Assignment M4
Search Function for Coupang e-Commerce App
CS6750 – Human Computer Interaction

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Abstract—This study examines opportunities to redesign the existing interface for the search function of the Coupang e-Commerce App by following a user-centered four-stage design life cycle. Coupang is the largest e-Commerce platform in South Korea by market share at the time of writing, in 2022, and the platform exists as a website and as an App. The four-stages in the design life cycle for this study are: Needfinding, Design Alternatives, Prototyping, and Evaluation. Participants for this study are all English-speaking adults.

1. STUDY CONTEXT

For further understanding of the overall study context, please refer to *Appendix 7.1: Extended Abstract*, *Appendix 7.2: Study Context and Problem Space*, *Appendix 7.3: User Types*, *Appendix 7.4: Data Inventory*, and *Appendix 7.5: Defining Requirements*.

2. QUALITATIVE EVALUATION

2.1 Prototype and Method Selection

Qualitative Evaluation in the form of an **Online Survey** will be undertaken on the **Wireframe Prototype** developed in the previous stage of the study. A sample of the Wireframe Prototype can be viewed below (Figure 1). For reference a full design of this Wireframe Prototype can be viewed in *Appendix 7.6: Wireframes – Full Design*, which demonstrates a search for a 'Playstation 5' taking place in both native Korean and in the English-translated version of the Coupang App. There are three screens: a home-screen, search results screen and a specific search result (specific product) screen with details. The prototype also features less banner advertising than the existing interface.
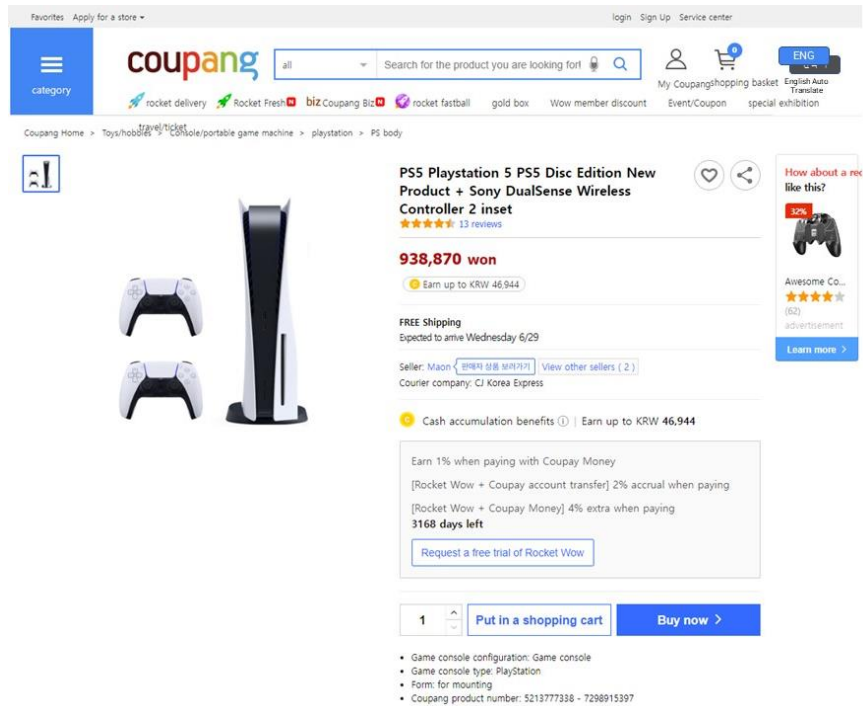
Figure 1— Wireframe: Search Results with English Translation

2.2 Online Survey - Procedure

An asynchronous Online Survey will be distributed online via Google Forms, along with the Wireframe Prototype for Qualitative Evaluation by participants. The Wireframe Prototype is of sufficient fidelity to acquire evaluation feedback from participants without heavy researcher oversight during the actual evaluations. Distributing the Online Survey via Google Forms allows the survey to be distributed efficiently at scale and also for automatic data visualization. Furthermore, the survey will consists of 10 questions to make survey participation less time consuming and attractive to potential participants.

The participants will be 18-44 years old English speakers (expatriates) residing in South Korea, in line with the user base identified in the Data Inventory during initial needfinding. Older demographics are welcome to also participate if captured by the convenience sampling strategy, however it is anticipated that predominantly English-speaking expatriates typically fall into this category. Beyond this demographic, there is strong possibility that expatriates have actually naturalized.

