EasyPick : Food Shopping Recommendation Application Using LLM - Reducing Review Fatigue and Utilizing Price Tracking

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EasyPICK

painless to it, pay less to eat

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Abstract

With the rise of diverse online shopping platforms, users face information asymmetry and uncertainty in preferences due to differing product prices and details across sites. A survey conducted with 24 participants revealed that 91.6% expressed the need for and interest in a service that summarizes product reviews. In this project, we developed *EasyPICK*, a shopping recommendation system specialized in groceries. EasyPICK integrates and summarizes information such as prices, discounts, and reviews from different platforms. Powered by an large language model (LLM), the service offers features like summarized product information, smart search, and *E's Pick* to enhance user convenience. Post-implementation surveys revealed that 91.7% of users were highly satisfied with the service, and over 75% found the *Graph Readability* and *Price Information* features easy to understand.

Keywords: Online shopping platforms, Information asymmetry, preference uncertainty, LLM

1. Introduction

1.1 Overview of project

The rapid expansion of online shopping has created a growing challenge for consumers to efficiently navigate the vast amount of available products. Particularly in food shopping, users often encounter 'review fatigue', struggling to make informed decisions due to excessive and fragmented review data. Furthermore, issues such as price fluctuations and unclear product preferences add layers of complexity to decision-making. To solve these challenges, we developed **EasyPick**, a food shopping recommendation application leveraging large language models (LLMs). This application aims to reduce the burden of analyzing reviews while providing price tracking features, enhancing shopping efficiency for users.

1.2 Background

Modern consumers face two critical issues in online food shopping: information asymmetry and preference uncertainty. Information asymmetry arises from inconsistent product prices and scattered reviews across multiple platforms, making it difficult to extract essential information. Preference uncertainty, on the other hand, comes from unclear or conflicting consumer preferences, leading to decision-making paralysis. These issues often result in 'review fatigue', where users are overwhelmed by the number of reviews they must sift through to make an informed choice.

The significance of these challenges is evident in a pre-survey conducted among 24 participants. Key findings revealed that 50% prioritize ratings (stars), 41.7% value price, and 33.3% consider review content as the most important factors when shopping for food. However, 87.5% of respondents indicated difficulties in selecting products, largely due to the overwhelming amount of review data. Additionally, while only 25% of participants use price comparison platforms like Danawa, there is a strong interest in features like review summarization (91.7%) and recommendation systems based on reviews (87.5%).

To address these pain points, EasyPick combines the power of large language models (LLMs) with user-centric features such as review summarization, price fluctuation tracking, and smart search functionalities. These tools aim to reduce cognitive load while ensuring accessibility, enabling users to make well-informed and economical decisions. By streamlining the shopping process, EasyPick enhances not only convenience but also the overall user experience.

2. System Overview

2.1 System Architecture

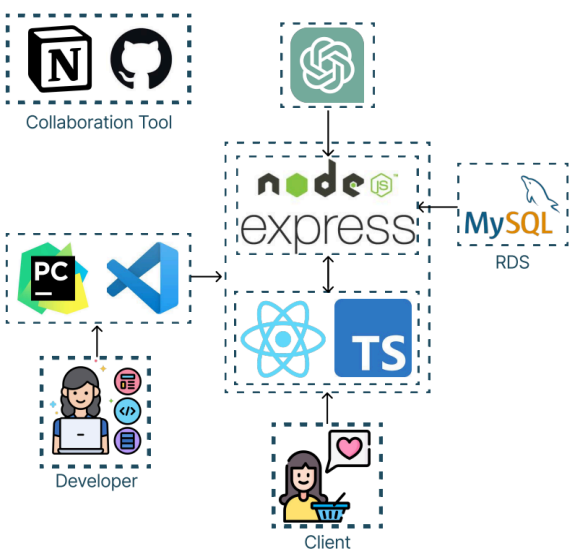


Figure 1. Overall System Architecture

The system architecture is illustrated in the figure above. We have selected React as the frontend engine. React is an open-source frontend library developed by Meta, designed for rendering interactive UI components. This choice supports the project's goal of delivering information through various user interactions and ensures an intuitive and responsive interface. TypeScript has been incorporated to improve the maintainability of the project. By utilizing static typing, TypeScript facilitates better code organization and reduces runtime errors.

On the backend side, Node.js and Express were chosen. Node.js is a JavaScript runtime that supports non-blocking, event-driven architecture, which is suitable for scalable network applications. Express, a minimalist web framework for Node.js, provides a set of features for building web applications and APIs. This setup ensures seamless integration between the

frontend and backend and enables efficient handling of API requests. We have also integrated LangChain, a library that assists in creating user-friendly prompts to streamline communication between the user and the system.

For the database, MySQL was chosen for its relational database structure, which organizes the project's data across eight tables. This choice supports efficient data retrieval and storage. Collaboration among team members is managed using Notion for task management and documentation, and GitHub for version control.

2.2 Target Users

Our Target is busy young professionals who need to manage their spending efficiently due to limited income. As an example, we present a user persona named Ji-young Na.

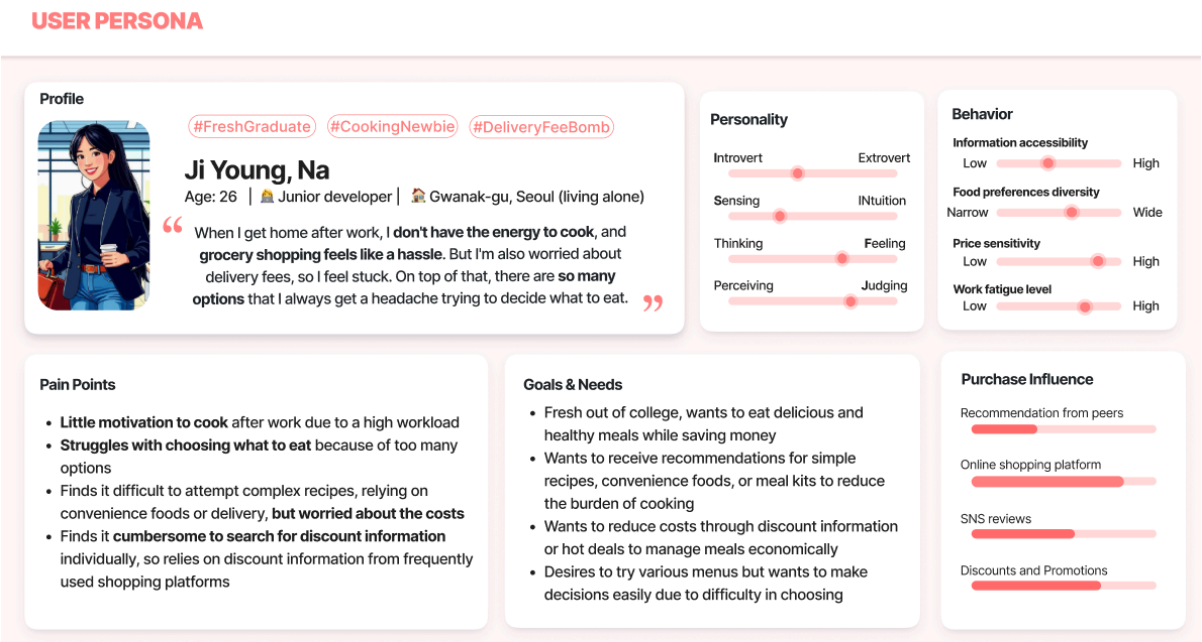


Figure 2. User persona of our project

Ji-young Na, as a young professional, faces several challenges in her daily meal routines:

- **Low Motivation to Cook**: After a demanding workday, she often lacks the energy to prepare meals.
- **Decision Fatigue**: The abundance of food choices makes deciding what to eat overwhelming.
- **Difficulty with Complex Recipes**: She tends to avoid complicated cooking processes, often choosing convenience foods or delivery services, which can be expensive.
- **Inefficient Discount Search**: Searching for discounts individually is time-consuming, leading her to rely on promotions from familiar shopping platforms.

To address these pain points, the following goals and needs are highlighted:

- **Healthy and Cost-Effective Meals**: As recent graduates, she aims to enjoy nutritious and affordable food.
- **Simplified Cooking Options**: She prefers recommendations for simple recipes, convenient meal kits, or ready-to-eat options to reduce the effort of meal preparation.
- **Economic Meal Management**: Access to discount information or hot deals is essential for managing meal costs effectively.
- **Easy Menu Selection**: While she wishes to explore diverse menus, she seeks a straightforward decision-making process to avoid being overwhelmed.

