



Bilkent University

Department of Computer Engineering

Senior Design Project

TechRank

Analysis Report

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Analysis Report
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Analysis Report

TechRank

1. Introduction

Online shopping is one of the rapidly growing trends in the last decade. People think that doing shopping with using websites or shopping apps is easier and less time consuming than doing shopping in the stores. Because, they can search the products they want to buy by using search bar without losing time while finding the products in the store. Customers are surfing on e-commerce websites not only for buying the products online but also, even when people are buying things from stores, they are checking out reviews and comments of products online. In any case, checking out reviews is quite common nowadays, as it is hugely beneficial. However, people do not want to read hundreds of comments due to timing constraints. In addition, it is not always easy to understand general consensus on comments because there are inconsistencies among comments. Because of that, seeing the products' rates that are constituted by analyzing all comments is beneficial for the user. By observing rates about the products, customers can easily decide which product is worth buying.

When we consider the common usage of online shopping, we decided to develop a web application in order to help people to decide and find out which technological product is beneficial and necessary for them by analyzing user comments from trusted e-commerce websites and by rating and ranking them into some related categories. Our application will analyze all comments scattered on web, then it will rank the devices on the same category using criteria. TechRank will also decide on overall rating for the device and overall rating for the producer company of the device.

2. Current System

Euroncap (<https://www.euroncap.com/en>)

Euroncap is an assessment program in which the cars (mostly brand new) are assessed according to the criteria such as pedestrian safety, driver safety, etc. that have been decided previously by the program authorities. The working principle of the assessment consists of taking the cars under several physical tests in which they collect data for the evaluation of the previously defined criteria. After the collection of data, the assessment is concluded by giving percentage evaluations for each criterion of the car that has been assessed. Our working principle has been influenced by the assessment of cars depending on the criteria defined in the assessment process of the program. The data that they gather are based on the physical test results they made on cars. In our case, as we will be considering the gathered data as the user reviews on the particular electronics products. Then, as in parallel with the evaluation of Euroncap, the data will be assessed to specific criterion and the evaluation of these criteria

will be made in terms of percentages. In the below screenshot, it can be seen that a car has been assessed according to the following criteria: adult occupant, child occupant, vulnerable road users, safety assist.

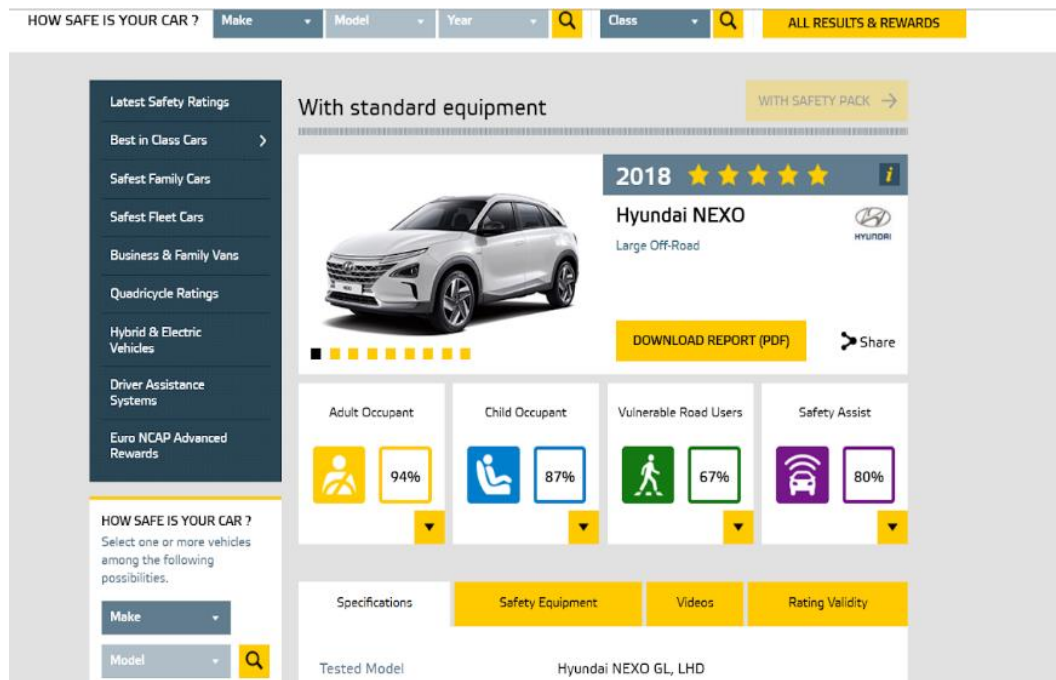


Figure 1 Euroncap Website

TestFreaks (<https://www.testfreaks.com>)

TestFreaks is a website which combines thousands of comments from the most-popular e-commerce websites with professional experts' reviews as well. The system that TestFreaks has consists of crawling data and presenting them to the user with the use of some intelligent algorithms so that the users are going to be able to access the best local recommendation results. The website also provides its user an opportunity to see different purchasing options and directing links to those options. Apart from showing the user reviews on a particular electronic device, TestFreaks also shows the test results to its users. Below, there is a screenshot in which a simple electronic device's main page has been shown that includes the reviews, and purchasing option. The pros and cons are directly crawled from the websites that the comments are gathered, thus there needed no processing of the reviews to figure out what the pros and cons are.

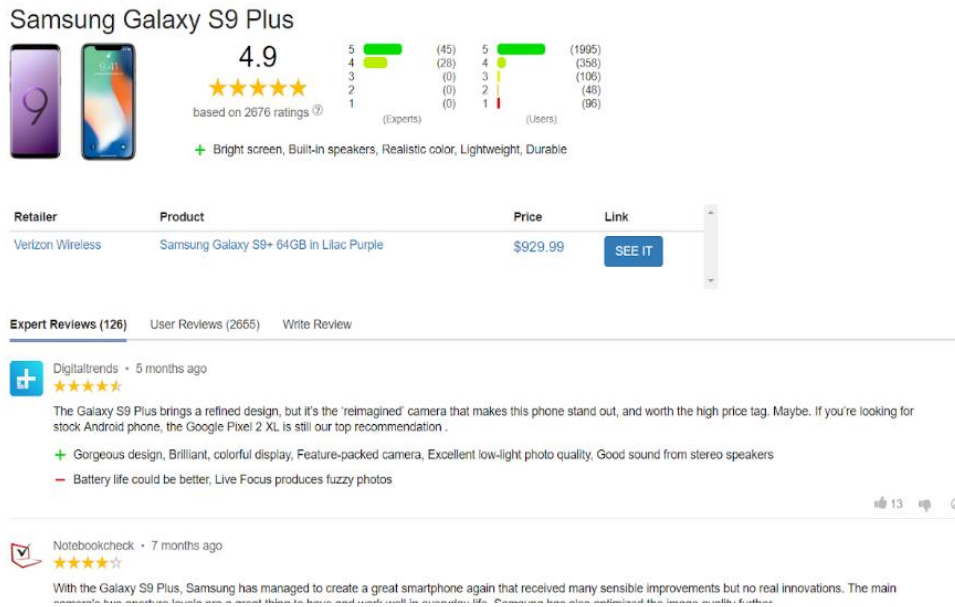


Figure 2 TestFreaks Website

3. Proposed System

3.1. Overview

TechRank is a web application which provides comment-based ratings and rankings for electronic devices such as TVs, computers, mobile phones, audio devices, appliances, etc. Our system will collect reviews on electronic products from the trusted e-commerce websites. It will analyze the comments using Natural Language Processing (NLP) and based on the analysis it will provide following functionality: Maximum 4 criteria for each product type will be pre-selected. For each one of these criteria, TechRank will assign a percentage point by analyzing comments on specific criterion. For example, if the criterion is performance for computer, TechRank will analyze comments on this device that includes negative or positive statements on performance of this device, and determine percentage point. After this, ranking of the device amongst all other devices on its category regarding selected criterion will be determined. This ranking will show the selected products' place on the market based on only selected criterion. In addition, overall rating for the device will be assessed by averaging percentage points for each of the criteria. And by averaging overall ratings of all products of the producer, overall rating of the producer will be determined. Using all these rankings, users will be able to understand general consensus on products and their specific qualities, and the producers. This way users will not get lost among hundreds or thousands of comments in the web, and will be able to understand the rankings of the product they are looking for amongst all of its rivals on the market. Furthermore, users will be able to view all the comments that are used to determine percentage point of the device on specific criterion.