Participants will be recruited via convenience sampling with snowballing. Colleagues, friends and family residing in South Korea will be invited and any consenting participants will also be encouraged to invite their own colleagues, friends and family. This recruitment process is consistent with the initial need-finding.

2.3 Online Survey - Content

The questions below and directions will be included in the Online Survey, in the order shown.

Section 1. Understanding When and Where you use the Coupang search function

1. What is your age group? [interval data]
2. On what platform do you usually use the Coupang search function? [nominal data]
3. How long have you been using Coupang / the Coupang search function? [ratio data]
4. On average, how often do you use the Coupang search function? Pick the closest choice. [ratio data]

Section 2. Wireframe Prototype User Evaluation

Please review the attached Wireframe Prototype and follow the process of searching for a 'Playstation 5'. An English-Translation feature has been added to the existing App. Comparison between native Korean and translated English can been seen side-by-side for each screen of the search process. Please compare this prototype to the existing App, and then answers the questions below.

5. From 1-5 strongly disagree to strongly agree, compared to the existing interface, the English translation feature is beneficial to English-speaking users. [nominal]
6. From 1-5 strongly disagree to strongly agree, the English translation feature is designed well (easy to find, easy to use and stylistically consistent). [nominal]
7. From 1-5 strongly disagree to strongly agree, compared to the existing interface, the reduction in in-App advertising is beneficial useful to users. [nominal]

8. From 1-5 strongly disagree to strongly agree, compared to the existing interface, the reduction in in-App advertising is designed well (screen real estate has been made free in a useful and stylistically consistent manner). [nominal]
9. What, if any, aspects of the prototype do you like -or- do you think work well?
10. What, if any, changes -or- improvements would you like to see made to the prototype?

2.4 Links to Data Inventory & Defined Requirements

How will this evaluation help you gauge whether or not the prototype has actually met the requirements?

The goal of this evaluation is to collect participant evaluation feedback on the English auto-translate feature, the new button design, the reduction in in-App advertising and the overall interface design. The online survey questions address who the users are, as identified in the Data Inventory, and the defined requirements of Accessibility and Usability.

Section 1 of the survey addresses who the users are by: identifying ages, platform preference, experience/exposure levels, and frequency of App usage.

Question 5 asks for participant sentiment on the perceived benefits of the English translation feature which is aligned with the requirement of Accessibility i.e. more non-Korean speakers can access the Coupang App. Question 6 asks for participant sentiment on the overall design and user experience of the English translation feature which is aligned with the requirements of Accessibility and Usability. Similarly, Question 7 and 8 asks for participant sentiment on the perceived benefits and user experience of the reduction in in-App advertising, respectively. The reduction in in-App advertising enhances the usability of the App through reduced distraction and user cognitive load. All these questions are measured in a nominal scale and will allow me to determine whether the prototype has actually met the requirements when I analyze this data in aggregate.

Finally, Question 9 and 10 allow the user to provide free text entry of positive feedback and prototype criticism. Sentiment analysis can be undertaken on this text to code it into nominal data to analyze in aggregate. This is another avenue for participants to express their satisfaction or dissatisfaction with the proposed changes identified in the Wireframe Prototype.

3. EMPIRICAL EVALUATION

3.1 Prototype

In order to undertake an Empirical Evaluation, it is necessary to create a high-fidelity prototype that can be compared to the existing App in meaningful scenarios and user testing. Therefore, for the purposes of this evaluation I will either: hypothetically create a working prototype of the App with the English translation feature and reduced in-App advertising, or use a simple workaround physical prototype where the web browser version of Coupang will be viewed on Google Chrome with the English translate feature on and particular advertising elements will be blocked locally.

3.2 Method and Experiment Design

The control (point of comparison) will be the existing Coupang App, and the experimental interface (what we will be testing) will be the aforementioned working prototype or physical prototype in three versions: one with the English translation feature, one with reduced in-App advertising, and one with both features implemented.

In order to make a judgement about the usefulness and efficiency of the English translation feature and reduced in-App advertising, software logging and synced video recording will be used to collect data relating to the number of mistakes and time between actions. Time between actions is a proxy measure for hesitation or search time. Participants will be given a list of 5 basic items, 3 less-general items and 2 niche items to search for. These item lists will be pulled randomly from a shortlist of items, categorized by the three difficulties, that will be determined and pre-checked by researchers. Finally, post-event protocol questions will also be used to collect ordinal data on the perceived ease of use of the experimental prototypes (all three versions).