Based on the persona above, we propose the following problem scenarios. Details are explained in the user scenario below.

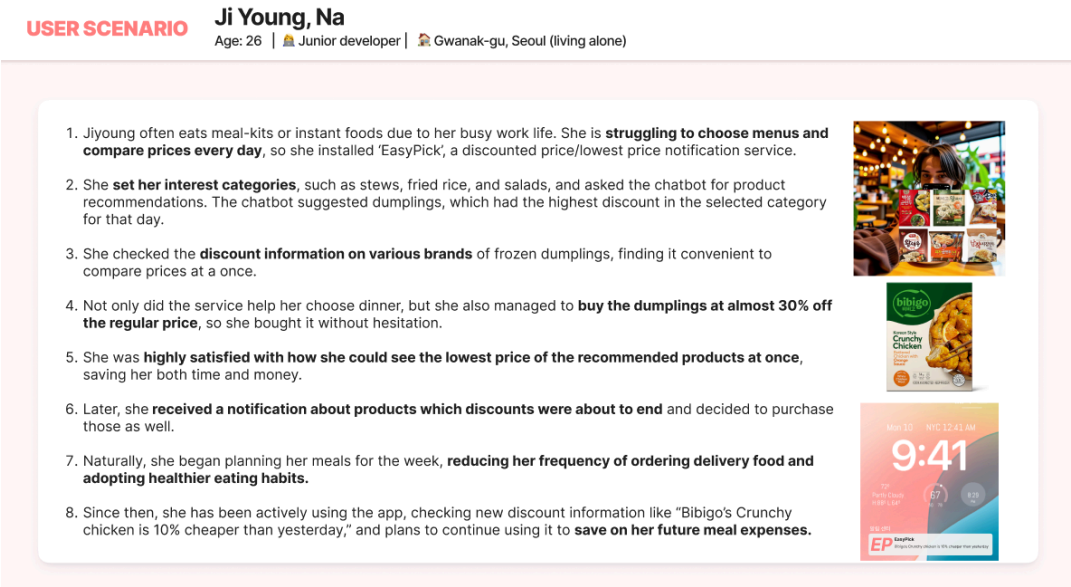


Figure 3. User scenario of our project

2.3 Key Functionalities

In our system, we have mainly five key functionalities as below.

- **Product Information**: The LLM-based product summary page provides the pros and cons of that item. User reviews on five key features — delivery, taste, packaging, price, and convenience — are summarized based on crawled review data. As a result, users can quickly and conveniently assess the product's evaluation without having to read through numerous reviews. Also, it provides a price trend graph. A graph displays the product's price trends over the past three months. This allows users to make informed purchasing decisions by reviewing recent price fluctuations.
- **Main Screen**: Popular categories are displayed in six sections, allowing users to quickly access products within these categories. Also, "E's Pick" suggests recommended products to assist consumers in their selection process.

- **Smart Search**: which is the main functionality. A chatbot enables users to search for various products in a conversational format. As a result, Users can access all the information provided in the product information tab, including LLM-generated summaries of product reviews. These summaries are presented in sentence form for a more user-friendly experience. If users prefer to view the actual reviews instead, they can click the "View Actual Reviews" option.
- **Today's Deal**: This feature lists products with the highest discounts of the day in descending order, regardless of category. Consumers who prioritize price when purchasing food can gain significant value from this tab.
- **WishList**: Users can quickly gather products of interest by clicking the heart icon. When they are ready to purchase or when a desired discount is achieved, they can proceed to buy immediately via the "Buy Now" button.

3. Dataset Crawling & Database Construction

3.1 Used Dataset

We have crawled the product data from several e-commerce websites such as Coupang, G-Market, Auction, etc. The product data includes the product's brand, name, image, current price and its price history, review score, major category, minor category, and the website link where the user can purchase the product at the cheapest price.

3.2 Database

Based on the dataset, We have constructed the database using 8 tables in total. The database structure is as follows.

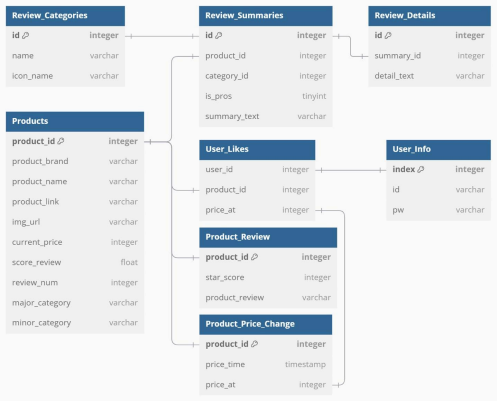


Figure 4. Entity Relationship diagram

- 'Products' table is the table which contains the data of the product. It includes the product's brand, name, price, category information, image and the website link where the user can buy the product at the cheapest price. The product search function and the smart search function checks the information from this table, then shows it to the user. It also includes review related information such as review score and the number of reviews.
- 'Review Summaries' table contains each product's review that is summarized by GPT-4o model. We have saved the summaries in the table instead of summarizing every time when the user searches the product. By doing so, it saves time and enhances the user experience of the search engine.

- ‘Review Details’ table includes the total review which isn’t summarized. While summarized reviews are easy to look at, there are some cases where users want to check the actual reviews. Providing actual reviews will assist users leading to smart decisions.
- ‘Product Price Change’ table contains the history of the lowest price of the product for the last 3 months. This data will be used in the price change graph, which we will introduce later on, to show results that are easy to understand using a visual way instead of showing simple numbers.
- ‘User Likes’ table contains the product itself and the price of the product when it’s added to the wishlist. This is used to show the difference between the current price and the price when the user initially added.

4. Methodology

4. 1 Review Summarization

4.1.1 Review Data Morphemes analysis

In order to enhance the understanding of customer reviews and provide structured insights, a morpheme analysis was performed on the review data for various products. The analysis focused on identifying the most relevant terms and removing irrelevant ones using a predefined stopword list: ['있다', '이다', '때', '더', '좀', '요', '개', '또']. All reviews across different products were aggregated into a single dataset for analysis, and a morphological analysis was conducted to extract meaningful terms. Frequencies of the extracted terms were calculated to identify the most significant words, which were then analyzed for contextual relevance.

The top-ranked terms after filtering and categorization were 맛 (Taste) with 13,495 occurrences, 배송 (Delivery) with 10,690 occurrences, 포장 (Packaging) with 2,961 occurrences, 가격 (Price) with 7,985 occurrences, and 간편하다 (Convenience) with 2,485 occurrences. The terms ranked between these top occurrences were also related to these five categories, reinforcing their relevance as primary classification criteria.

Rank	Term	Count
2	맛	13495
3	배송	10690
4	가격	7985
16	포장	2961
22	간편하다	2485

Table 1. Top ranked terms for review data

Figure 5. Word cloud of review data

4.1.2 Review Data Summarization and Classification

Based on the analysis results, it was decided to structure customer review summaries using these five categories: taste, delivery, packaging, price, and convenience. Summarization was conducted using the LLM GPT-4o-mini model. The process began with an instruction to the model: "You are tasked with reading all the reviews and summarizing what aspects of the product people feel positively and negatively about. Please summarize the reviews into the categories of taste, delivery, price, packaging, and convenience, prioritizing the most commonly

mentioned pros and cons at the top." To enhance the model's performance, a two-shot learning approach was employed by providing two examples as part of the input prompt. The model's response included summaries aligned with the five categories for each product ID, detailing pros and cons and associating them with specific reviews. For further details about the exact prompt used, refer to Appendix A. The generated results were subsequently stored in the Product Review Table for further analysis and utilization.

ir	pro(int	ir	ti	summary_text varchar(200)
46	3054694	1	1	빠르고 안전하게 배송되며, 포장 상태도 좋음.
47	3054694	2	1	맛있고 다양한 조리 방법으로 즐길 수 있음. 약간 매콤한
48	3054694	3	1	포장 상태가 좋고, 제품이 안전하게 도착함.
49	3054694	4	1	가성비가 좋고, 저렴하게 구매 가능함.
50	3054694	5	1	에어프라이어나 오븐으로 간편하게 조리 가능.
51	3054694	4	0	가격이 많이 올랐다는 점에서 아쉬움을 표현함.
52	3054694	3	0	포장과 관련하여 일부 불만이 있음.
53	3054694	6	0	제품 설명이 오해를 불러일으킬 수 있음.
54	3054775	2	1	대체로 맛있고 간편하게 먹을 수 있음. 특히 아이들 간식

