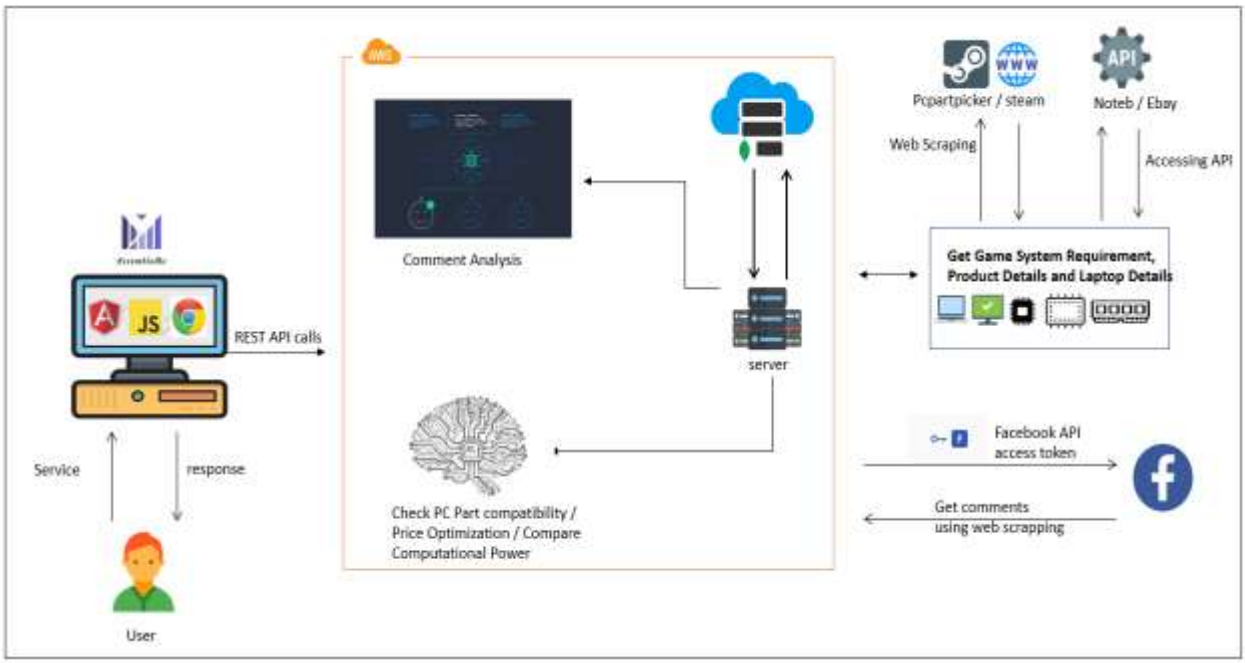

Figure 3. 1-High level architectural diagram

3.2 Software Solution

Agile methodology is the development lifecycle that we will be considering for this project [17]. Under this we will be following the Scrum methodology. Scrum is considered as a light weight agile project management framework. It is capable of managing and controlling both iterative and incremental projects. This method is applicable for smaller achievable modules and can be gradually developed. Flexibility in this module make it easier to include the timely changes. Most importantly this methodology reduces the failure rate to a greater extent [18] [19].

Figure 3. 2-Agile software development life cycle [20]

- **Requirement Gathering and Analysis**

Firstly, we decided to conduct a requirement gathering process.

- **Survey Results**

  We the authors did a requirement gathering via a questionnaire that was distributed among different age groups. Through this we were able to understand the areas and features the users look in before purchasing part. The results we got also shows the impact our solution can create to the society. Main objective of this questionnaire is to full fill the project objectives.

- **Feasibility study**

    - **Schedule feasibility**

    The proposed project should be completed within the timeframe that is allocated. In each milestone we need to produce the required output. This could be a document or a product. Finally, the completed output should be produced on the due date.

- **Technical Feasibility**

    - **Programming Knowledge**

    For the successful completion of this project, project members need to have a good knowledge on programming. We use Python for scrape data from the internet to get game requirements, Facebook comments and PC parts details. Our team members should also need the knowledge about web technologies like Angular and Spring Boot. Angular is JavaScript framework use to build frontend of the web solution. Spring Boot is a JAVA-based framework which use to build the backend servers of the system. Moreover we need to know about databases to handle data, so we use MongoDB for store our web solution data. MongoDB is a document oriented NoSql database.

