An evaluation of usability and retrieval performance of price comparison websites

A study submitted in partial fulfillment of the requirements for the degree of Master of Science in Information Systems

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by

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Abstract

Due to the rapid developing of e-commerce, the online shopping websites are ubiquitous, consumers become harder to locate the product. Hence, price comparison site was born to fill the gap. Although usability test has been noticed since the late 20th century, nowadays more and more people use it to examine the usability for the website redesign or identify the usability problem; price comparison site has never been examined before. At the same time, even though price comparison site has the characteristic of the search engine, it has never been examined carefully as well.

This study adopted user evaluation to examine and compare the usability and the retrieval performance of Shopping.com and best-price.com. In the usability aspect, usability measures (efficiency, effectiveness, satisfaction) in ISO 9241-11 (1998) were employed. Meanwhile, the relevance measure in Su’s information retrieval system user-oriented evaluation model (2003) was adopted to evaluate the retrieval performance. Sixteen participants were assigned two tasks to be accomplished on both two sites. The observation technique and questionnaire were used to gather data.

This study found that although Shopping.com had the higher price comparison market share, it did not prove that it had significant difference on usability and retrieval performance than best-price.com. However, it did show that there was significant difference between the product genres, and Shopping.com was more efficient at browsing and the best-price.com was at searching. It also illustrated that there were usability defects in the selected price comparison sites. Such as, unclear label, inconsistency link etc.
Acknowledgment

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1. Introduction

1.1. Research background and motivation

Since the Internet has been carried in the business world, it definitely changes the shopping behaviour of people. Nowadays, most people, especially younger groups, have established the habit of searching and obtaining product information on the internet rather than through tangible shopping. This has led to the rapid developing of e-commerce and online shopping websites have mushroomed. Now, users no longer face the problem of insufficient information, but have an overwhelming amount of information instead. Although users can use text-based search engines to make their enquiry, the results can still number tens of thousands and a only a small portion of the results are likely to be useful. This quantity of responses makes it even harder for users to identify the correct information. Alternatively, consumers can visit online-shopping websites one by one and acquire information manually, but then users can only get the information from within one particular website, and this may not be enough. Price comparison sites were born to fill this gap between insufficient and excessive information, for the consumer.

Price comparison sites (also known as comparison shopping engines or price engines) are built with the purpose of gathering the product information (such as price, features, visual details etc.) and sometimes consumer reviews. In addition to the product information, the price comparison mechanism was another important factor, allowing consumers to make purchasing decisions from among the collected retailers in accordance with the price for the same product. The operation of price comparison sites’ is straightforward and similar to search engine. First, users type the product
query into the search box, and then the shopping engine will list the product information of different retailers and then present it to the users. This kind of service allows users to evaluate the accuracy of product information easily and also gives users alternative choices with different merchants.

Shopping engines normally use several methods and technology to collect data. One of the primary methods is to crawl the World Wide Web, and retrieve prices from retailers’ web-pages, a mechanism adopted from search engines.

The usability of e-commerce sites has always a popular topic; it not only affects the website operation, but also the consumers’ desire to purchase from those sites. Therefore, an evaluation of the usability of e-commerce sites is becoming increasingly necessary. Besides the usability evaluation, the history of evaluation IR system evaluation has taken place for many years. Dong and Su (1997:67) addressed how the significance of comparison and evaluation of search engines is “great importance for system developers and information professionals, as well as end-users, for the improvement and development of better tools”. This shows the essentiality of examining an information retrieval system, it can consequently be seen that a series of studies using all kinds of methods to examine both precision and usability of various search engines have emerged. There is also much research that studies the effectiveness of search engine ranking. However, there does not appear to be particular research which deals with the effectiveness of retrieval performance or that provides usability evaluation on comparison-shopping sites. This would appear to be a significant gap in the research as in the e-commerce age, more and more consumers become online shoppers. 69 million people (40% of total online consumers), visited comparison shopping sites and 75% of the visitors’ purchasing decisions are
influenced by Comparison Shopping Engines (CPCStrategy LLC, 2007). All this shows the significance of providing a detailed and critical examination of the comparison shopping sites.

1.2. Research Objectives

Based on the research motivations which mentioned above, this study attempts to formulate an approach to figure out the operation behind the price comparing sites while evaluating and identifying the effectiveness of the sites chosen for the research in the hope of providing online shopping users with a clearer idea of the actual performance of existing price comparison sites. This research aims to achieve the following goals:

- Contribute to the literature on price comparison sites, in order to help future researcher.