Given that there are three versions of the experimental interface, each will be compared to the existing interface (the control), using Student's t-tests for the number of mistakes and time between actions, and using Kolmogorov-Smirnov tests for the ordinal sentiment data. The Null Hypothesis for each test will be there is no difference between the existing interface and the experimental prototype version (i.e. outcomes/distributions are equal), and the Alternative Hypothesis will be there is a significant difference between the control and experiment

(i.e. outcomes/distributions are unequal). We would hope to see lower mistakes and time between actions with the prototype features. Finally, we would need to determine if there is any significant difference between the prototype interfaces with three level tests. We would use ANOVA on the ratio data and a Chi-squared test on the ordinal data for all three levels and then follow-up with pairwise testing if the alternative hypothesis is true i.e. any one outcome/distribution is unequal, and the null hypothesis is false i.e. all outcomes/distributions are equal.

Given that there are three versions of the prototype interface to test and one control, a **within-subjects** experiment design shall be used to maximize participant coverage of the four interfaces. Participants will be initially randomly assigned to into two groups, A and B: one testing the control, experiment with English translation and experiment with reduced in-App advertising; and one testing the control, and experiment with English translation and reduced in-App advertising. It not advisable to have participants test all three versions of the prototypes due to feature overlap and familiarity with the features creating order bias and subsequently improving performance with each version of the prototype tested. Group A will be equally distributed, with random assignment to ordering permutations of the three interfaces (e.g. Control-English-LessAds, English-LessAds-Control, LessAds-Control-English, and so on, for a total of six permutations). Group B will be equally distributed, with random assignment to ordering combinations (e.g. Control-Experiment, Experiment-Control). This is also to control order bias and familiarity increasing participant levels of expertise.

As stated above, participants will be given a list of 5 basic items, 3 less-general items and 2 niche items to search for in each interface. These item lists will be pulled randomly from a shortlist of items, categorized by the three difficulties, that will be determined and pre-checked by researchers. These lists will be the same for each group, so that errors (ratio), time between actions (ratio), and ease of use (ordinal) are directly-comparable between the interfaces tested by the same participant. We can infer that less time between actions and reduced mistakes is a relevant measure of user Accessibility (English speakers can find what they want quicker and with less mistakes due to translation) and Usability (English speakers can find what they want quicker and with less mistakes due to translation, reduction in interface advertising and overall interface design).

3.3 Lurking Variables

Potential lurking variables in the experiment relate primarily to the composition of the two groups (A or B) and eight sub-groups (interface ordering). Due to random assignment to each group, participant demographics, levels of technical expertise, prior App familiarity and Korean proficiency variables are difficult to equally distribute across each group and sub-group. We can counteract biases arising from these variables with larger sample sizes, however the presence of eight sub-groups may present problems with prior App familiarity and any inherent Korean proficiency biasing our analysis and comparison.

3.4 Analysis

As stated above in *3.2 Method and Experiment Design*, Student's t-tests will be undertaken on the number of mistakes and time between actions, and Kolmogorov-Smirnov tests will be undertaken on the ordinal sentiment data. Each interface will be compared to the control pair-wise using these tests, however ANOVA and Chi-squared tests, and further pair-wise testing (if necessary), will be used to determine if there is any significant difference between the three levels of experimental interfaces.

4. PREDICTIVE EVALUATION

4.1 Type of Analysis

A **Cognitive Walkthrough** will be undertaken on the **Catalogue, Samples and QR Codes** prototype developed in the previous stage of this study. This prototype can be viewed in *Figure 2* below. The purpose of undertaking a cognitive walkthrough is to investigate the adequacy and effectiveness of the prototype by contemplating the user's though process, how they make purchase decisions and any branches they take within the interface.

4.2 Cognitive Walkthrough

The goals of the user are to purchase items through the Coupang app without having to rely heavily on the App interface which is currently in native Korean. Circumventing the language barrier with an English-based catalogue with samples and associated QR codes is hypothesized to be beneficial to achieving the requirements of Accessibility (ease of access for English-speakers in South Korea)

and Usability, since technical expertise requirements are lower to using a physical mail-based catalogue hybridizes with QR codes to use within the App. There is also no requirement for typing.