- **Implementation**

    The implementation process can be divided into several sub functionalities as mentioned below,

    - Assemble PC according to specific system requirement of a game
    - Social media comment analysis
    - Price comparison and optimization
    - Laptop computational power comparison

The above mentioned functionalities will be implemented in our final product.

- **Web Application development**

    To build the final product we use Angular which is platform to build single page applications. Angular is a structural framework that combines declarative

templates, dependency injection, DOM manipulation, and it follows MVC architecture.

- **Database Management**

  In this platform we need to handle more data. We use NoSQL databases to store and retrieve data. MongoDB is document oriented, highly scalable, free and open source database. Team members should have the knowledge about database management to insert, update, and delete the data using the MongoDB.

- **Testing**

  Before integrating each units, which are test to ensure that unit is working properly. After doing the unit test we integrate that unit with our system and do the integration test to check whether that unit is not affected with our final system.

- **Deployment**
  - **Amazon Web Services**

    The final product is a web based platform so that it should be deployed in AWS to access the users and get services from our platform. AWS is a cloud-based platform that provide secure, auto scalable, easy to use and high availability services. AWS provide interfaces to simplify the usability for developers to get quickly and reliable services.

4 Description of Personal and Facilities

4.1 Assemble PC Considering the game system requirements

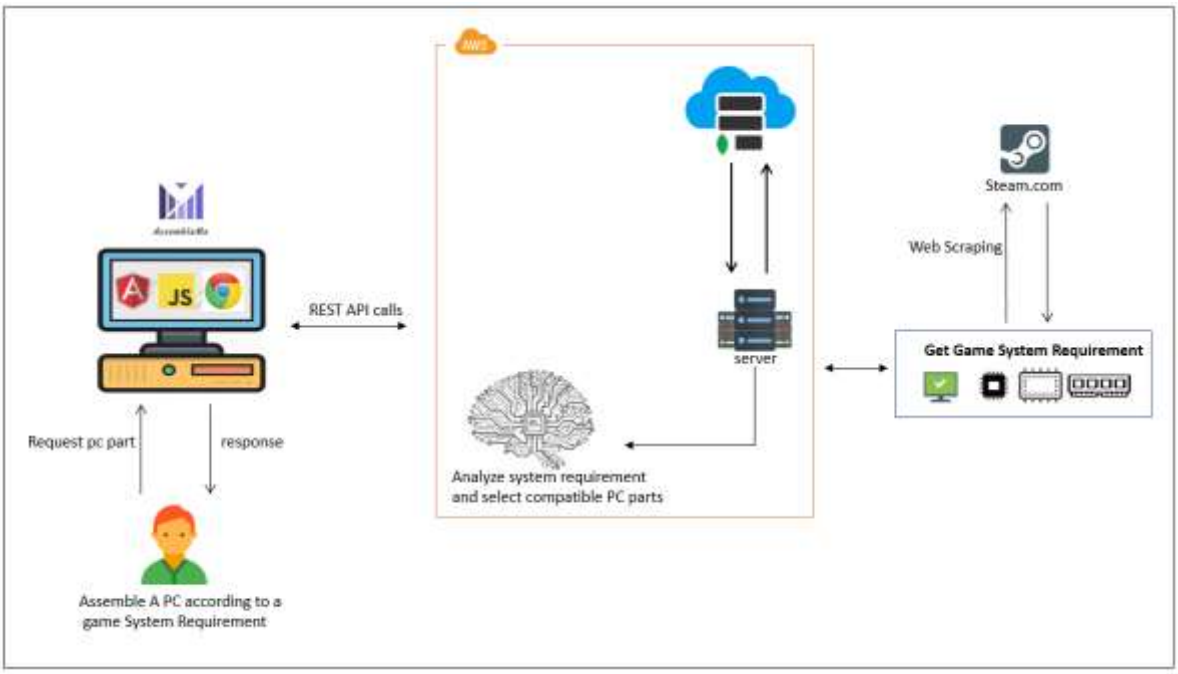

Figure 4. 1-Assembling PC according to game

1. Get the system requirements of the selected game by the user.
    - Get the selected game requirements by using web scraping. We get the requirements of game through scraping the steam.com which is a platform to buy and play computer games.
2. Using build sequence identify the compatibility of the parts that need to run the PC game.
3. The build sequence will analyze the final product (assembled PC) as several sub components and match those specifications.
    - After getting the specifications of the game and analyze the requirements, a sequence is built to assemble the final PC and search for compatibility of each parts and specification
    - When we define the building sequence we will consider the final product as combination of several sub components. We divide the final PC as Processor, motherboard, memory and graphics.
    - Then select the required processor to run the game by analyzing the system requirements. We can get the specification of the processor (socket) and match with the compatible motherboard to assemble the complete PC.