In addition to this core feature, to provide better experience for users many information on selected device will be made available on TechRank. Application will show pictures of the product from different e-commerce website, it will provide technical

specifications of the device, users will be able to see all the comment on web for selected device. Users will also be able to examine success of companies on each category of devices that companies manufacturing. By examining page of companies and selecting one of the categories that company is producing devices of, users will be able to see ranking of the company on that category among all of its rivals. Furthermore, users will be able to view full list of products of the company on that category. Searching keyword in TechRank will yield results of both companies and products, which will be provided in the same page. This can be seen in the mockups provided in later sections.

3.2. Functional Requirements

- User will be able to see percentage point of the viewed product regarding 4 different criteria specified for the product's category.
- User will be able to see rating of the viewed product among its rivals on the same category regarding 4 different criteria specified for the product's category.
- User will be able to see the full list of ratings for the category that the viewed product is in.
- User will be able to analyze all the comments that are used to determine percentage points and ratings for the viewed product on each criterion.
- User will be able to see overall percentage point and rating of the viewed product.
- User will be able to see technical specifications for the viewed product.
- User will be able to see all the comments regarding the viewed product along with their sources which are trusted e-commerce sites.
- User will be able to see photos of the viewed product from different websites along with their sources.
- User will be able to search for producer companies that exist on the market for electronic devices.
- User will be able to see percentage point and the rating of the producer company of the viewed product on specific category.
- User will be able to see product and company results at the same page according to the keyword that used for searching. Also, in search results page, user will be able to see overall ratings of products.
- User will be able to select category of the product by using the navigation bar.
- When user select a category by using navigation bar, S/he will be able to view the rankings of top-rated products according to each of the criteria for this category.
- User will be able to view the products of the selected category and the rating lists for each of the criterion.

3.3. Non-Functional Requirements

- System will be function as a web application.
- System requires internet connection.
- System will work 7/24
- System will have easy-to-use graphical user interface to provide users with smooth user experience even in the first use of the application.

- System will be able to respond to actions of users under two seconds.
- System will update the comments in the database and add newly added comments to the system frequently.
- Gathering data for the products will be conducted periodically, after collecting comment data, sentiment analysis with NLP will be initiated only once for these periods. Starting and ending times for these periods will be predefined.
- System will have scalable database to maintain and store huge amounts of data that is required for TechRank to work.

3.4. Pseudo Requirements

- TechRank will be designed as web application.
- GitLab will be used as issue tracking system.
- Backend Part of the project will be designed by SpringBoot.
- Frontend Part of the TechRank will be implemented by Angular.js framework
- Data Storage will be provided by S3 service of Amazon Web Service.
- For the task of data retrieval Lambda service of Amazon Web Service will be used.
- Database will be detailly implemented by using RDS based on MySQL and Mongo based on NoSQL.
- To be able to benefit from cloud computing, EC2 service of the Amazon Web Service will be used.
- Deliverables of the project must be delivered without latency. And implementation must be started as soon as possible.
- The current language of the TechRank will be English. According to current design there will not be any other choice for language.
- In TechRank there will be no direct social interaction between users.
- Prices of the AWS services and server domain expenditures will not exceed unaffordable amounts for us.
- In order to provide sustainable service to users TechRank will keep comments up-to-date and web servers of TechRank will be updated incessantly without allowing problems on them.
- Criteria that decided for every single product type should be updated according to these technological developments.
- To be able to reach data from online shopping web pages in a sustainable way, we should update our online listeners according to the changings on these webpages to be able to reach these data whenever it required.

3.5. System Models

3.5.1. Scenarios

3.5.1.1. Scenario 1

Jacob enters the TechRank web page. He writes his desired product name which is the Huawei Mate20 to search bar exist on the upper part of the main page. Then Jacob examine the results from the searching page and searching engine will brings the best possible results related with this keyword. And its first result is the phone which Jacob wants. Jacob enters the page of this product by clicking the first result. Here Jacob see the overall ranking of the Huawei Mate20. This device is in the 4th place between all of other mobile phones. Then he observes the ranking for each criterion. And he starts to observe all of the rankings for each of the mobile phones. He saw that this phone is in 1st place on durability,7th for Battery Usage, 4th for other two criteria. Since durability of the product is too important for him, seeing the high rank of this product about durability endorse his desire to buy this product. After that he observe technical specifications of the product from bottom part of the product page. Then he opens the other tab and see all of the comments that causes the current ratings of the product. After reading some comments that answers the Jacob's questions about this phone, finally he decided to buy this product and close the web browser.

3.5.1.2. Scenario 2

Jacob wants to buy a computer of HP. He enters to the main page and searches company by typing HP in the search bar. Then he sees both HP products and company results. He clicks into the company result and he sees the overall rating of the HP. He decides to look at the popular computers list. He sees that HP Pavilion is the first computer in the list. He clicks the product and examine this product's detailly by looking its rankings compared to other computers. After seeing satisfying results, finally, he decided to buy the HP Pavilion computer.

3.5.1.3. Scenario 3

Jacob wants to buy a mobile phone. He enters to the main page and select a mobile phone category at the top of the main page. Then he sees criteria of the phone and decides to find a mobile phone which has high durability ranking. Then he clicks into the durability criterion and see the list which shows mobile phones sorted by durability. He sees the Huawei Mate20 which is the first phone in the list and he examine product in detail. Finally, he decided to buy it.

3.5.2. Use-Case Model

Visual Paradigm Standard (serhat@Bilkent Univ.)

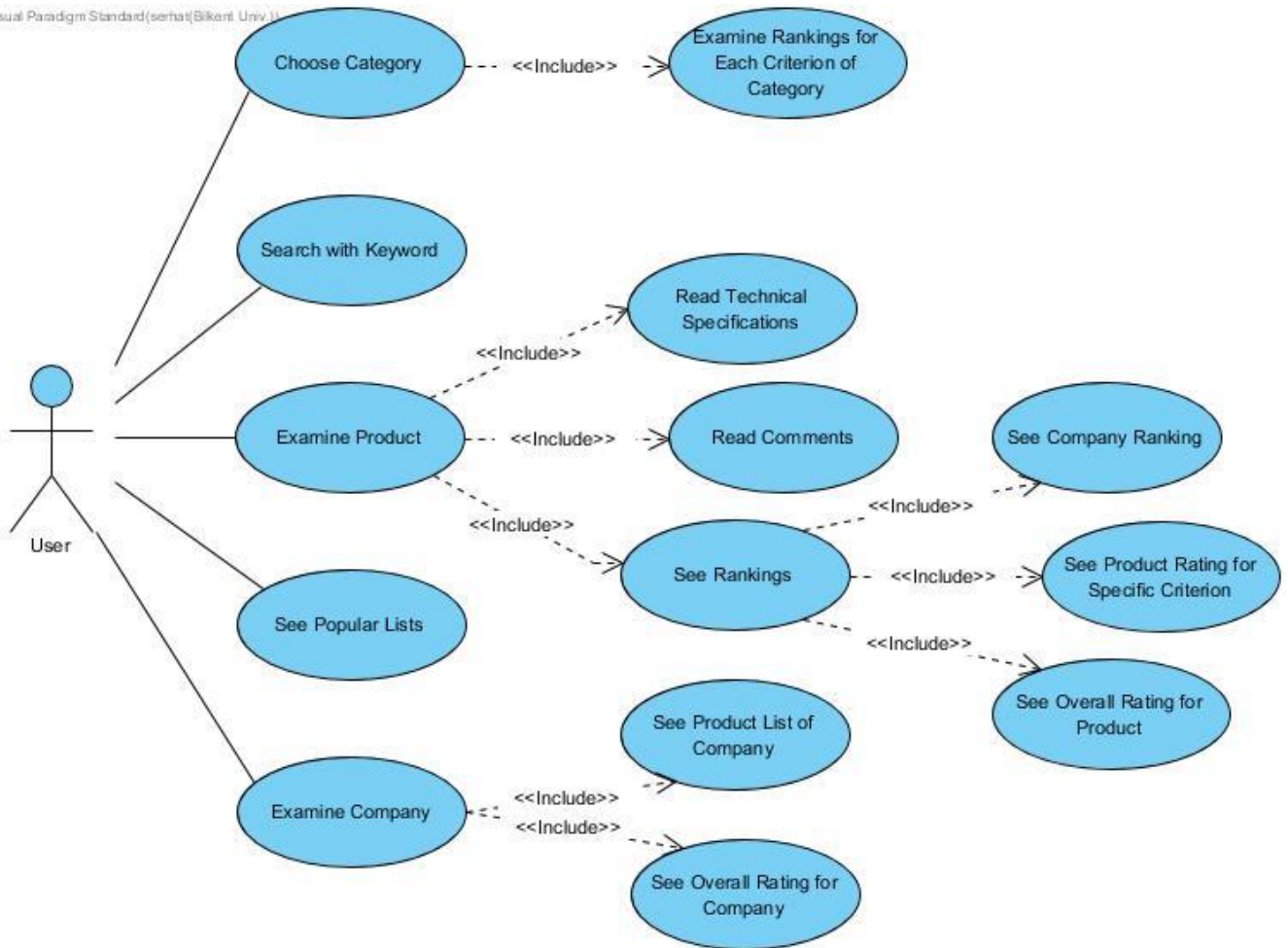


Figure 3 Use Case Diagram for TechRank

Use Case: *SearchWithKeyword*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to search for a product or company.