Table 2. 'review_summaries' table

ir	detail_text varchar(200)
46	배송빠르고 제품 좋습니다
46	빠른배송 감사합니다
46	안전하게 빠르게 잘 받았습니다
47	맛있어요 다음에 또 시켜 먹을께요
47	온 가족이 잘 먹고 있습니다
47	생각보다 맵지 않고 오븐에 구워도 부드럽고 촉촉하고
47	버팔로 윙 살짝 매운맛이 있어서 맛있고 감칠맛 나네요
48	포장상태도 좋습니다
48	포장상태도 좋습니다 또 사러 올게요
49	최저가이네요 감사히 잘 먹습니다

Table 3. 'review_details' table

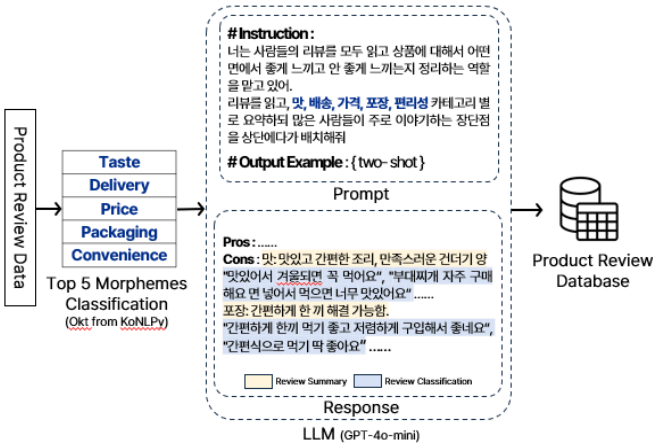


Figure 6. Overall architecture of review summarization

4.2 Product Recommendation

We utilized the Retrieval Augmented Generation (RAG) system to provide personalized product recommendations to users. RAG is an effective approach that combines retrieval and generation methods. In the retrieval phase, it searches for relevant documents based on the user's query, and in the generation phase, it generates answers using a language model based on the found documents. The structure of the RAG system, utilizing Langchain, can be seen in the system architecture below.

The system uses MemoryVectorStore to store and search product information. Each product's information is vectorized using OpenAI's text embedding model (text-embedding-3-small) and

stored. The vectorized documents include detailed information about the product such as product name, brand, price, reviews, pros/cons extracted from reviews and review summary. The retriever searches these documents to find the relevant information. During this process, the vectorized data captures the meaning of the documents, enabling efficient retrieval of documents related to the user's query.

When a user submits a question through the POST /natural-query API, the system processes this question through several stages. First, the user's question is vectorized by the Retriever and compared with the data stored in the VectorStore. The Retriever searches for documents related to the query and returns the top 3 most relevant products. The information from these products is then used as input for the subsequent answer generation process.

The retrieved documents are then transformed into a format suitable for the language model using PromptTemplate.fromTemplate() from Langchain. This prompt template conveys the user's question along with the retrieved product information to the language model, providing the necessary context for the model to generate a natural answer. The prompt includes specific numerical information such as price, discount rate, and rating, enabling the model to generate answers that are easily understandable and user-friendly.

The prompt generated above is processed by LLM (GPT-4o-mini). The model generates a natural answer based on the user's question and the retrieved documents. This answer provides a recommendation based on the relevant product information and can include pros and cons from reviews, offering a persuasive and clear recommendation. The generated answer is presented in a manner that is easy for the user to understand.

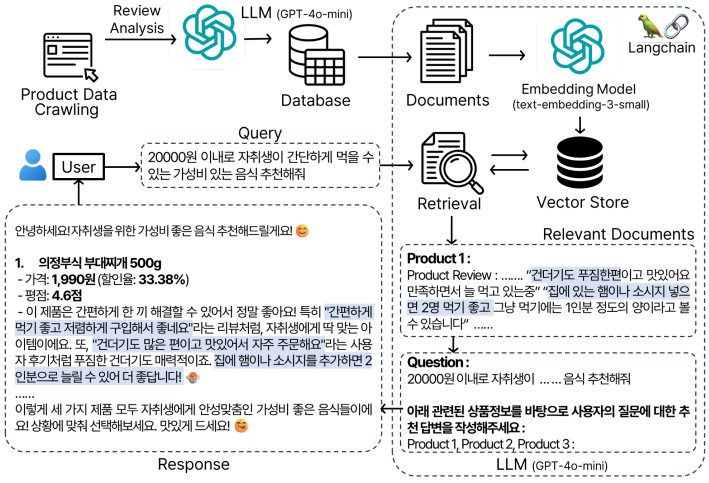


Figure 7. Overall architecture of product recommendation

4.3 Price Change Tracking

4.3.1 Wishlist Price Change Display

When users add items to their wishlist, the price at the time of addition is continuously stored in the database. This feature provides users with valuable insights on the wishlist page by visually

comparing the price at the time of addition with the current price. Price increases are highlighted in red, while price decreases are displayed in blue, allowing users to quickly identify price changes at a glance. This functionality helps users make informed purchasing decisions by enabling them to track price fluctuations in real-time, ultimately enhancing their shopping experience and helping them seize the best opportunities to buy.

Figure 8. Overall architecture of Wishlist price change

4.3.2 Price Fluctuation Graph

Every week, the lowest price among the prices crawled from all e-commerce websites is stored in the product_price_change table along with the timestamp. This data is directly connected to the front-end and displayed as a price change graph.

product_id int	price_time timestamp	price_at int
Filter	Filter	Filter
67389833	2024-09-24 00:00:00	40310
67389833	2024-10-01 00:00:00	40310
67389833	2024-10-08 00:00:00	30030
67389833	2024-10-15 00:00:00	30030
67389833	2024-10-22 00:00:00	40310

Table 4. ‘product_price_change’ table

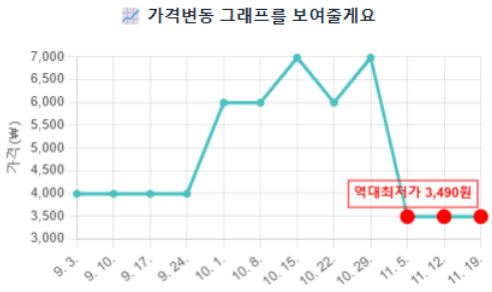


Figure 9. Price fluctuation graph

5. App Interface

5.1 Lo-fi Prototype

Our storyboard is depicted below.