4.2 Social Media Comment Analyze

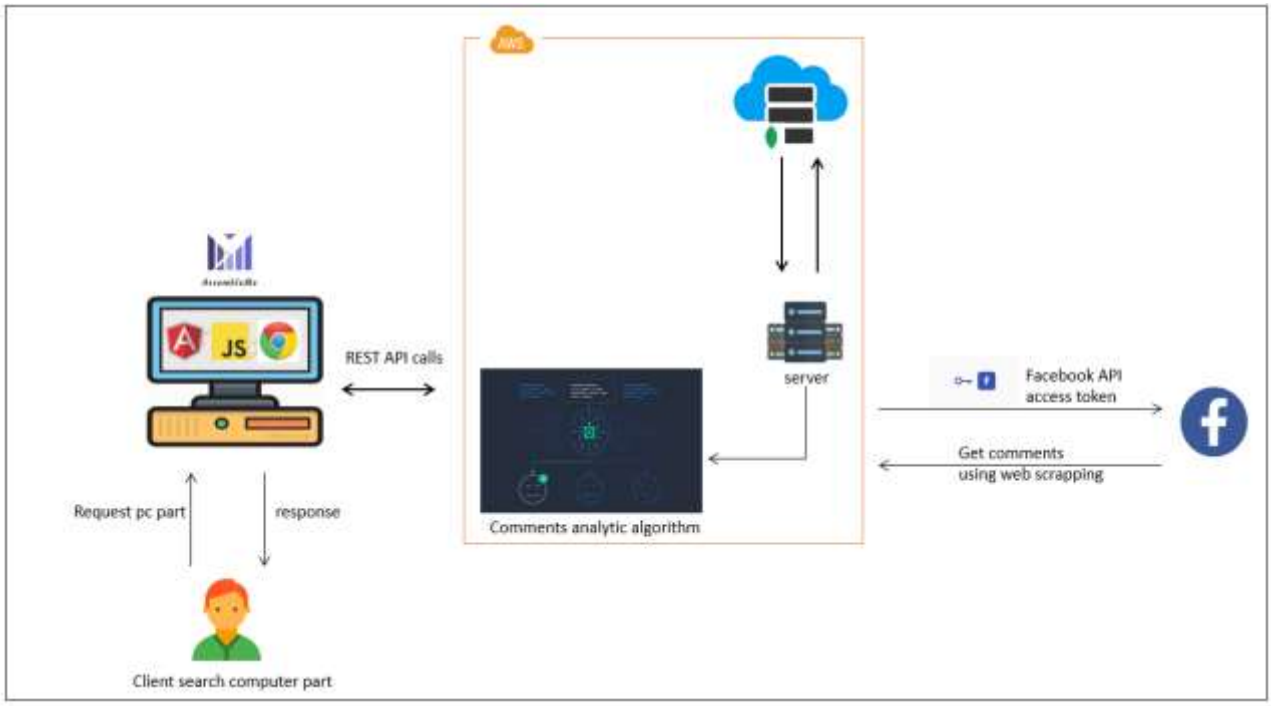

Figure 4. 2-Get social media comment and analyze

1. Track the product name using the text user writes on the Search text field.
2. Using the product name tag, track the relevant record for the product.
    - As for each product details will be stored in the database. The record which matches the search term should be retrieved.
3. Simultaneously, using Real Time Data Extraction, data that is necessary for analysis will be accessed from the social media.
    - We will extract the comments mainly from Facebook. For that process we will be using a Facebook API Access token.
    - Then comments related to the product tag will be traced and using web scraping these comments will be extracted in real time.
4. Using optimal sentiment analysis algorithm to produce the result.
    - This algorithm will separate the text. Filter the comments removing unnecessary tags. Then opinion mining will be conducted to identify the nature of the comment (positive/negative).
    - Then a count will be taken for each opinionated comments and the result will be displayed to the user.