Exit Condition:

- Brad sees the products' or companies' search results that are sorted by relatiness.

Main Flow of Events:

1. Brad enters the information he knows on the desired product or company name to the search bar.
2. System will show related results sorted by relevance.
3. Brad finds the product he is looking for, and selects the item.

Alternative Flow of Events:

1. Brad enters the information he knows on the desired thing to the search bar.
2. System will show related results sorted by relevance.
3. Brad cannot find the item he is looking for.
4. Brad filters the search by choosing the item type he is looking for or he is changing the sorting type.
5. Brad finds the product he is looking for, and selects the item.

Use Case: *ReadComments*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to search for comments of a product.

Exit Condition:

- Brad reads the desired product's comments.

Main Flow of Events:

1. Brad enters the information he knows on the desired product to the search bar.
2. System will show related results sorted by relevance
3. Brad finds the product he is looking for, and selects the item.
4. Brad clicks into All Comments button to see the comments of the product.

Alternative Flow of Events:

1. Brad enters the information he knows on the desired product to the search bar.
2. System will show related results sorted by relevance.
3. Brad cannot find the item he is looking for.
4. Brad filters the search by choosing the item type he is looking for or he is changing the sorting type.
5. Brad finds the product he is looking for, and selects the item.
6. Brad clicks into All Comments button to see the comments of the product.

Use Case: *SeeCompanyRanking*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to see for overall ranking of the company he is looking for.

Exit Condition:

- Brad see the overall ranking of the desired company.

Main Flow of Events:

1. Brad enters the company information to the search bar.
2. System will show related results sorted by relevance.
3. Brad finds the company he is looking for and selects the company.
4. Brad can see the overall ranking in the company page.

Alternative Flow of Events:

1. Brad enters the one of the products' information of the company to the search bar.
2. System will show related results sorted by relevance.
3. Brad clicks into the product of the company.
4. Brad clicks into company name of the product.
5. Brad can see company's rankings.

Use Case: *SeeOverallRankingForProduct*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to see for overall ranking of the product he is looking for.

Exit Condition:

- Brad see the overall ranking of the desired product.

Main Flow of Events:

1. Brad enters the product information to the search bar.
2. System will show related results sorted by relevance.
3. Brad finds the product he is looking for, and selects the product.
4. Brad can see the overall ranking of the product in the page.

Alternative Flow of Events:

1. Brad enters the information he knows on the desired thing to the search bar.
2. System will show related results sorted by relevance.
3. Brad cannot find the product he is looking for.
4. Brad filters the search by choosing the item type he is looking for or he is changing the sorting type.
5. Brad finds the product he is looking for, and selects the item.
6. Brad can see product's overall ranking.

Use Case: *SeeProductRatingForSpecificCriterion*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to see ranking of the specific criterion that belongs to product he is looking for.

Exit Condition:

- Brad see ranking of the specific criterion of the desired product.

Main Flow of Events:

1. Brad enters the product information to the search bar.
2. System will show related results sorted by relevance.
3. Brad finds the product he is looking for, and selects the product.
4. Brad can see the ranking of the specific criterion of the product in the page.

Alternative Flow of Events:

1. Brad enters the information he knows on the desired thing to the search bar.
2. System will show related results sorted by relevance.
3. Brad cannot find the product he is looking for.
4. Brad filters the search by choosing the item type he is looking for or he is changing the sorting type.
5. Brad finds the product he is looking for, and selects the item.
6. Brad the ranking of the specific criterion by clicking into the desired criterion .

Use Case: *ReadTechnicalSpecifications*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to search for comments of a product.

Exit Condition:

- Brad reads the desired product's technical specifications.

Main Flow of Events:

1. Brad enters the information he knows on the desired product to the search bar.
2. System will show related results sorted by relevance.
3. Brad finds the product he is looking for, and selects the item.
4. Brad clicks into Technical Specs button to see the technical specifications of the product.

Alternative Flow of Events:

1. Brad enters the information he knows on the desired product to the search bar.
2. System will show related results sorted by relevance.
3. Brad cannot find the item he is looking for.
4. Brad filters the search by choosing the product type he is looking for or he is changing the sorting type.
5. Brad finds the product he is looking for, and selects the item.
6. Brad clicks into Technical Specs button to see the comments of the product.

Use Case: *SeeProductListOfCompany*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to see for product list of the company he is looking for.

Exit Condition:

- Brad see the product list of the desired company.

Main Flow of Events:

1. Brad enters the company information to the search bar.
2. System will show related results sorted by relevance.
3. Brad finds the company he is looking for, and selects the company.
4. Brad can see the product list of the company in the page.

Alternative Flow of Events:

1. Brad enters the one of the product's information of the company to the search bar.
2. System will show related results sorted by relevance.
3. Brad clicks into the product of the company.
4. Brad clicks into one product of the company.
5. Brad clicks into company name of the product.
6. Brad can see company's rankings.

Use Case: *SeePopularLists*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to see for popular product lists.

Exit Condition:

- Brad sees the popular product lists.

Main Flow of Events:

1. Brad can see the product lists in the main page.

Use Case: *ExamineProduct*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to see for particular product.

Exit Condition:

- Brad sees the product page.

Main Flow of Events:

1. Brad searches the product in the search bar.
2. He selects the relevant result from the result page.

Alternative Flow of Events:

1. Brad can click into product category that he wants to see.
2. He finds the product lists.
3. He choose the product that he wants from the list.

Use Case: *ExamineCompany*

Actors: Brad

Entry Condition:

- Brad has entered the website for TechRank and wants to search for particular company.

Exit Condition:

- Brad sees the company page.

Main Flow of Events:

1. Brad searches the company in the search bar.
2. He selects the relevant result from the result page.

Alternative Flow of Events:

1. Brad can click into product of the company in the search page.
2. He clicks into the company logo in the product page.
3. He sees the company page.