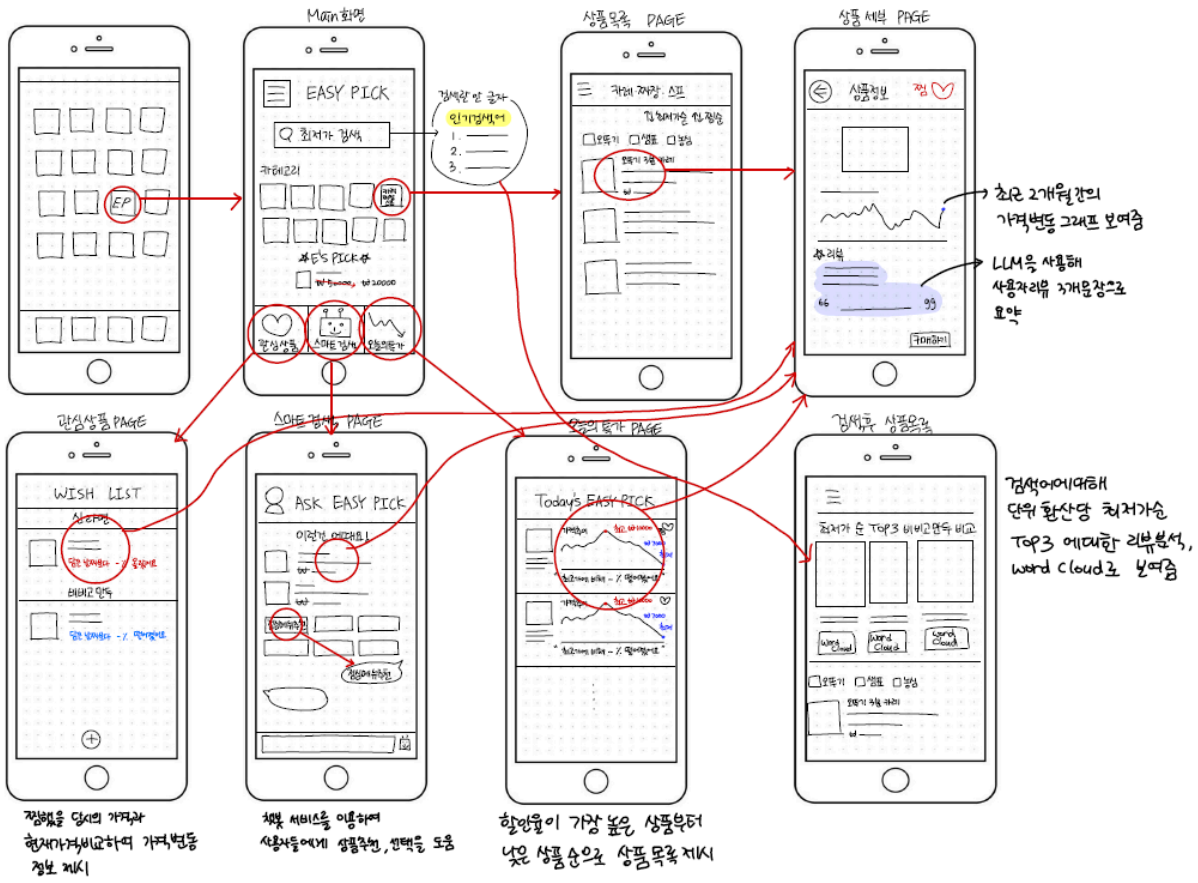


Figure 10. Lo-fi prototype

5.2 Mid-fi Prototype

Mid-fi prototyping was created using Figma, and you can refer to the link below for details.

1. Prototype : https://www.figma.com/proto/lWZ6jVJO1LsTpU9ws6lVWH/%EC%9D%B8%EC%BB%B4%EC%83%81_prototype_GROUP1?node-id=495-2&p=f&t=I2D6vAEhUAtVMiKx-1&scaling=min-zoom&content-scaling=fixed&page-id=489%3A2&starting-point-node-id=495%3A2&show-proto-sidebar=1
2. Detail of Prototype https://www.figma.com/design/lWZ6jVJO1LsTpU9ws6lVWH/%EC%9D%B8%EC%BB%B4%EC%83%81_prototype_GROUP1?node-id=489-2&p=f&t=0UcEkscOR3sKN2GF-0

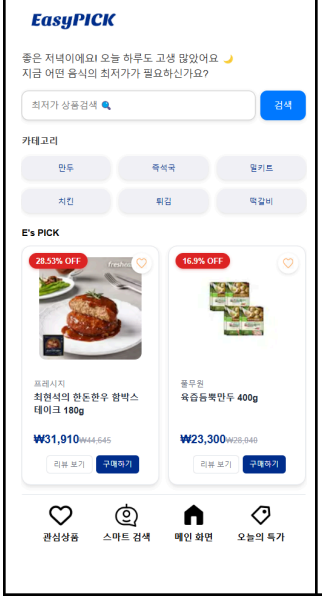
5.3 Final Version of Our app Interface

Based on the results of the pre-survey (N=24), 58.3% of participants reported experiencing review fatigue, 91.7% expressed interest in using a review summarization service, and 87.5% showed interest in using a review-based recommendation service. Initially, in the Lo-fi and Mid-fi versions, we focused on simply summarizing product reviews into three lines.

However, in the final version, we categorized product reviews into five categories (taste, delivery, packaging, convenience, price) and used LLM to organize them into pros and cons and summarize it, which are then displayed to users. Also, we incorporated the processed review data into the recommendation service to provide more refined and personalized recommendations. By clarifying the purpose and considering user experience, we enhanced the interface of our app accordingly.

5.3.1 Main Page and related functions

On the Main Page, users can explore products by category by clicking on the desired category buttons. Also, the app displays randomly selected products with high discounts and ratings of 4 stars or above from the ‘E’s Pick’ section. To enhance user experience, the first screen of our app was designed with intuitive navigation, featuring buttons at the bottom for 'Wishlist,' 'Smart Search,' 'Main Page,' and 'Today's Deal,' allowing users to easily access their desired pages.

<table>
<tr><th rowspan="2">Main Page</th><th colspan="3">Main Page → Category Button Click</th></tr>
<tr><th>By Ratings</th><th>Mostly Reviewed</th><th>Lowest Price</th></tr>
<tr>
<td> 
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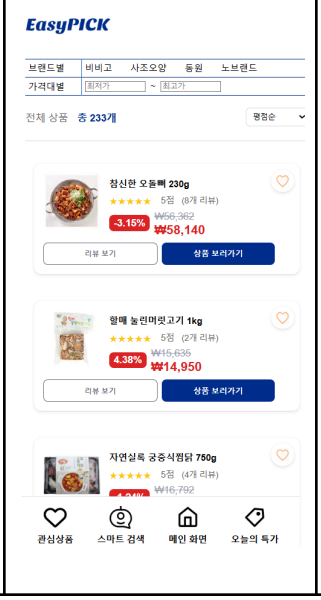
<td> 
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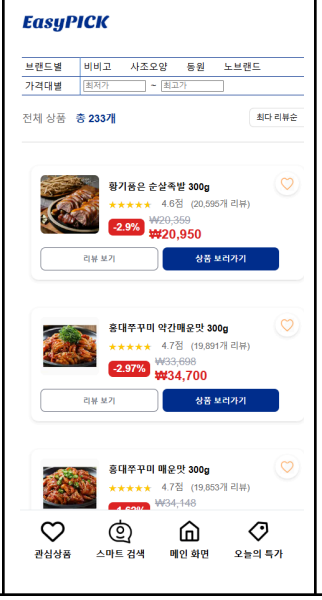
<td> 
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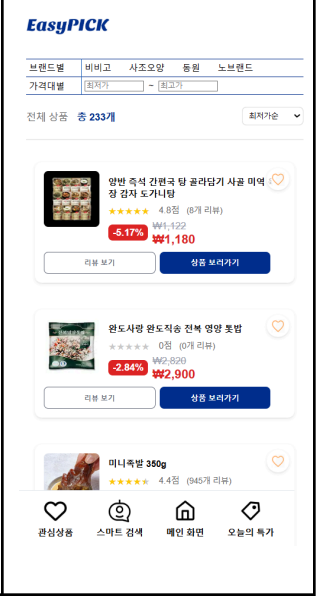
<td> 
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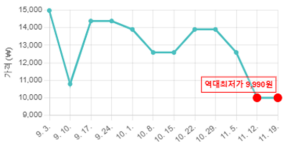
</tr>
</table>

5.3.2 Product Information

Along with the 'E's PICK' section displayed on the main page, product information across all pages is presented through a user interface containing the following details.

Product information includes the price, star rating, number of reviews, average price, discounted price, and discount rate. In the price change graph, weekly price fluctuations over the past two months are shown, with a red dot marking the date of the historical lowest price on the graph. The review section displays reviews categorized into five key categories, and users can click on the 'Pros' or 'Cons' button to first view a summary. Clicking on a specific summary reveals the actual reviews used to generate that summary.

<table>
<tr><td rowspan="2">Price, rating, discount rate</td><td colspan="3">Review Summarization & Details</td></tr>
<tr><td>Pros</td><td>Cons</td><td>Actual Review</td></tr>
<tr><td rowspan="2"> 

Price Change Graph
 
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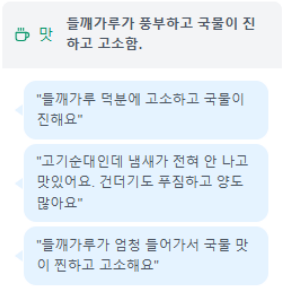
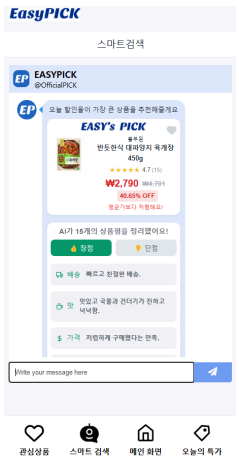
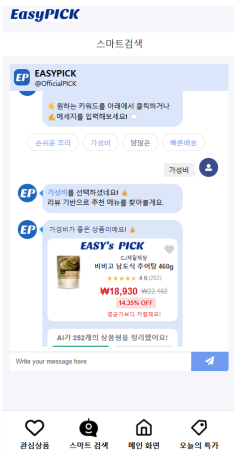
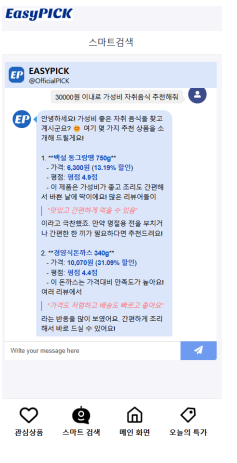
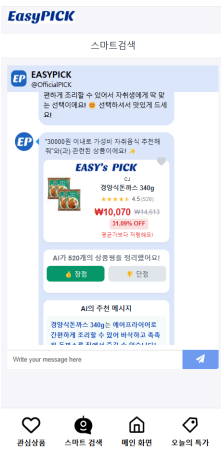
</td><td> 
</td></tr>
</table>

5.3.3 Smart Search Chatbot

For a more detailed overview of the smart search chatbot results, please refer to Appendix A.