First, the user needs to make an account for Coupang via the App or web browser. If the App is not installed, there is a subtask of visiting the Apple Store or Google Play Store and downloading the App. The overall task includes operators such as: clicking, typed search, scrolling and reading/deciphering/inferring (from Korean text). It is possible that a more tech-savvy (or Korean speaking)
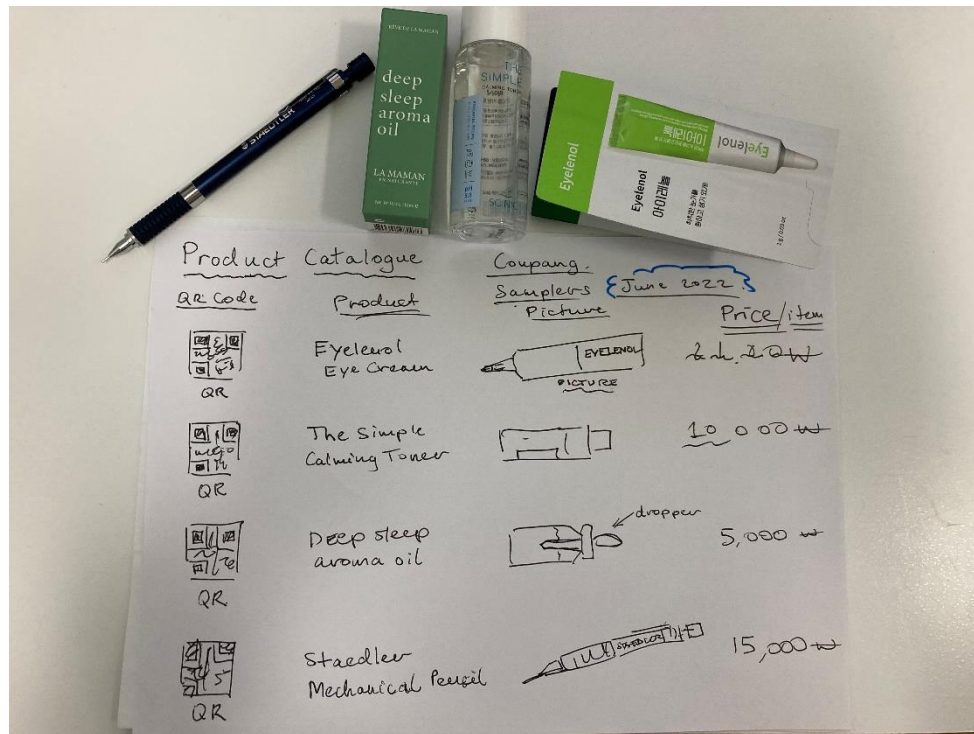
relative or friend could undertake this on the user's behalf.

Figure 2— Product Catalogue, Samples and QR Codes

Second, the user needs to enter their payment information on the App or website. opt-in for this mail catalogue service. Operators include: reading/deciphering terms and conditions (in Korean), clicking, typing name, address and credit card information, scrolling, retrieving a driver's license or ID card and a credit card from a wallet or purse, reading the driver's license or ID and credit card details, and comparing card information to entered information. It is possible that a relative or friend with technical expertise and/or Korean proficiency and/or better eye-sight or dexterity could undertake this on the user's behalf.

Third, the user opts in the catalogue service. Operators include: clicking, visual search, reading and identifying relevant icons, typing/confirming name and address information. Of particular note, I have realized that I need to design a button or menu option that will allow the user to discover this opt-in service within the App in English, along with English terms and conditions. Temporary discoverability through promotions or banner advertising in-App in insufficient long-term.

Fourth, the user waits to receive a catalogue. Of particular note, I realize that some form of feedback or information on mailing times or frequency needs to be provided within the App in English. Otherwise, the user will sit there wondering when/if they will ever receive the catalogue.

Fifth, the user receives the catalogue. Operators include: retrieving the mail, taking the mail to an area with sufficient room for perusal.

Sixth, the user reviews the catalogue items and samples. Operators include: opening the mailed catalogue, reading the item names and details, testing the samples, contemplating any purchases decisions.

Next, the user decides on a purchase decision and seeks to make a purchase. Operators include: deciding on a particular item within the catalogue, opening the App on their smartphone, visual search for the associated QR code, point camera at QR code, screen-click focus on the QR code, click QR code on screen, click confirm purchase in the App, continue this process until the minimum shipping requirements are met or all items desired are purchased.

Finally, the user awaits their deliveries and the next catalogue.

5. PREPARING TO EXECUTE

In the next stage of the study, the Qualitative Evaluation method of using an Online Survey with the Wireframe prototype, and the Predictive Evaluation method of a cognitive walkthrough using the Physical prototype will be undertaken. A working prototype or physical prototype including the English-translation and reduced in-App advertising is not ready, nor capable of collecting data relating to the number of mistakes or time between actions. Furthermore, with eight sub-groups required for empirical evaluation, this will be logistically challenging to recruit sufficient participants for lengthy empirical testing tasks.