3.5.3. Object and Class Model

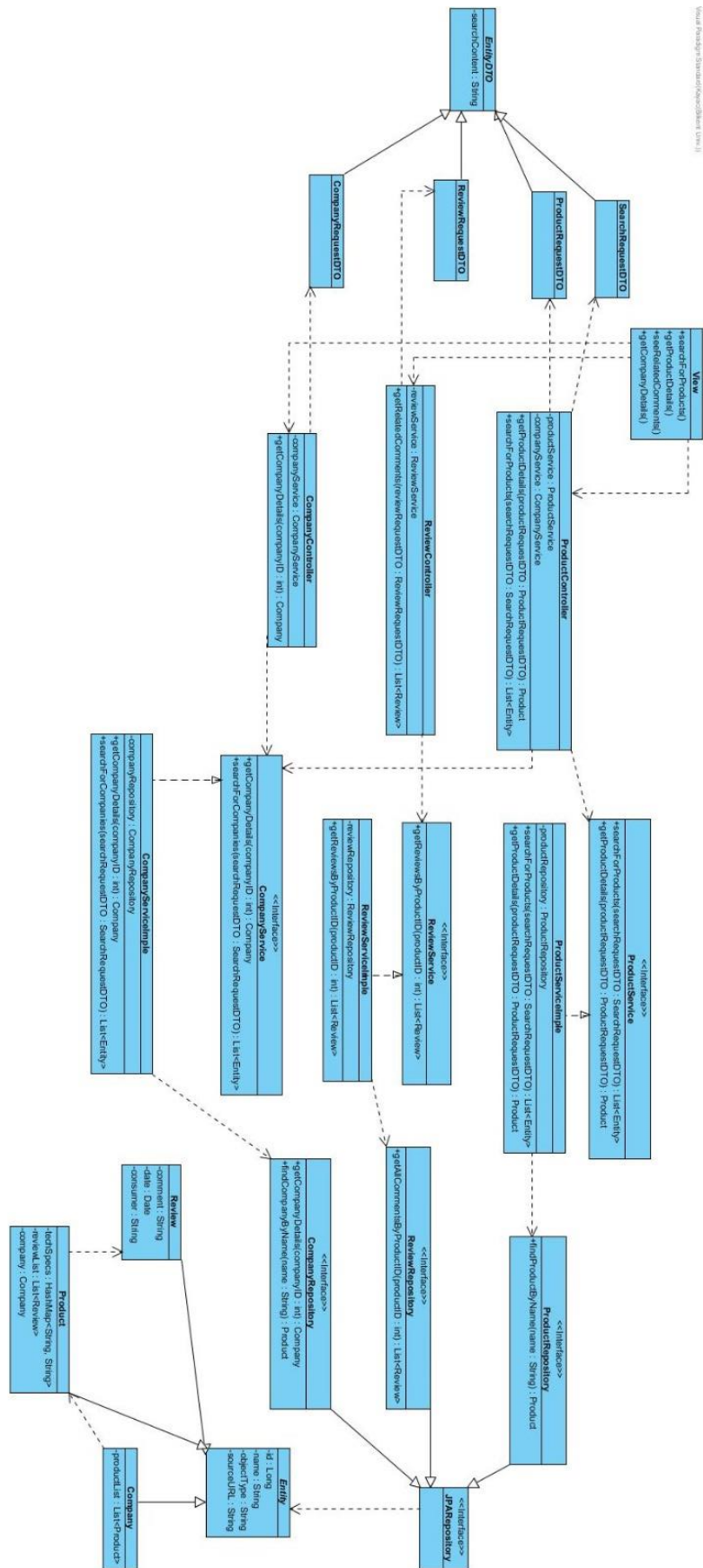


Figure 4 Class Diagram for TechRank

3.5.4. Dynamic Models

3.5.4.1 Sequence Diagrams

3.5.4.1.1. Search Product / Company Sequence Diagram

This sequence diagram describes the situation when the user wants to search a specific product or company. Firstly, user enter the product name / company name into the searching bar and he/she see both companies results and product results on the same page.

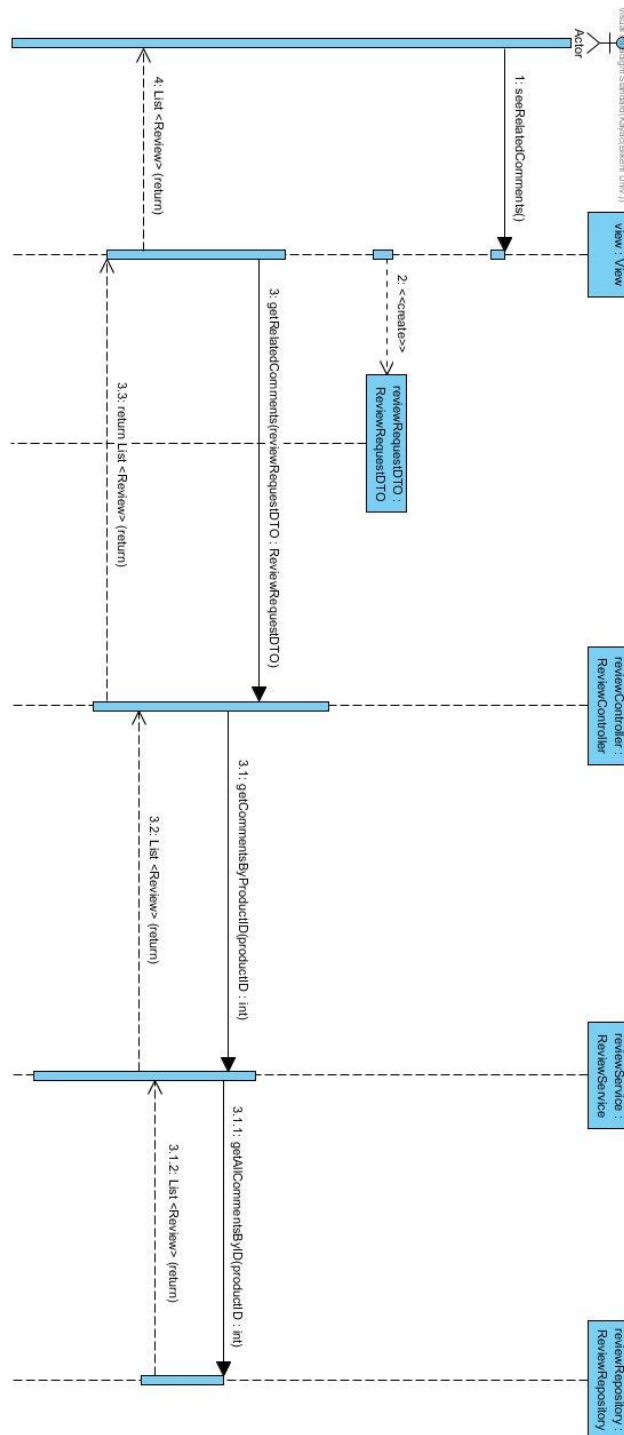


Figure 5 Sequence Diagram for Searching Product / Website

3.5.4.1.2 See All Comments Sequence Diagram

This sequence diagram describes the situation when the user wants to see all comments about the product. Firstly, user enter the product name into the searching bar and he/she see the sorted results. After selected the intended product, user can see technical information of the product by clicking the 'All Comments' button.

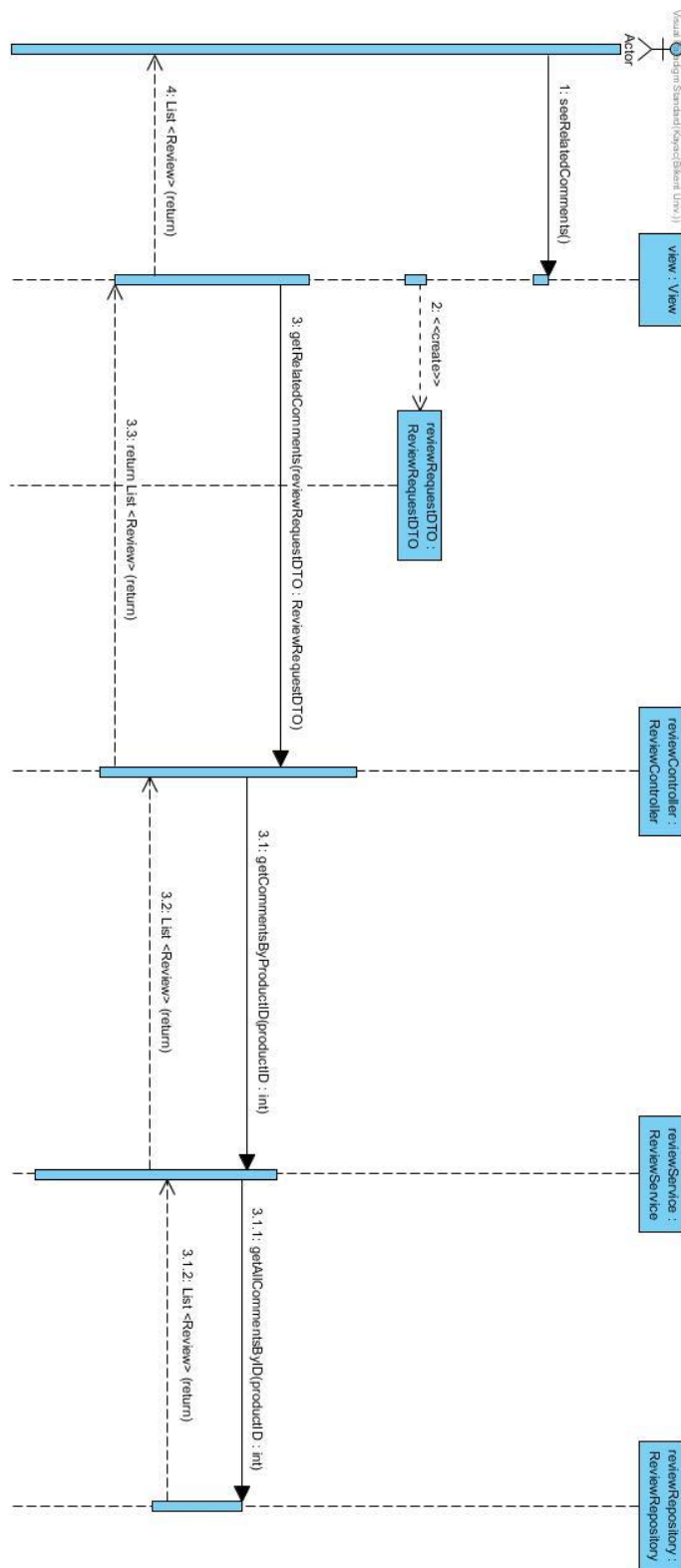


Figure 6 Sequence Diagram for Seeing All Comments

3.5.4.1.3. Get Product Details Sequence Diagram

This sequence diagram describes the event flow when user navigates to a particular product's details page. After a product's detail page is navigated, user will be able to see all the related things of the product such as its images, technical specs, the related criteria, user reviews and the ranking lists.