<table>
<tr><td rowspan="2">Main Page</td><td colspan="3">Main Page → Search</td></tr>
<tr><td>Click Keyword</td><td colspan="2">User Query</td></tr>
<tr><td> 
</td><td> 
</td><td colspan="2"> 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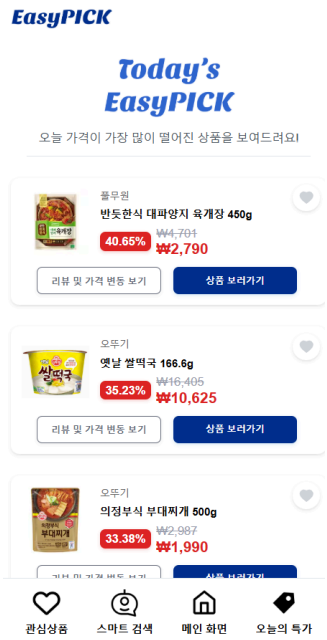
5.3.4 Today's Deal Page & WishList

<table>
<tr><th colspan="2">Today's Deal Page</th><th>WishList Page</th></tr>
<tr><th>Main Page</th><th>Click Review, Price Button</th><th>Price Got Lower</th></tr>
<tr>
<td> 
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<td>Price Got Higher</td>
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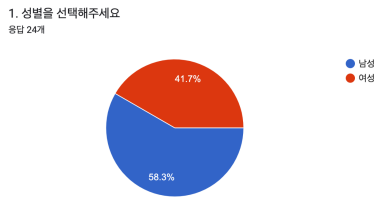
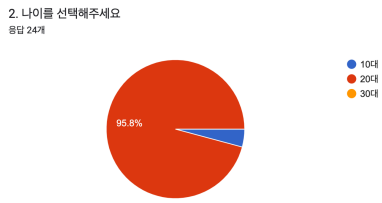
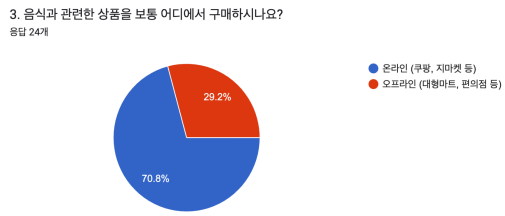
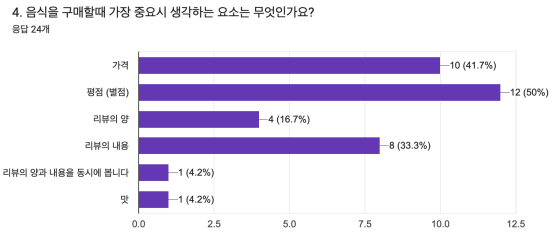
6. User Study

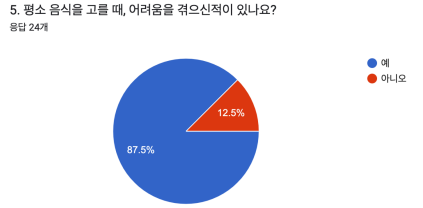
6.1 Pre-Survey

<table>
<tr><th colspan="2">Demographics</th></tr>
<tr><td> 
</td><td>[Gender]

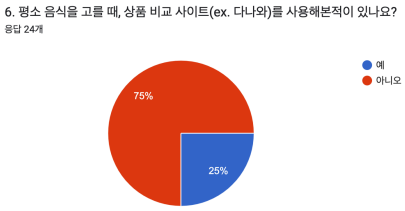
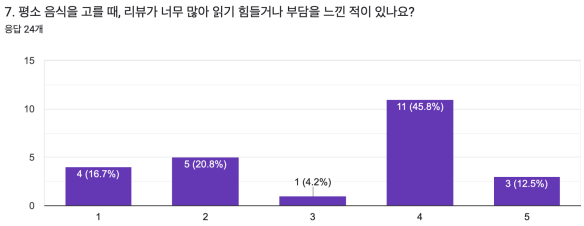
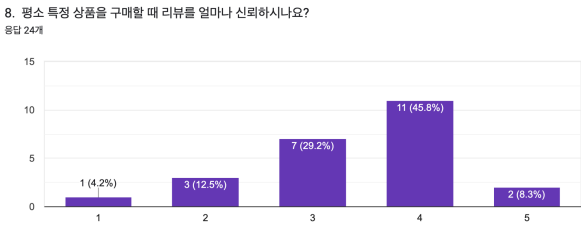
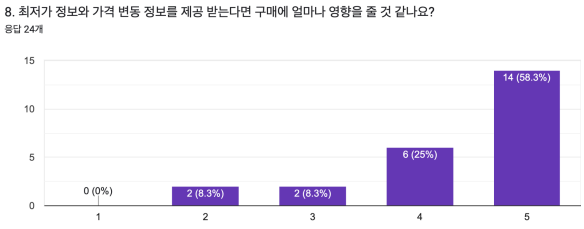
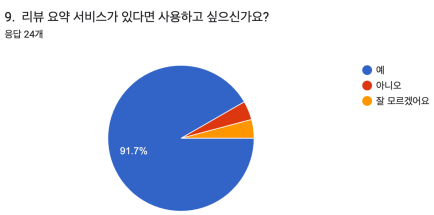
58.3% of respondents were male, and 41.7% were female.</td></tr>
<tr><td> 
</td><td>[Age]

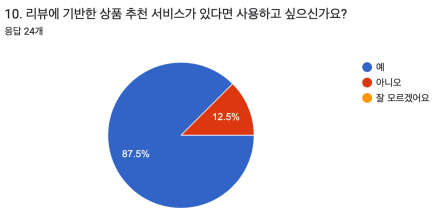
The majority of participants (95.8%) were in their 20s, with a smaller proportion in their 30s and teens.</td></tr>
<tr><th colspan="2">Shopping Habits and Preferences</th></tr>
<tr><td> 
</td><td>[Shopping Platforms]

70.8% primarily shop for groceries online (e.g., Coupang, G-Market), while 29.2% prefer offline stores (e.g., supermarkets, convenience stores).</td></tr>
<tr><td> 
</td><td>[Important Factors for Grocery Purchases]

Top priorities were ratings/reviews (50%) and price (41.7%).
Other factors included the quantity of reviews (16.7%), detailed review content (33.3%), and taste (4.2%).</td></tr>
<tr><th colspan="2">Challenges in Grocery Shopping</th></tr>
<tr><td> 
</td><td>[Difficulty in Choosing Food Products]

87.5% of respondents have faced challenges in selecting food items, citing the overwhelming volume of reviews as a key issue.</td></tr>
</table>

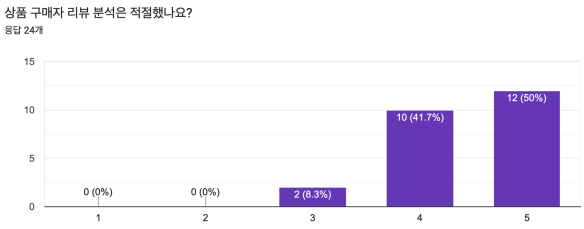
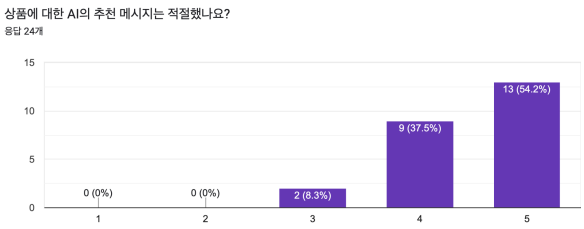
	[Use of Comparison Sites] Only 25% reported using comparison platforms (e.g., Danawa) for grocery shopping.
Feedback on Reviews	
	[Review Overload] 45.8% of users feel burdened by the large number of reviews to read, with 12.5% rating the difficulty as very high.
	[Trust in Reviews] 45.8% moderately trust reviews when purchasing specific products, while 29.2% indicated a slightly lower level of trust.
Interest in Proposed Features	
	[Impact of Price Alerts and Trends] 58.3% strongly believe that receiving information on price drops and trends would significantly influence their purchasing decisions.
	[Demand for Review Summarization Service] 91.7% expressed interest in a review summarization service, citing convenience and time savings.