- Establish what features a good shopping engine should contain through a competitor analysis of the price comparison sites.

- Examine which price comparison sites investigated in this research have better usability from a user perspective through a usability test.

- Examine which price comparison sites in this research have better retrieval performance from a user perspective, establishing the relative effectiveness and efficiency of current comparison sites through user evaluation of the retrieval performance.

- To see the correlation between market share and the users’ test appraisal.
1.3. Research Questions

**Question 1:** What are the operation models behind the price comparison sites?

**Question 2:** What are the features a good price comparison site should have?

**Question 3:** Between these two price comparison sites, which site has better usability in the user’s view?

**Question 4:** Between these two price comparison sites, which site has better retrieval performance in the user’s view?

**Question 5:** Is there a correlation between the market share rate and actual usability and retrieval performance?

1.4. Research scope and limitations

1. The investigated sites were restricted to the UK only.

2. Only evaluating from the users’ perspective as data from the websites (i.e. flow rate, collaborate retailer lists, etc) is hard to obtain.
2. Literature Review

2.1. Online Shopping

2.1.1. Overview

Online shopping is one of the most popular activities in the electronic commerce domain. Therefore, before actually discussing online shopping, it is necessary to understand what electronic commerce is in brief. According to Rayport and Jaworski (2001:3), electronic commerce is “technology-mediated exchanges between parties (individuals, organisations, or both) as well as the electronically based intra- or interorganisational activities that facilitate such exchanges.” Turban et al. (2007:4) defined it more concretely: “Electronic commerce (EC) is the process of buying, selling, transferring, or exchanging products, services, and/or information via computer networks, including the Internet.”

Based on the pattern of transactions or the relationships between the participants, electronic commerce can be divided into four major categories: Business to Business (B2B), Business to Customer (B2C), Customer to Customer (C2C), and Customer to Business (C2B) (Rayport & Jaworski, 2001). Online shopping belongs to the Business to Customer (B2C) classification. The definition of online shopping for the purposes of this paper will be that consumers purchase products or services from the virtual store through the medium of the internet.

In 2008 January, a Nielsen survey revealed a number of interesting insights indicating how far online shopping has come. It was shown that more than 85 percent of the world’s internet users have made a purchase through the internet, (meaning
approximately 875 million people have had the experience of online shopping) and the online shopping market has increased 40 percent in the last two years. In addition, 97 per cent of the available UK internet access has been used for shopping, which is the second in the world only to South Korea (99%). In the US, the consumer satisfaction score of e-retail (83%) is higher than the traditional offline retail (74.2%) by almost 12%. This indicates how consumers have increasingly trusted in the online merchants, and the shopping environment on the internet.

2.1.2. Consumer’s motivations for shopping on the internet

While the paragraph above shows the increasing use the Internet for shopping purposes, it is also important to understand what propels them to shop online.

Khalifa and Limayem (2003) saw several primary factors influencing online shopping behaviour. These included price, convenience, time, quality of customer service, and the provision of a platform for comparative shopping. Of these, price was considered as the greatest influence on consumers while shopping on the Internet (Joines et al., 2003). According to the study, the prices of books and CDs online are 9-16 percent lower on average than in a conventional store and the success of Amazon.com and its imitators provides evidence of how lower prices can be used as strong encouragement to stimulate consumers’ purchases (Chen & Chang, 2003). However, the Internet is not always cheaper than conventional shops, in particular when sales tax, shipping and transaction fees are taken into account (Cox et.al, 2002).

Convenience is an area where the internet shopping is often seen to have an advantage over conventional retailers. Electronic stores have 24/7 accessibility and shoppers can shop anytime and anywhere they have internet access. The possibility for comparative shopping is also seen as something that significantly encourages online consumers’
shopping. In 1996, Rowley had already claimed that the majority of consumers expect to be able to compare products from a variety of online retailers. Nowadays people have become used to utilising the Internet to gather information. As a result, it is easier for online shoppers to compare a particular type of product on the basis of brand, price, features, or even the customer reviews in addition to purchase from alternative choices of electronic shops (Kown and Sadeh, 2004). For this purpose, the Internet can be regarded as a “valuable, interactive communication medium that facilitates flexible, non-linear search for up-to-date product information, simulated product/service testing, and assistance with comparison shopping and decision making” (Vijayasarathy, 2002: 412).