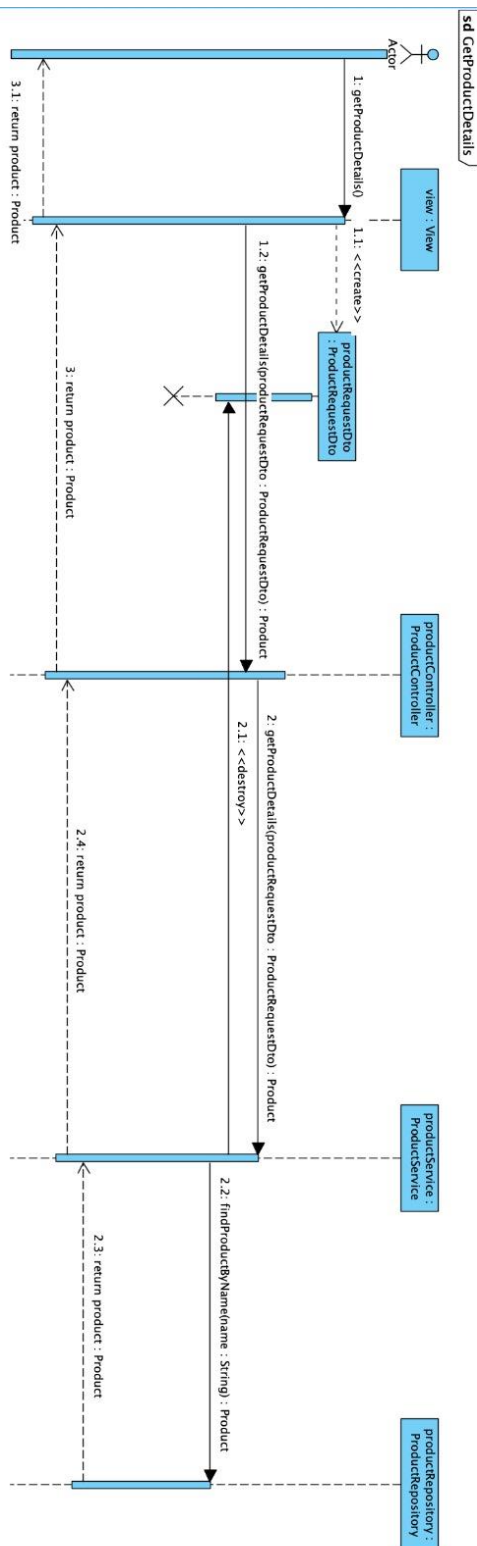


Figure 7 Sequence Diagram for Getting Product Details

3.5.4.1.4. Get Company Details Sequence Diagram

This sequence diagram describes the event flow when user navigates to a particular company's detail page. When a company has been clicked to get its detail, this page shows up. In this page, the categories, the ranking lists are shown to the user.

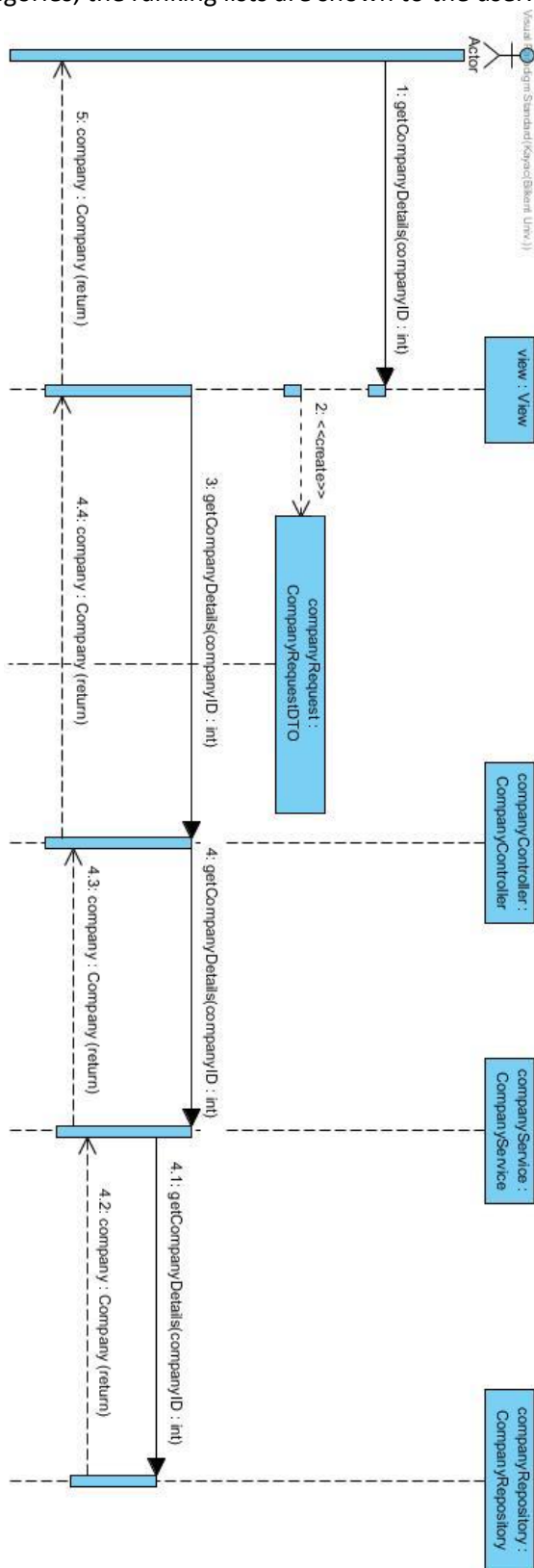


Figure 8 Sequence Diagram for Getting Company Details

3.5.4.2. Activity Diagram

The activity diagram provided below shows the overall flow of the TechRank including 2 types of ways to reach data (browsing and searching), and 2 types of main pages (company and product pages), with their most dominant functionalities. Letters A and B are used in the diagram to make it easier to understand, as otherwise there would have been many arrows indicating application returning back to previous activities.

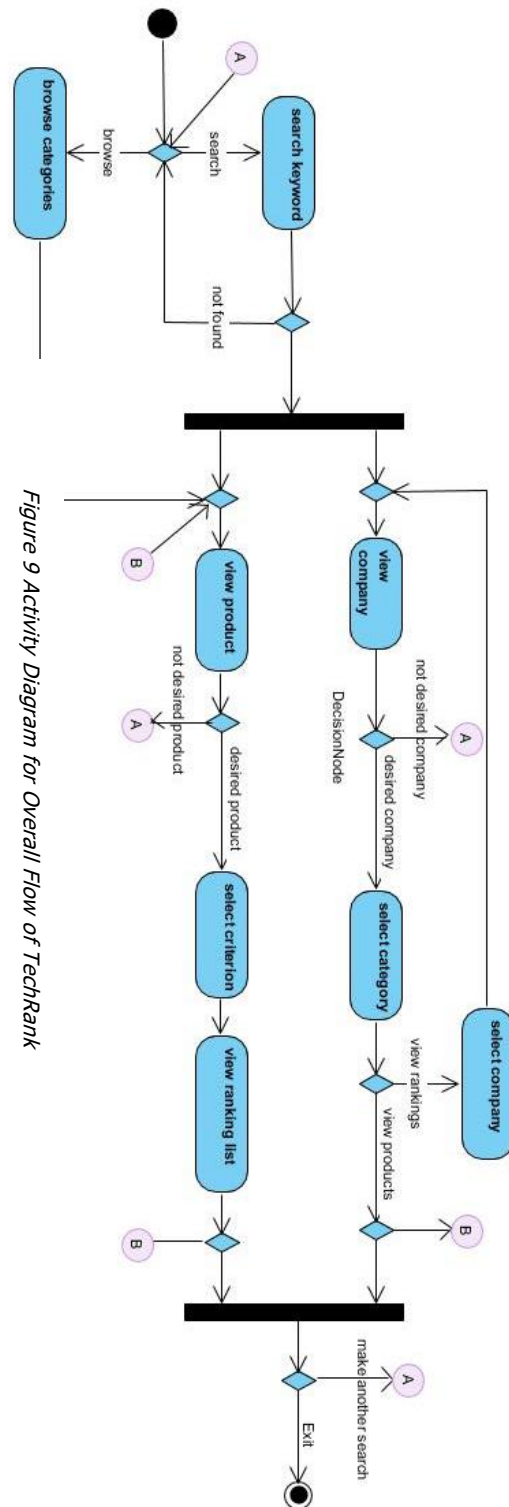


Figure 9 Activity Diagram for Overall Flow of TechRank

3.5.5. User Interface

3.5.5.1. Mockups

3.5.5.1.1. Main Page

This mockup visualizes the entering page of TechRank. It consists of a search bar and navigation bar which are the 2 methods used to reach to company or product. In addition, 3 popular ranking lists will be displayed on the main page, where users can select product from the list and redirected to page of this product.