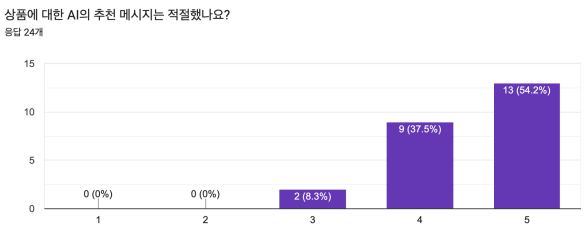
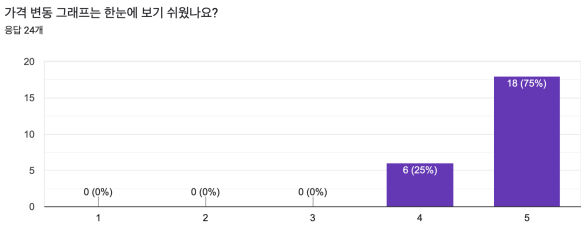
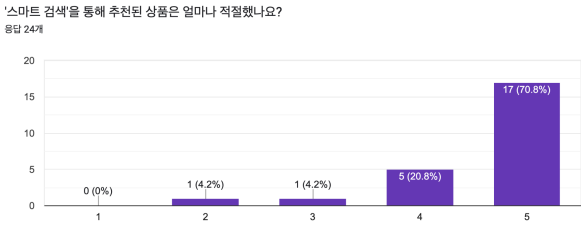
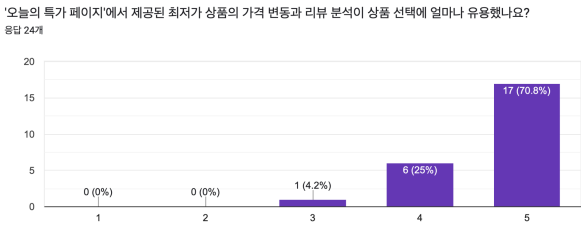
	[Interest in Recommendation Services Based on Reviews] 87.5% showed a strong preference for a product recommendation feature derived from review data.

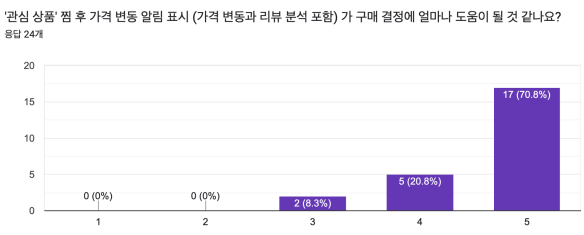
These findings highlight the importance of integrating personalized and data-driven features into EasyPICK, such as price alerts, review summarization, and trust-building mechanisms, to address user pain points and improve the overall shopping experience. Future iterations of the platform will focus on these user-centered enhancements.

6.2 Post-Survey

The post-survey results gathered from 24 participants provide valuable feedback on the features and performance of EasyPICK. Here are the major findings:

Review Analysis	
	[Satisfaction with Review Analysis] 91.7% of users rated the review analysis as highly appropriate (scores of 4 or 5). This indicates that the review analysis functionality effectively met user expectations for summarizing and presenting key insights from reviews.
AI Recommendations	
	[Relevance of AI Recommendations] 91.7% of users found the AI's product recommendation messages to be appropriate. The AI recommendations successfully guided users in selecting products that matched their preferences.

Price Information Display	
	[Clarity of Price Display] 100% of users rated the display of product prices (original price, discount rate, and current price) as highly appropriate, with 75% giving the highest score (5). This confirms that the price information was well-presented and easy to understand.
Price Trend Graph	
	[Ease of Reading Price Trends] 100% of users agreed that the price trend graph was easy to read, with 75% giving it the highest rating (5). The graph effectively helped users visualize price changes and make informed purchasing decisions.
Smart Search	
	[Effectiveness of Smart Search Recommendations] 91.6% of users rated the product recommendations from the Smart Search feature as highly appropriate (4 or 5). Users found this feature particularly useful for exploring and selecting products based on their queries.
"Today's Deal" Feature	
	[Utility of Today's Deal] 95.8% of users rated the "Today's Deal" page (showcasing lowest prices and review analysis) as useful for making product selection decisions, with 70.8% giving the highest score (5). This indicates strong user satisfaction with this feature.

Wishlist and Price Alerts	
	[Impact of Price Alerts] 91.6% of users agreed that price alerts (showing price changes and review analysis) would significantly assist in making purchasing decisions, with 70.8% giving the highest rating (5).

The survey results highlight the overall effectiveness of EasyPICK's features, particularly in review analysis, price display, and smart search. The high satisfaction scores emphasize the importance of integrating these functionalities into the platform while exploring potential improvements, such as personalized price alerts and expanded smart search capabilities.

7. Conclusion & Future Works

7.1 Result

7.1.1 Overall Summary

This project involved the design and implementation of EasyPICK, a system aimed at addressing information asymmetry and preference uncertainty faced by users across various online shopping platforms. EasyPICK is a grocery-focused recommendation system that leverages an LLM to integrate and summarize information such as prices, discounts, and reviews from different platforms.

The front-end was developed using React and TypeScript to deliver an intuitive and responsive interface, while the backend utilized Node.js and Express to efficiently handle API requests. LangChain facilitated seamless interaction between users and the system, and MySQL was employed to systematically manage data across eight tables. Collaboration among team members was effectively managed using Notion and GitHub.

EasyPICK implemented key features to enhance user convenience. The product information summary page, powered by the LLM, provided concise overviews of product pros and cons, along with a price trend graph to assist users in making informed purchasing decisions. Popular categories and "E's Pick" recommendations enabled users to quickly navigate to desired products. The smart search feature allowed users to explore products in a conversational format, while features like Today’s Deal and WishList added personalized shopping experiences.

Through this project, 91.7% of users reported high satisfaction with the service, and over 75% found the price information and graph readability features easy to understand. EasyPICK demonstrated a unique and innovative approach, significantly enhancing the user experience compared to traditional e-commerce services.

7.1.2 Our Unique Differentiation

Our service offers a clear differentiation from existing e-commerce platforms. Most traditional services focus on comparing prices based on the lowest available price or do not share the lowest price trends over time. For instance, the 'Danawa' platform shows price trends and provides information on the lowest price. However, this information lacks the reference unit price of a product, and in cases of bundled sales, it simply calculates the unit price through basic multiplication and division to suggest the cheapest seller, which often compromises reliability.

Moreover, traditional platforms do not utilize LLMs (Large Language Models) to enable users to interact directly with the service, express their needs, and receive personalized recommendations based on those inputs. In contrast, we leverage LLMs to provide a highly personalized recommendation system that helps users find and purchase the products they truly desire.

In addition, we have introduced a feature that analyzes review data to extract diverse opinions about a product and summarizes them into easy-to-understand formats for users. This allows users to grasp key information without reading through extensive reviews, making their decision-making process much more efficient. By combining this review analysis feature with our personalized recommendations, we offer an innovative approach that significantly enhances the user experience and surpasses the limitations of conventional e-commerce platforms.

7.2 Limitations

7.2.1 Aspects of methodology

First, price change tracking was performed on a weekly basis rather than daily, which made it challenging to provide users with near real-time accurate pricing information. This limitation was particularly evident for products with frequent price fluctuations or during promotional events, where timely updates are critical to enhancing user experience.

Second, the review summarization system faced challenges in condensing over 1,000 reviews into brief summaries, often omitting key or unique perspectives. This issue limited the ability to convey diverse viewpoints effectively, potentially reducing the reliability and utility of the summary for users.