4.3 Price Comparison and Optimization

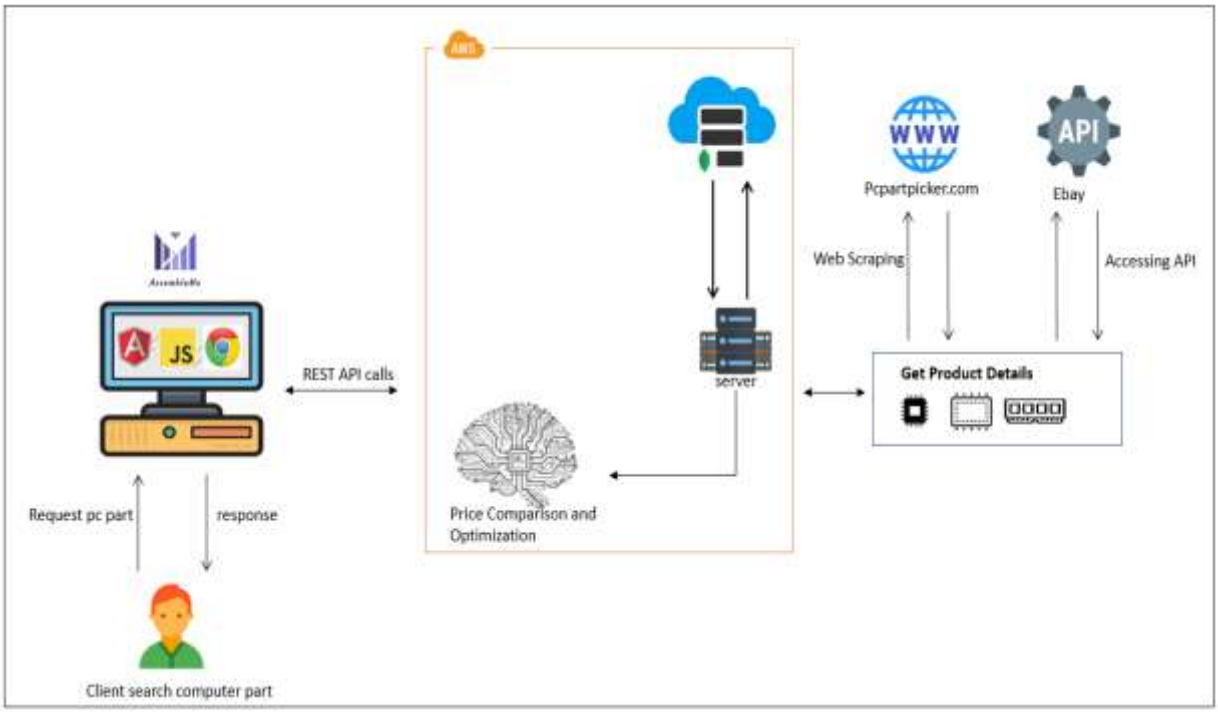

Figure 4. 3-Get product prices and optimize

5. Get the part prices through different vendors and compare those.
    - Get product details from local vendors and get details by web scraping and accessing web APIs from e-commerce sites.
6. Assemble the PC according to client budget.
    - Users can change the price ranges so that the system recommends PC parts for the lowest budget.
7. Notify the price drops to user.
    - If the users' budget does not match with the product prices, users can track those prices. If the price drops to the users' expected budget, they will be notified.
8. Select and suggest the best PC part by considering features, number of selling, user feedbacks and price of the product.
    - System analyzes the product features, user feedbacks from social media, how much the customers have purchased that product and the price of the product. Based on those facts, the system recommends the best PC part to the user.