6. REFERENCES

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7. APPENDICES

7.1   Appendix: Extended Abstract

Abstract—This study examines opportunities to redesign the existing interface for the search function of the Coupang e-Commerce App by following a user-centered four-stage design life cycle. Coupang is the largest e-Commerce platform in South Korea by market share at the time of writing, in 2022, and the platform exists as a website and as an App. The four-stages in the design life cycle for this study are: the Needfinding stage, where research seeks to establish a comprehensive understanding of both the task and its users; the Design Alternative stage, where multiple preliminary ideas are formulated to tackle the task; the Prototyping stage, where alternatives with the most potential are developed into prototypes for future user testing; and the Evaluation stage, where user testing occurs on prototypes and user feedback is collected. Participants for this study are all English-speaking adults.

7.2   Appendix: Study Context and Problem Space

This portion of study created a plan for and undertook individual brainstorming to generate ideas for design alternatives. These design alternatives were then

evaluated against selection criteria and shortlisted to three ideas to move forward to prototyping. Finally, these three ideas were developed into three prototypes of low to high fidelity (for academic purposes and exploration), and then evaluated.

The Data Inventory and Requirements from the previous portion of the study (as seen in *Appendices 9.4* and *9.5*, respectively) played a large role in framing: the initial brainstorming idea generation for design alternatives; the development of prototypes; and the evaluation of both design alternative ides and prototypes.

Coupang is the largest e-Commerce platform in South Korea by market share at the time of writing, in 2022. Coupang is often referred to as the "Amazon of South Korea" (Heebs, 2021) because of its significant local market share, large variety and supply of available goods, low and competitive prices, short delivery times, significant logistics infrastructure, and ease-of-use owing to its online website and App. However, it has not held this mantle for a significant time. Coupang's revenue has increased from 4,054 million USD in 2018 to 18,406 million USD in 2021, and its profit has increased from 189 million USD in 2018 to 3,109 million USD in 2021 (Coupang Inc., 2022).

This study seeks to examine opportunities to redesign the existing mobile App interface's search function (depicted in Figure 3) or to discover alternative solutions to the search function. Due to the size and high usage of this e-Commerce platform within the domestic market, such opportunities yielded by the research could potentially have far reaching benefits. The study is limited to understanding the environment surrounding the use of the mobile App and does not include the website version of the e-Commerce platform.

Figure 3— Coupang App Interface, Search Bar shown (Byun, 2022)

At a glance, the search function on the Coupang App is similar to search functions on other popular e-Commerce platforms such as eBay or Amazon. After completing a search for a particular product, closest or related matches for products from Coupang or other sellers are displayed.

At a glance, the App landing page is populated with banner advertising directly underneath search bar. Banner advertising usually relates to sponsored brands, special deals or new proprietary offers from Coupang. Beneath the banner advertising are 10 icons including: product categories, current specials, Coupang Eats (a food delivery service similar to Uber Eats), and Coupang Play (similar to Amazon Prime video and gaming). Further beneath these 10 icons are further product spotlights.

Once a product is selected it is added to the user's shopping cart. From there, assuming the user wishes to proceed with a purchase or number of purchases, the user will then be prompted to organize shipping details, delivery methods and payment. Of particular note, Coupang offer 'Rocket Wow' delivery (similar to the Amazon Prime shipping service) which offers expedited shipping and no minimum shipping for a monthly fee.

7.3   Appendix: User Types

Coupang primarily serves the domestic market (South Korea) and the website and App are only available in the Korean language. However, international shipping is available for users to various locations such as Canada, the US and

Europe. Therefore, a majority of users are based domestically within South Korea and there is a smaller international base of users.

In order to register an account with and use the Coupang App, a user requires an Android or iOS mobile device, a bank card or credit card capable of online purchases, a cell phone number, their name, and a suitable address. This means that users could potentially be anyone in South Korea that fulfills these requirements.

In saying that, users of the Coupang App require a baseline technical proficiency in using mobile technology, the necessary expertise to download, open and operate a mobile app, and necessary understanding to complete account registration.

For the purposes of this study, all participants and user groups will be English-speaking adults.