Third, the product recommendation system lacked the capability to retain user queries, hindering its ability to provide consistent personalized recommendations or adapt to changes in user preferences. This lack of memory functionality diminished the system’s interactivity and the quality of user customization.

Lastly, the project lacked sufficient A/B testing or comparative analysis with similar systems, which are essential for objectively validating the system's performance. Such statistical validation processes could have played a crucial role in quantitatively analyzing the strengths and weaknesses of our service and demonstrating its feasibility to external stakeholders.

7.2.2 Aspects of App Interface

Providing detailed product information proved challenging because the original pages displayed detailed images as a whole, making it difficult to extract and display such information within our service. As a result, users had to rely solely on limited data such as review-based insights, prices, and discount rates to understand and compare product features. This limitation could negatively impact the user experience and hinder users from making well-informed purchasing decisions.

7.2.3 Aspects of Dataset & Database

First, there was a lack of sufficient data. For instance, while we referred to comparison platforms like Danawa and attempted to gather additional information from various e-commerce sites(e.g. Coupang, G-market, …), data for certain product categories or attributes were missing, forcing us to substitute or omit these sections. This issue reduced the completeness of the dataset and limited the reliability of the analysis results. Second, during the category classification process, some products were incorrectly classified or duplicated due to unclear criteria, potentially causing confusion during product comparison or recommendation. Lastly, there was a lack of baseline data (e.g., reference prices) necessary for practical evaluations. Reference price data are critical for comparing product affordability or calculating discount rates, but the absence of such data became a major limitation in achieving a fully functional service.

7.2.4 Aspects of User Study

The user testing was conducted in a local environment due to the unavailability of a public server, using a direct face-to-face testing approach. While this method provided flexibility, it posed challenges in observing users' natural interactions with the system.

Several improvements were identified during the testing process. First, to evaluate the service's performance more effectively, a control group should be established, and comparison-based survey questions should be designed to highlight the unique features of the service. Second, clearly defined user action scenarios are required, along with specific functionality checks for each scenario, to ensure consistency and collect detailed feedback. Lastly, to compare the results against pre-defined user personas, it would be beneficial to include a section in the survey to collect users’ background information. Implementing these improvements will contribute to more precise and reliable testing outcomes.

7.3 Future Work

Based on the analysis of user testing results, we have identified several areas for improvement and expansion. These suggestions are categorized into **system-focused** and **user-focused** approaches to ensure a comprehensive enhancement of the service. Below, we outline the future work derived from user feedback and survey analysis.

7.3.1 Systemic Approach

> Price Drop Alerts

- Introduce real-time price monitoring and notification features to enhance usability and user satisfaction.
- *"It would be great if notifications are sent when prices drop."*

> Enhanced Review Analytics

- Increase the credibility of AI review summaries by including the proportion of actual reviews reflected in the analysis.
- Add features to sort by "lowest-rated reviews" and provide access to detailed negative feedback.
- *"Include a breakdown of the percentage of reviews reflected in the AI summary."*

> Dynamic Graph Customization

- Allow users to set custom time ranges for price trend graphs, offering more detailed and flexible insights into pricing.
- *"Allow users to set the time range for the graph period."*

> Product Recommendation Expansion

- Expand integrations with additional e-commerce platforms to provide a wider range of options and better deals.
- *"If the service connects to more sites, it will become even more useful!"*

> Real-Time Updates

- Enable real-time updates for food product availability and delivery times to enhance the service's practicality.
- *"Add real-time updates for food availability."*

> Integration with User's Purchase History

- Implement chatbot memory functionality to retain prior queries and suggest alternatives when no matching items are found.

- *"The chatbot lacks memory. It would be better if it could suggest alternatives when no matching items are available."*

7.3.2 User-focused Approach

> Personalized Tracking

- Allow users to track frequently purchased items and set preferences for specific categories to receive personalized notifications.
- *"If frequently purchased items could be tracked, it would be very useful."*

> Interest-Based Recommendations

- Enable users to set preferences for their favorite food categories and receive alerts or recommendations when matching products are available at favorable prices.
- *"It would be great to have a feature where I can set my interest categories and receive alerts or recommendations for those products."*

> Improved Visual Review Categorization

- Organize reviews into clear, categorized sections (e.g., delivery, taste, packaging), similar to platforms like Musinsa, to make review analysis more intuitive.
- *"Organize reviews by category, like 'fit,' 'thickness,' etc., for easier understanding."*

> Transparent Review Display

- Display summarized pros and cons alongside selected actual reviews to enhance trust and provide context.
- *"It would be helpful to see the actual reviews that were analyzed to build trust in the summaries."*

> Interactive Delivery Time Information

- Replace generic delivery time reviews with accurate data retrieved from the ordering process.
- *"Delivery time reviews are meaningless. Show actual delivery times instead."*

> Educational Content on Ingredients

- Provide clear and detailed descriptions of product ingredients to assist users in making informed choices.
- *"More detailed descriptions of ingredients would be helpful."*

Experience & Feelings

Jibin Hwang
Applying the theoretical knowledge I learned during my first and second years to the actual process of creating a web service through this project was incredibly meaningful. By practicing core elements of web development such as frontend, backend, database, and SQL, I was able to deepen my understanding of concepts I had studied and see how they are applied in real-world scenarios.

In particular, I have always had a strong interest in Human-Computer Interaction (HCI), so I had high expectations for this course and project. It turned out to be an even more engaging and challenging experience than I had anticipated. Analyzing people's needs and pain points, defining user personas, creating prototypes, and ultimately developing a fully functional web service allowed me to understand the intricate connection between service planning and development.

Through this process, I realized once again how crucial it is to solve user problems effectively. The experience I gained from this project will not only enhance my academic journey but also have a significant impact on my future career path. This project has inspired me to explore other web services or HCI-based projects and has motivated me to delve deeper into user-centered development.

Dohoon Kim
The biggest challenge was that this was my first experience with web development, requiring a significant amount of learning. My prior experience had been focused primarily on Python-based programming, without any exposure to the concept of building a complete service. As a result, the process of acquiring new skills and understanding new concepts was undeniably exhausting. Understanding how the frontend and backend work together was particularly difficult. Although both used TypeScript files, their writing styles were different, and the method of invocation in the frontend was unfamiliar. Every step was a continuous process of learning and adapting.

Nevertheless, the most impressive aspect of this experience was the potential applications of large language models (LLMs). My prior AI studies were grounded in the premise that a well-designed system could perform specific tasks, such as modeling unknown distributions or predicting particular data. However, there were few opportunities to directly witness these outcomes in action. In contrast, utilizing LLMs allowed me to observe results more intuitively by summarizing long texts or formatting data into desired structures, presented in a natural language format that is easy for humans to understand. This made the workings of AI much clearer and more tangible.

This experience was meaningful a lot, specifically learning about LLM technology. It also provided substantial insights into the process of practical service development. I came to understand the distinctions between research and service development, as well as the importance of human-centered design in creating effective services. Notably, I recall the effort involved in

designing features that enable users to easily find the information they need and in devising methods to deliver intuitive insights through data visualization. Through these processes, I not only enhanced my technical skills but also deeply considered the essence of creating services that genuinely communicate with users.

SeEun Lee
Through this project, I had the opportunity to experience various aspects of the entire service development process, which I found very rewarding. While previous courses primarily focused on handling and analyzing data, this course emphasized how to utilize and present the collected data from a user's perspective, which was particularly helpful.

During the data collection phase, gathering information from various e-commerce sites posed challenges due to the wide variety of product categories. A great deal of effort was required to generalize and organize this data effectively. Additionally, as it was my first time working on web design, frontend, and backend development, I had to put in significant effort, but I felt a sense of accomplishment seeing the final result.

Furthermore, by directly applying an LLM (Large Language Model) to our service, I was able to firsthand understand how practical and trending LLM technology is in today's market. I plan to reflect on the shortcomings of our project and revisit what I learned in this course by undertaking another project during the upcoming break, where I will design and develop a service in a different domain using LLM.

YuChan Nam
Personally, the project was a really meaningful experience. What started as a simple idea about creating an e-commerce comparison service turned into a large project after many discussions with our group. We worked hard to solve real problems, like information gaps and confusion in personal preferences, and tried to find practical solutions. This process made me realize how important user-centered design is when building services that people will actually use and enjoy.

While working on the idea, I also learned a lot about the technical aspects, especially regarding database design and data management. To make EasyPICK work, we built a relational database using MySQL to organize and store product data, including prices, reviews, and historical price trends. This database was key to features like price fluctuation graphs and wishlist price comparisons, which can help users make smarter shopping decisions.