4.4 Laptop Comparison

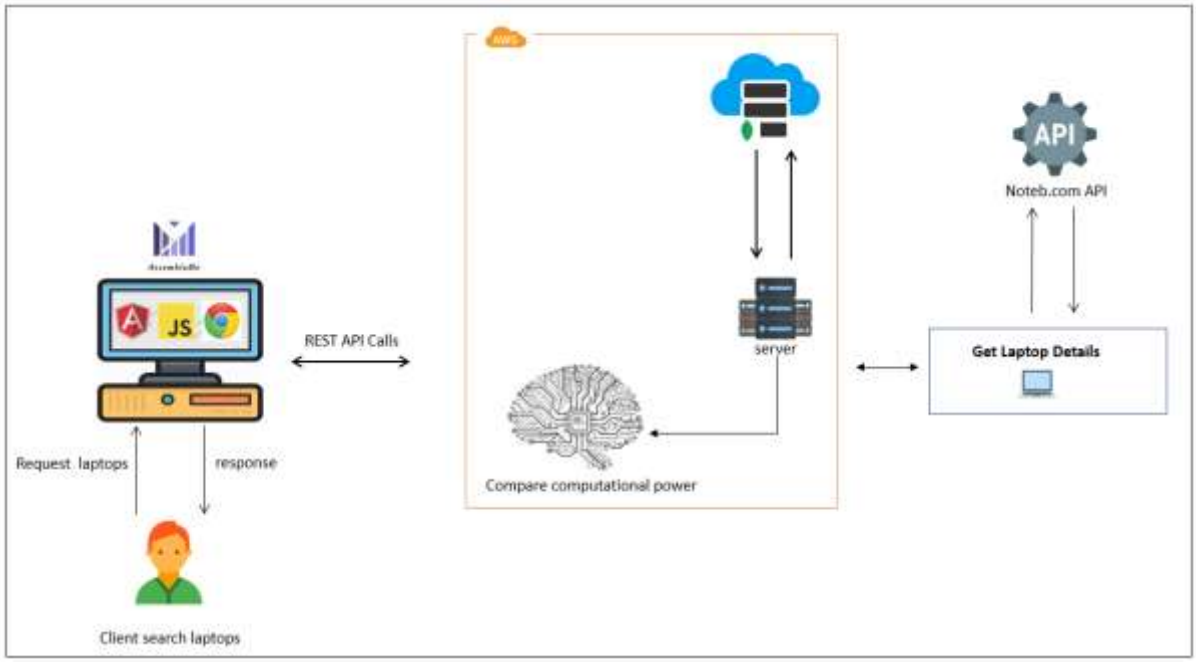

Figure 4. 4-Compare laptops computational power

1. Detect the laptops that the user is looking to compare through our site.
2. Stored record for each model is identified and retrieved from the database.
    - Details of each laptop that is available in the market is stored in our database. Using the searched names relevant record will be identified and used. In each record we have stored the most searched functionality of each laptop.
3. A machine learning algorithm is used compare the two laptop versions.
    - This algorithm will consider the computational power of each. Computational power will be analyzed considering the functionalities and parts affecting to each.
4. Suggestions will be given based on the results produced from the algorithm.
    - The suggestion will be given based on the computational power analysis.

4.5 Summary of Personal and Facilities

Tasks	Component	Member
▪ Extract system requirements for games. ▪ Identify compatible PC parts needed to build a PC. ▪ Build the PC according to the system requirement.	Assemble PC considering the system requirements of games	H.K.S.P.Gunadasa
▪ Identify the comments on products on social media. ▪ Categorize the comments by processing them. ▪ Summarize the comments.	Social Media Comment analyze	Sewwandi E.D.D.
▪ Price comparison. ▪ Assembling PC according to the user budget. ▪ Pick the best PC part considering the features. ▪ Notify price drops to customers.	Price Comparison and Optimization	M.A.V.L.Gunathilaka
▪ Extract laptop details. ▪ Analyze the computational power and features of them. ▪ Compare and identify the best laptop.	Laptop Comparison	Tharaka K.K.S.