The mockup shows a browser window titled "TechRank - You Tech, We Rank!". The address bar contains "http://www.techrank.com/". Below the browser is a navigation bar with tabs for "Computer", "Mobile Phones", "Electronics", "White Appliances", "Camera", and "Printer". A search bar with the placeholder "Search Product" and a "Rank!" button is positioned below the navigation bar. The main content area is titled "Popular Lists" and contains three columns of product rankings:

▼ Durability for Mobile Phones	▼ Performance for Ultrabooks	▼ Image Quality for Cameras
1 Product Name	1 Product Name	1 Product Name
2 Product Name	2 Product Name	2 Product Name
3 Product Name	3 Product Name	3 Product Name
4 Product Name	4 Product Name	4 Product Name
5 Product Name	5 Product Name	5 Product Name
6 Product Name	6 Product Name	6 Product Name
7 Product Name	7 Product Name	7 Product Name
8 Product Name	8 Product Name	8 Product Name
9 Product Name	9 Product Name	9 Product Name
10 Product Name	10 Product Name	10 Product Name

Figure 10 Mockup for Main Page

3.5.5.1.2. Search Results Page

This mockup visualizes the way of search results displayed in TechRank. Both company results and product results will be shown in the results page, as understood from the keywords provided by user.

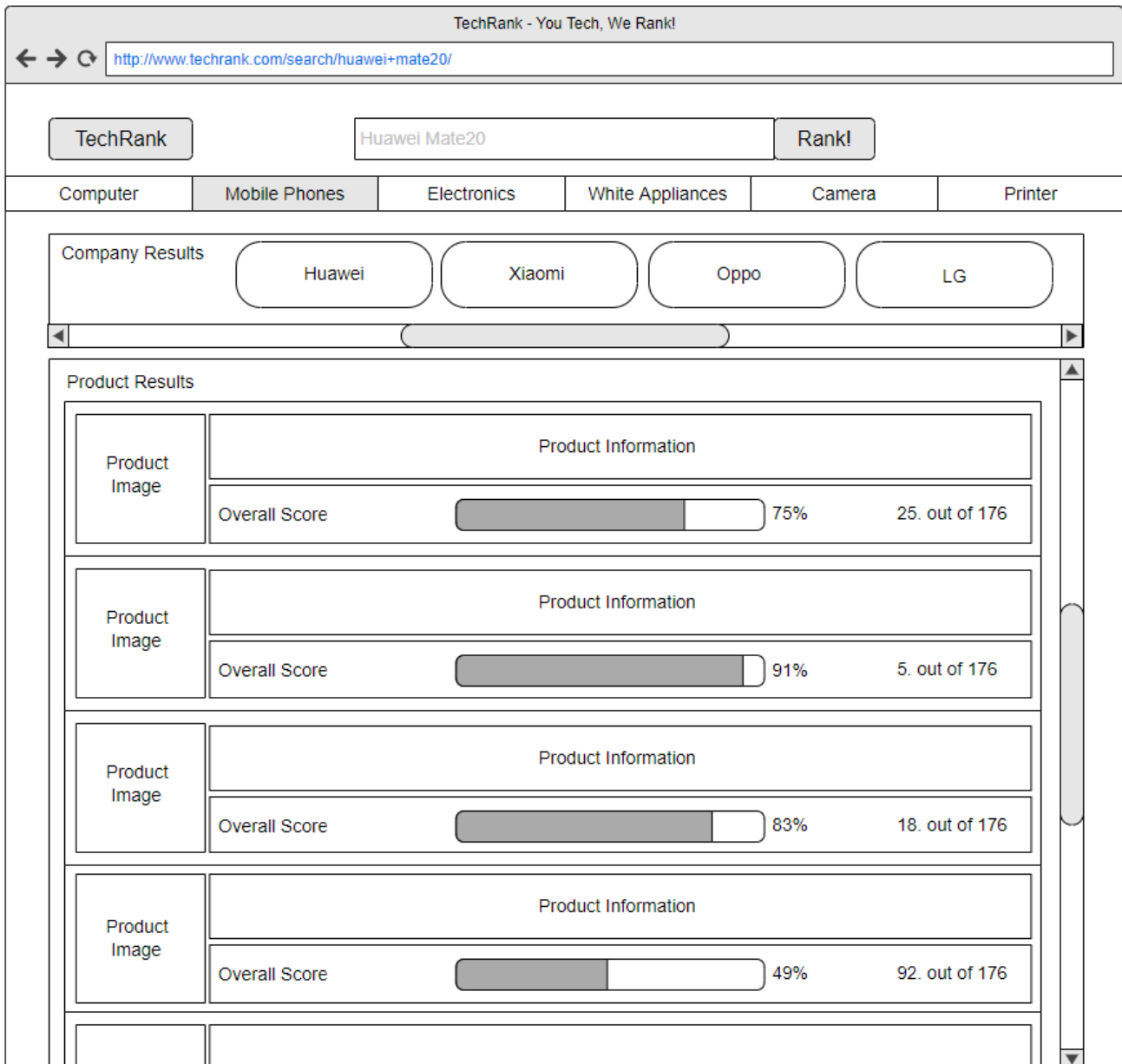


Figure 11 Mockup for Search Results Page

3.5.5.1.3. Product Page

This mockup visualizes the page displayed for each product consisting of the details of the product, images, overall rating, company rating, ratings for each criteria, tabs for viewing all comments and technical specifications.