At the same time, I was amazed by the potential of Large Language Models. We used LLMs to process and summarize product reviews, categorizing them into aspects like taste, delivery, and price. Instead of overwhelming users with raw data, the system delivered concise summaries and recommendations. It was exciting to see how LLMs could work alongside databases to enhance user experiences by combining structured data with intuitive insights.
This project showed me how the technical side can come together to create impactful services. It also inspired me to explore more projects where I can apply these skills.

Appendix A. Prompt Template and Result of Smart search

a. Prompt template (Review Summarization)

```
"""#Instruction
너는 사람들의 리뷰를 모두 읽고 사람들의 상품에 대해서 어떤 면에서 좋게 느끼고 안
좋게 느끼는지 정리하는 역할을 맡고 있어.
아래의 리뷰들은 모두 다른 사람들이 쓴 리뷰야.

리뷰:
{reviews_text}

이 리뷰를 보고, 아래 내용에 대해서 대답해줘 그리고 순서는 [배송, 맛, 포장, 가격,
편리성]을 쓰되 많은 사람들이 주로 이야기하는 장단점을 상단에다가 배치해줘 예를
들어서 맛있다는 말이 많으면 그 리뷰를 위에다가 쓰면 된다는 거야. 출력 예시에 있는
두 예시과 같게 작성해줘줘

#출력 예시
[분석 결과]
1. product id: 121345
2. 장점:
배송: 빠르고 정확한 배송.
"당일 배송시간 정확넘나 편리가격 만족맛도 만족매콤 매콤강추 강추."
"배송은 엄청 빠르고 당일 주문해서 당일 원하는 시간에 받아볼 수 있어 좋고 싱싱한
물건도 바로 받아볼 수 있어 좋네요."
...
3. 단점:
가격: 가격이 조금 상승한 점에 대한 아쉬움.
"가격이 많이 올랐네요 품절이라 기다렸다가 샀는데 가격 올린다고 그랬나보네요."
"가격이 센 듯 해도 한 봉에 20개 들었으니까요."
...

출력 예시를 참고해서 답변을 작성해줘
#실제 분석
1. product_id: {product_id}
2. 장점:
3. 단점:
"""
```

b. Prompt template (Product Recommendation)

```
사용자 질문: {question}

다음은 관련된 상품들의 정보입니다:
{context}

위 정보를 바탕으로 사용자의 질문에 대한 추천 답변을 작성해주세요.

답변 형식:
- 가격, 할인율, 평점 등 구체적인 수치 정보를 포함해주세요
- 실제 리뷰나 장점을 인용하여 설득력을 높여주세요
- 2-3개의 상품을 비교하여 추천해주세요
- 친근하고 자연스러운 톤으로 작성해주세요
- 이모티콘 적절히 사용해주세요

필수 지침:
1. 강조가 필요할 때는 반드시 <b></b> 태그만 사용할 것
2. 가격은 "<b>8,900원</b>" 형식으로 표시
3. 할인율은 "<b>40% 할인</b>" 형식으로 표시
4. 평점은 "<b>평점 4.5점</b>" 형식으로 표시
5. 상품명은 "<b>상품명</b>" 형식으로 표시
6. 인용은 "<quote></quote>" 형식으로 표시
7. 너의 답변에 **가 있으면 다 지워줘
```

c. Example of ‘Smart search’ after clicking keyword ‘가성비’

d. Example of ‘Smart search’ after user’s prompt

Appendix B. Code

For implementation details, refer to the following repositories:

1. Frontend : https://github.com/NYC0326/EasyPick
2. Backend : https://github.com/Jibinhwang/EasyPickBackEnd

Appendix C. Poster

EasyPick : Food Shopping Recommendation Application Using LLM
- Reducing Review Fatigue and Utilizing Price Tracking

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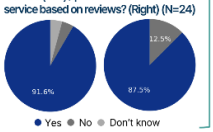
Motivation & Background

Information Asymmetry:
Product prices vary across sites and clients find it hard to extract key insights from reviews due to excessive volume

Preference Uncertainty:
With excessive information and unclear preferences, clients struggle to make decisions

Q. Do you want to use a review summary service (Left) / product recommendation service based on reviews? (Right) (N=24)



Leads review fatigue, causing customers to rely on incomplete or biased information or lose interest in making a purchase.

58.8% of respondents indicated that they often or always feel burdened by the excessive number of reviews

Assisting users by **analyzing product reviews** using a large language model, considering factors **like price, discount rates, and star ratings** to provide clear product recommendation

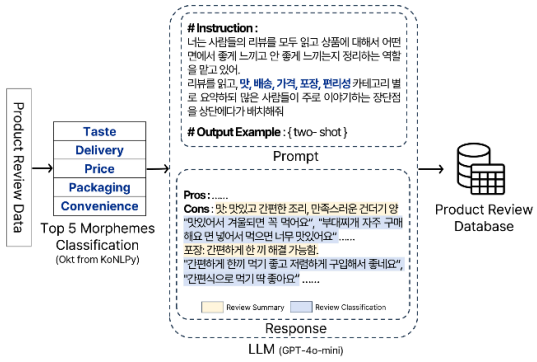
Methodology

Data Collection & Database Construction

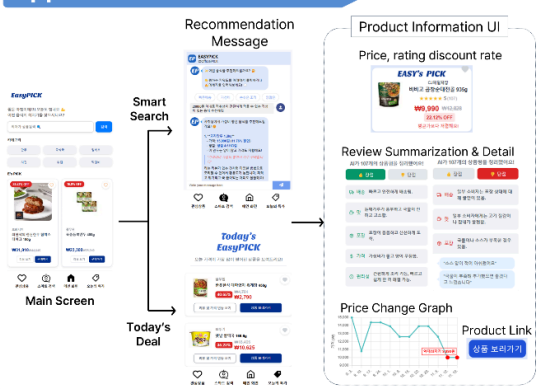
- Basic product information such as brand, ratings, image, price, name are crawled from the e-commerce marketplaces
- Crawled reviews are categorized as pros and cons and summarized into separate review section
- Historical price changes are tracked over time

Review Summarization & Product Recommendation

Product Review Data Analysis using LLM



App Interface



System Overview

System Architecture

Database

Entity Relationship Diagram

Key Functionalities

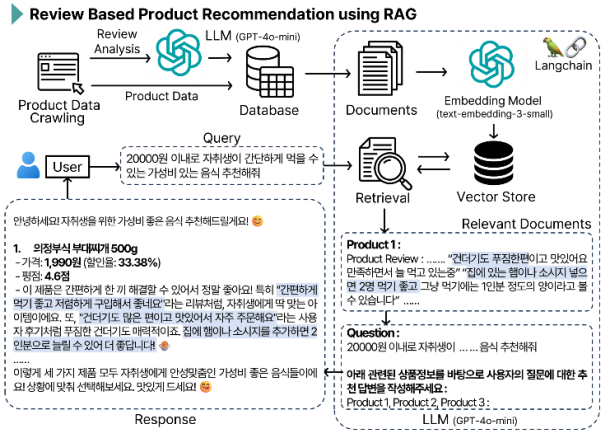
- **Product Information:** Analyzes reviews by splitting them into pros and cons, summarizes key points, displays price trends, and provides a purchase link
- **Main Screen:** Displays 6 popular categories and "E's Pick"
- **Smart Search:** Recommends products based on user queries through chatbot
- **Today's Deal:** Lists products with the highest discounts
- **WishList:** Allows users to easily compare the price they saved & current price

Price Change Tracking

Wishlist Price Change Alert

Price Fluctuation Graph

Review Based Product Recommendation using RAG



Result

User Test

- **High Satisfaction with AI Review Analysis and Recommendation**
  91.7% of participants rated the review analysis and AI recommendation messages as appropriate, reflecting the system's effectiveness
- **Clarity of Price Information and Graph Readability**
  Most users (75% or more) found the price display and price fluctuation graphs clear and helpful in decision-making
- **Effectiveness of 'Smart Search' and 'Today's Deal' Features**
  91.6% and 95.8% of participants rated features like smart search recommendations and the "Today's Deal" page as useful for purchase decisions

Future Work

- Show the ratio of actual reviews reflected in the AI summaries to enhance trust in analysis
- Add Chatbot Memory: To remember user inputs and provide more personalized responses