Table 4. 1-Summaries of Personal and Facilities

5 Work Breakdown Structure

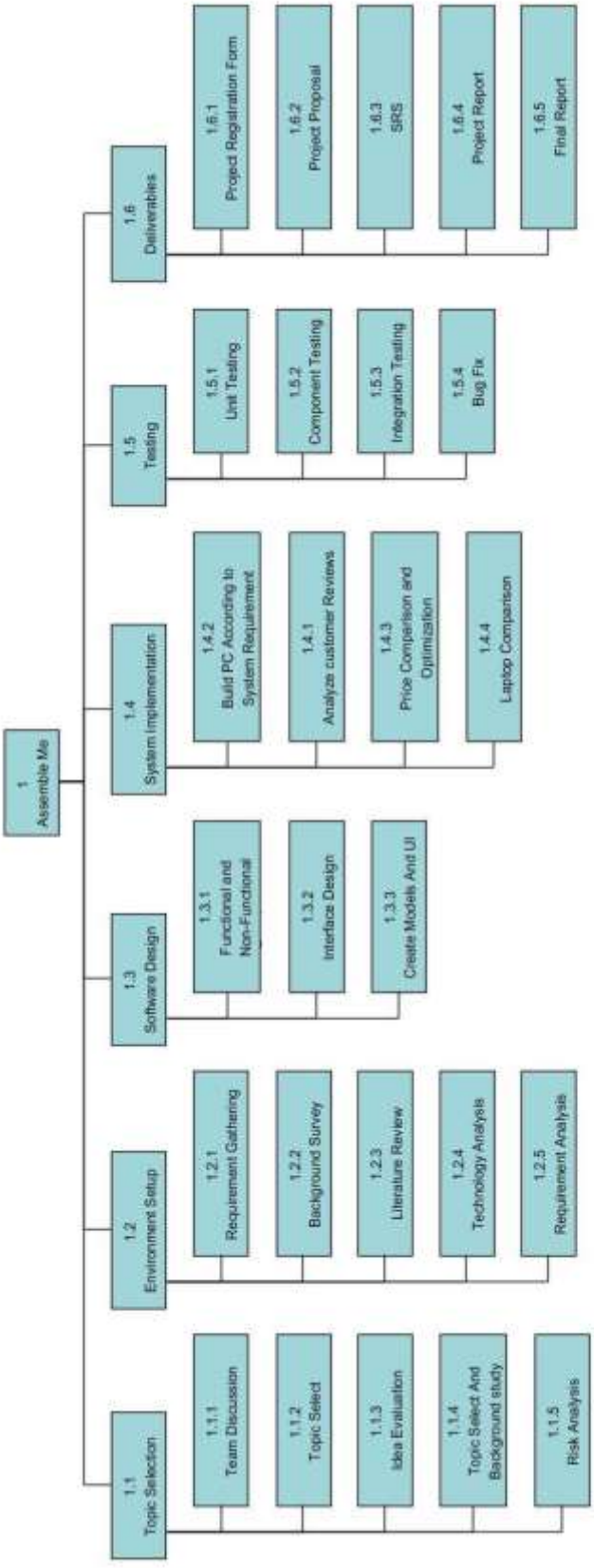

Figure 6. 1-Work Breakdown Structure

6 Gantt chart

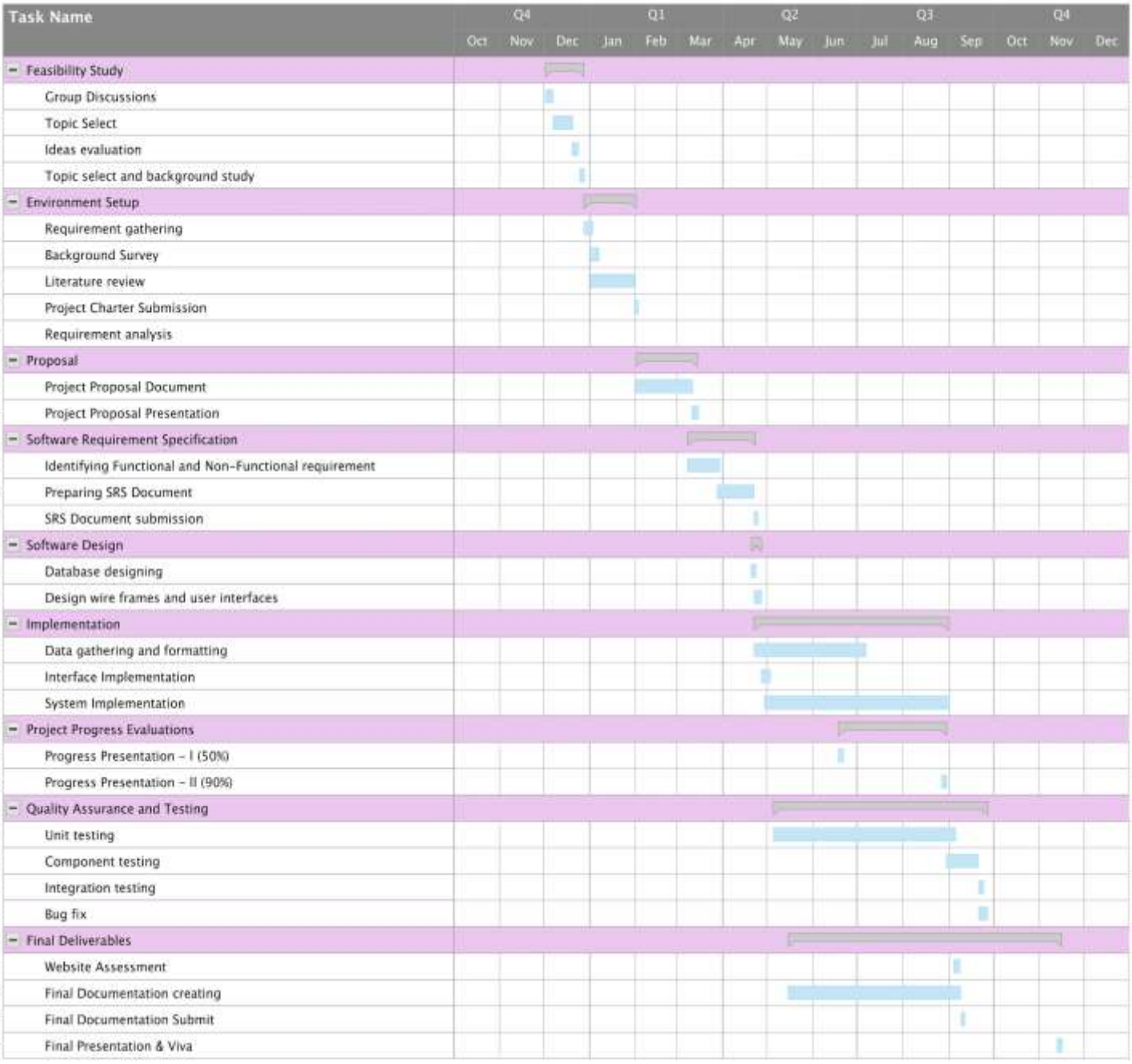