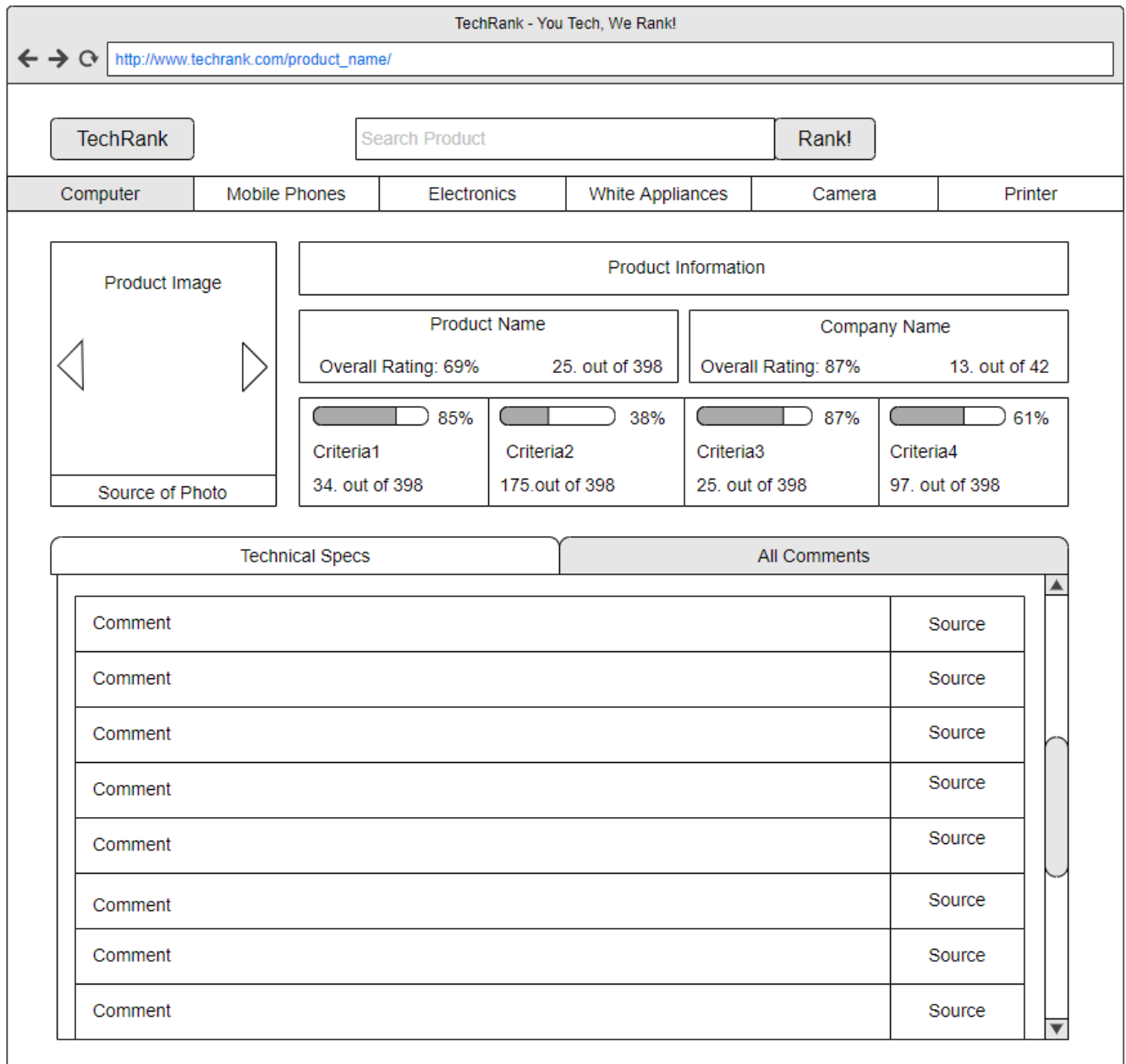


Figure 12 Mockup for Product Page

3.5.5.1.4. Product Criterion Page

This mockup visualizes the situation where user selects one of the criteria from the product page. The criterion page will show the rankings for every product on the same category for selected criterion. Also, user will be able to view all the comments that are used to determine ranking of the device on this criterion.

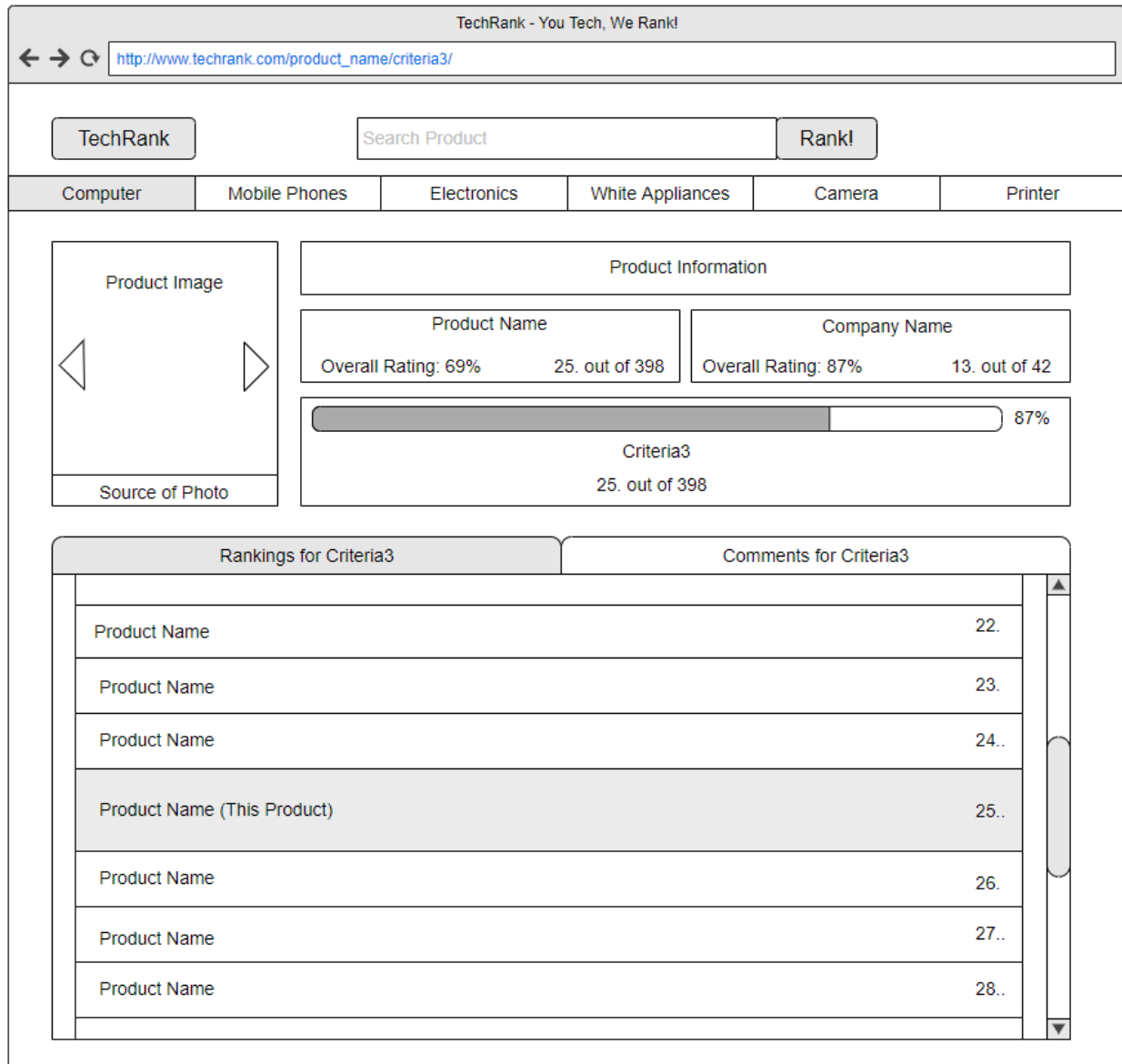


Figure 13 Mockup for Product Criterion Page

3.5.5.1.5. Company Page

This mockup shows the main page for company. It consists of every category that the company has product of, where user can select one of the categories and view the rankings of every company on this category. In addition, user will be able to view full list of products that company has on this category.