Of note, those without sufficient Korean language proficiency (such as expats, international students and travelers) often use Google Chrome's in-built translation tool as a workaround on the Coupang website. However, it is not possible to open the App in a translated form. It is possible that these users may open the website version in Google Chrome on their mobile device, with the translation functionality enabled.

The underlying motivations for a user to use the search function of the Coupang App is to search for products they may be interested in buying now or in the future. It is also reasonable that a user may also search for products on the e-Commerce App without a purchase decision in-mind. A user may simply be searching to gain an understanding of product prices and product variety.

7.4 Appendix: Data Inventory

Users: Who are the users? What are their ages, genders, levels of expertise? Refer primarily to Online Survey Summary, and Interview Summary for supporting information. As a result of only performing this survey in English, the users are English-speakers in Korea who primarily rely on their English ability, not being able to take advantage of using Korean in the Coupang app. Ages are primarily 18-44 and excludes older demographics. Levels of expertise are intermediate to advanced based on duration of using the apps, web browsers and

particular devices. Gender was not covered. I was very restricted with identifier collection so as to enhance participation. A larger survey could take place with a longer duration which also includes more identifiers such as heritage/race and gender.

Environment: Where are the users? What is the environment?
Refer to both Online Survey Summary and Interview Summary. This is primarily at home, but also takes place at work, while shopping at other locations and while commuting to a lesser, but still significant degree. There were no identifiers to establish if participants had families and thus likely more background distractions. A larger survey could take place with a longer duration to cover this.

Context: What is the context of the task? What else is competing for users' attention?
Refer to both Online Survey Summary and Interview Summary. At home, home chores or family could be a source of divided attention. While shopping at another location, having other items in mind is another source of divided attention. While commuting, paying attention to one's surrounding and not missing their stop or boarding the correct bus/train is a source of divided attention. Within the app itself, some survey respondents highlighted that banner advertising and pop-ups are distracting and this results in divided attention.

Goals: What are their goals? What are they trying to accomplish?
Refer to the Interview Summary. To buy an item, or to compare prices of an item.

Needs: Right now, what do they need? What are the physical objects? What information do they need? What collaborators do they need?
Refer to the Interview Summary. Users require: the Coupang app or a web browser; internet connection; and smartphone device, tablet or computer with power; a goal item in mind; and money for the purchase of the item in mind. I asked no questions regarding collaborators, and so in the future, I could expand questions to cover who else is involved in making this part of the interface work as intended i.e. get the participants to attempt to identify the collaborators themselves. This would be very dependent on their level of expertise.

Tasks and Subtasks: What are their tasks? What are they doing physically, cognitively, socially? What are the subtasks? How do they accomplish those tasks?
As outlined in the Interview Results and Summary.

1. Need [insert item], triggered by memory or another action/observation.
2. Open app or browser and type web address.
3. Click search bar.
4. Search using English. Sometimes using predictive text or recommended search terms.
5. Look at results.
6. Compare prices of first 5-10 items.
7. Assess quality of first 5-10 items.
8. Compare price vs quality trade-off.
9. Decide on particular item.

As mentioned in Participant Observation, users are using their visual senses for input/out and touch input (clicking virtual buttons or typing) in order to utilize the app's search function. Furthermore, they solely use visual feedback to evaluate their actions, using a combination of textual language and pictures.

As identified in the Interview Results and Summary, using Coupang can be a subtask of cleaning the home and undertaking other home chores, or as part of a bigger task of shopping. For example, when performing grocery shopping, the Coupang search function may be used to check or compare prices or availability of alternative products.

7.5   Appendix: Defining Requirements

Improved English support – better accessibility for those reliant solely on the use of English. Ideally, in the form of a fully English version of the app. Meeting in the middle, search results featuring more English for evaluation. At the bare minimum, improving search term accuracy when using English.

Enhance usability – despite the application and the search function requiring minimal cognitive effort to use (according to the needfinding), there are several sources of distractions within the app itself. There are many promotions, sales and pushing old-stock that are advertised as banner advertising and pop-ups, as evident from the survey results and participant observation. Investigating, less invasive and distracting alternatives of promotion would be ideal.

I believe functionality and learnability are fairly well performing at present. If better English support is offered, the learnability aspects will be taken care of.

The core features of the application appear to perform well, it is simply the periphery features that require improvements.

7.6   Appendix: Wireframes – Full Design

Figure 4 — Landing Screen Korean (top), Eng-transl (bot)

Figure 5 — Search Results Example with Eng-Transl (bot)

Figure 6 — Product Selection Example, Eng-Transl (bot)