Figure 7. 1-Gantt chart

7 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].

8 Appendices

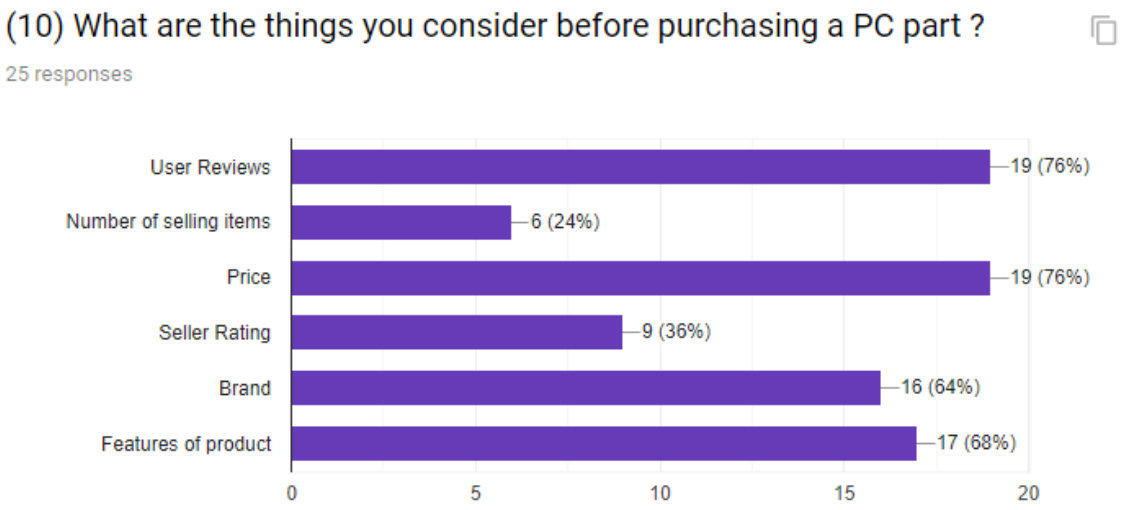

Figure 8. 1-Survey results of facts user consider purchasing a PC part