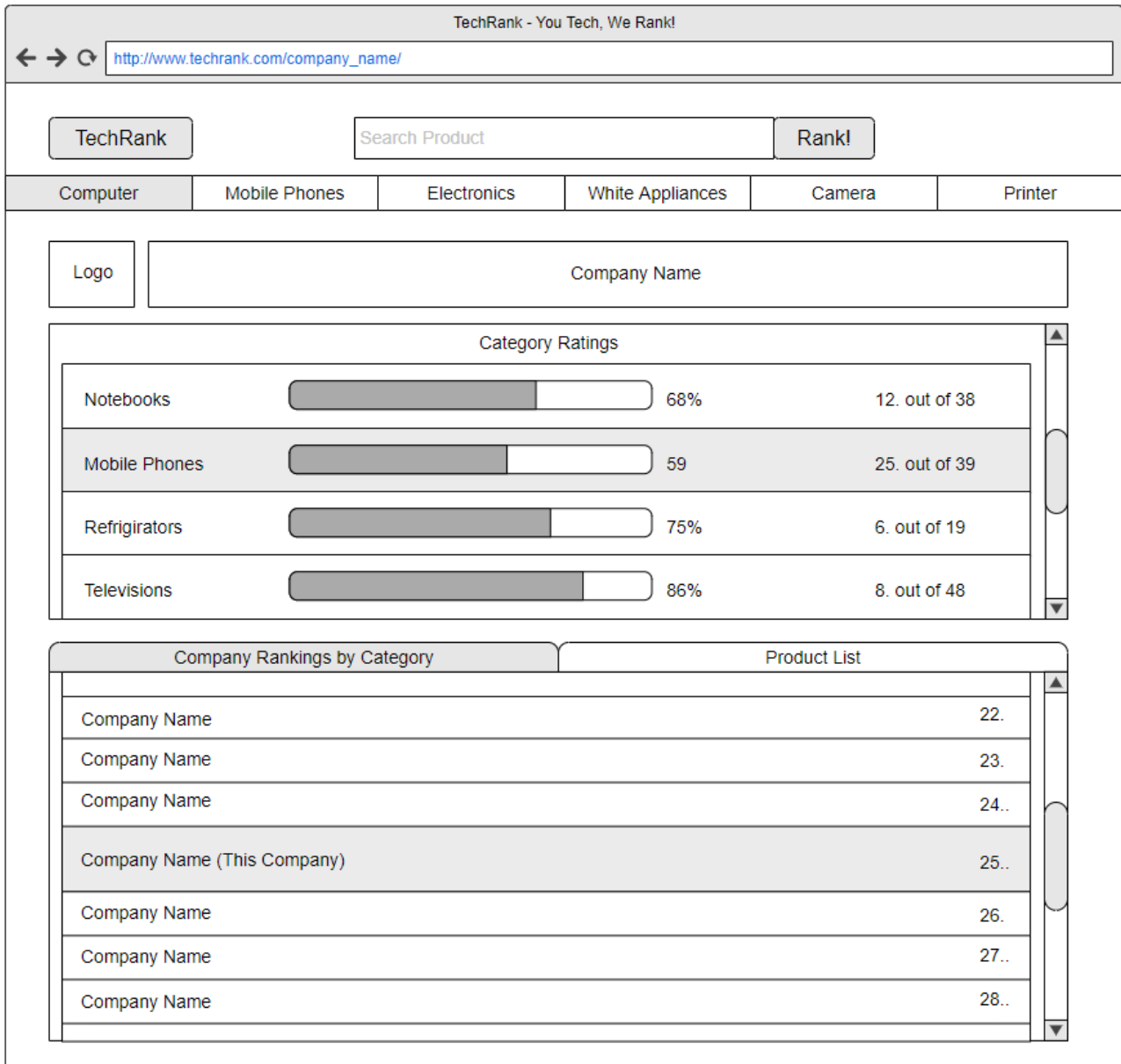


Figure 14 Mockup for Company Page

3.5.5.1.6. Category Page

This mockup visualizes another way of finding company on TechRank. By selecting one of the categories from the navigation bar, user will be able to view rankings of product of this category in each 4 preselected criteria. User will be able to select product from the list and redirected to page of this product.

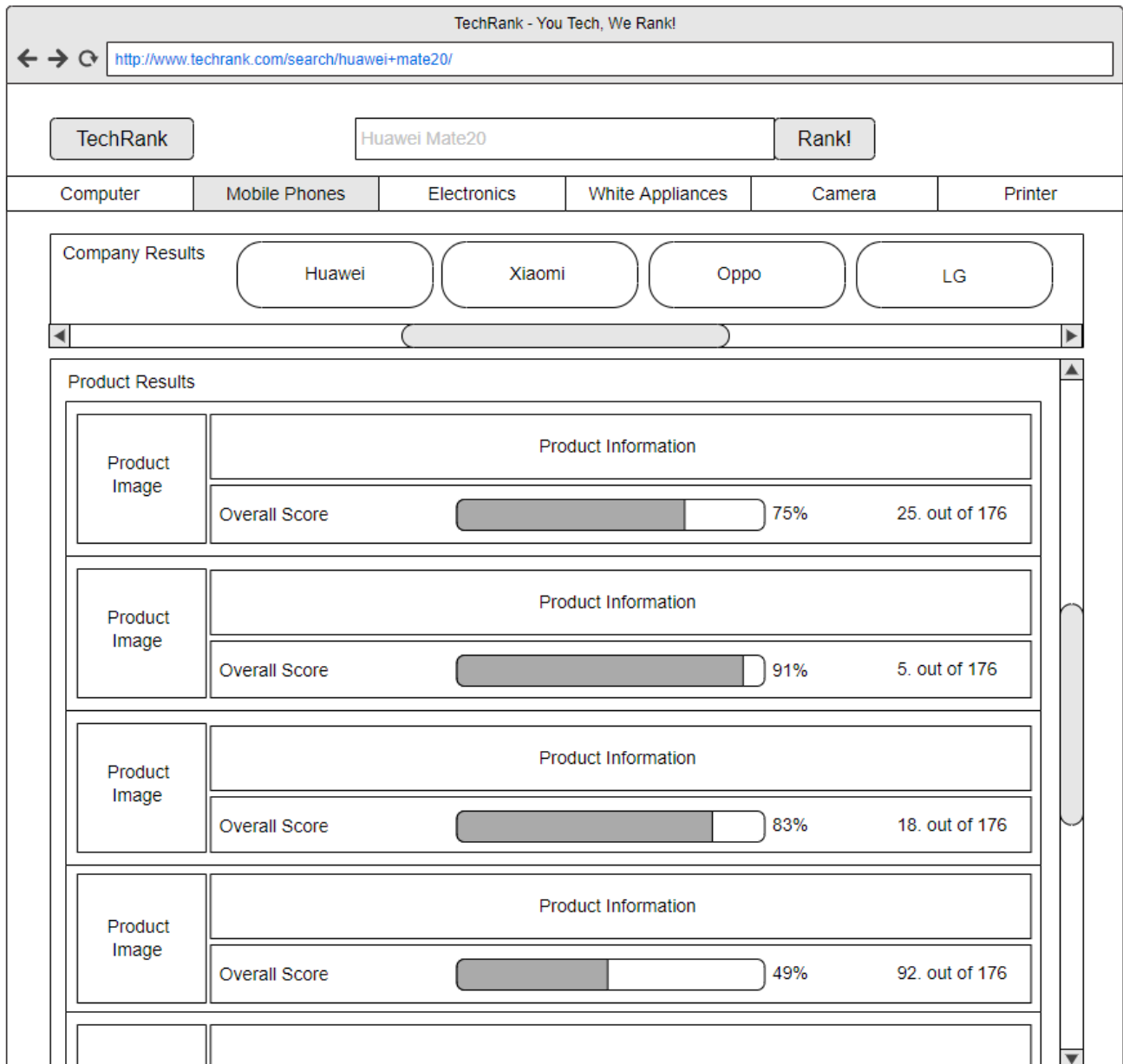


Figure 15 Mockup for Category Page

3.5.5.2 Navigational Path

In order to keep simplicity of the navigational path diagram we did not show some basic relations. In every page user can make search for desired keyword. In addition, category page is also reachable from all of the pages.

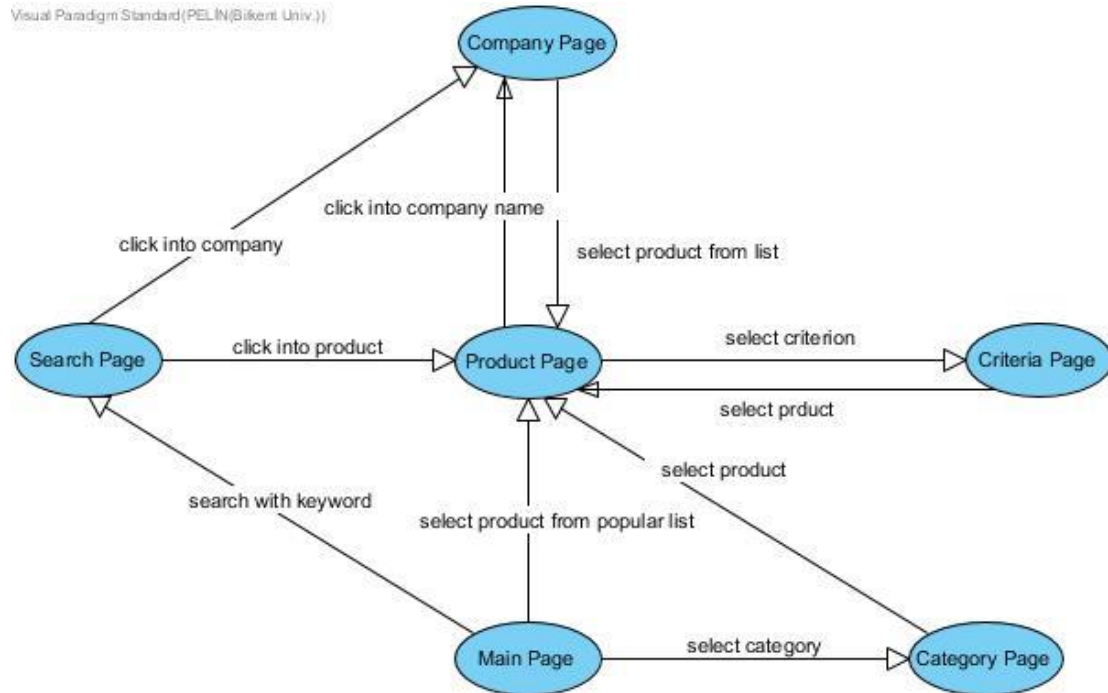


Figure 16 Navigational Path for TechRank

4. Glossary

API: Application Programming Interface

AWS: Amazon Web Service

Euro NCAP: European New Car Assessment Programme

NLP: Natural Language Processing

5. References.

[1] "Car Details," Euro NCAP | The European New Car Assessment Program. [Online]. Available: <https://www.euroncap.com/en/results/hyundai/nexo/33731>. [Accessed: 09-Nov-2018].

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