2.1.3. Decision making in online shopping

A great deal of research outlines the important factors affecting consumers’ decisions when they are shopping on the Internet. In keeping with the online shopping intentions already discussed, price is of most importance in their decision making process (Joines, L.J. et al., 2003). However, not all the consumers are exclusively price sensitive and factors such as age, income, and motivation also need to be taken into account (Long, M. et al., 2003).

Information is another vital factor that affects consumers’ shopping decisions. In the study of Bhatnager and Ghose (2004), various input such as product information from vendor, availability of products, price comparisons, and opinions of other customers were defined to be crucial for the online shoppers by observing the click stream data. Among these categories, the two most important types of information are product details and price comparisons.
2.2. Price comparison sites

In the late 20th century, even though the text-based search engine was already well developed, it is still difficult for e-consumers to locate specific products on the World Wide Web (Spiteri, 2000). Especially when the consumers want to acquire information in detail as search engines tend to bring lots of information in pieces and users have to put the information together themselves. Another issue is that if the customers want to actually do the purchasing online, the rapid increase in the number of electronic shopping websites increases the difficulty of decision making at the same time as providing more choice. Price comparison sites are created to bridge the gap between accurate product information and price comparison.

According to ROI.com.au (2008) “Shopping or price comparison websites are a type of web directory with many hundreds of product listings that allow consumers to search and compare products across different categories. These comparison sites provide product listings from a wide range of retailers, together with product prices, product descriptions (including their photograph) and consumer reviews.” Price comparison sites utilize search engines in a broadly similar way: users enter a query into the system by typing search terms into the search box, and then the engine will list all the relevant products from a number of merchants.

There are several different technologies which support a comparison-shopping engine’s operation. Conventionally it brings the data together directly from the retailers, the businesses who want the sites to include their products, offer the product lists actively, and these lists are then used against the database (ROI.com.au, 2008). The second way is to ask the third-party company to collect and consolidate the “data feed file” from the different retailers and then the comparison-shopping sites import
these data feeds. The data feed files are a cluster of data which are in a well format, ensuring the shopping engine gets the information faster and more easily (Roboshopper.com, 2007). However, there are also some weaknesses. Firstly, the data feeds might not have a uniform format with different price comparison using different ones. Secondly, the data feeds are offered by the merchants themselves, so they are only updated when the merchants do so. As a result, the data feed file might not be consistent with the one on retailer’s websites in some situations. Also, in many cases, the merchant only includes the most popular or the profitable products thus reducing the coverage of information.

The most comprehensive method that price comparison sites employed is using the robot program “crawler” to scan retailers’ webpage and extract product information, as happens with a traditional search engine. The crawler function first manually gives the robot program some particular URL links to obtain and the robot will then find the chosen web pages and save them into the store saver. Furthermore, the crawler will scan the web pages, find more URL links within, and repeat the entire process. This is the mechanism that allows crawlers to construct the scale of their crawling (Brin and Page, 1999). However, the main difference between comparison-shopping engines and traditional search engines is that instead of scanning the entire Web, comparison-shopping engines only scan online-shopping websites.

Besides crawling, information extraction is also an important technique adopted by price comparison sites. Information extraction refers to identified and collected specific pieces of information within the raw material (Cowine and Lehnert, 1996). From the price comparison sites’ perspective, it is used to locate the product information within retailers’ web pages. Usually, those online shopping websites have
their special format for presenting products and every product web page is generated with the format by obtaining the data from the database. Hence, in order to get the proper information, the first priority is to extract those structured data from those web pages. According to Arasu and Garcia-Molina (2003), there are two kinds of methods for extracting data from web pages: one is Wrapper induction and another is Automatic extraction. Wrapper induction is a program that can extract and analyze useful information from the web pages and is used by comparing shopping engine. However, in creating a wrapper, human input is required to establish the rules of the template in advance (Hammer et al., 1997). The alternative is that instead of constructing a pattern of the template, human input can be used to identify the position of data in a small amount of a web page, and a training example of this can be generated to provide knowledge of the template (Arasu and Garcia-Molina, 2003)

2.3. The evaluation methodology of usability

2.3.1. Expert (Heuristic) evaluation

Heuristic evaluation uses expert evaluation by, for example, hiring a group of people who are the specialists with plentiful experience in interface design or human psychology analysis or both. Those “experts” use not only their own professional knowledge but also usability guidelines to evaluate the targets and further identify the defects within the interface.

The usability guideline which is adopted here is “Heuristic”. Heuristic evaluation was first addressed by Nielsen in 1990, and it is simply the “rules of thumb” that describe the fundamental characteristics of any type of user interface. Version 1.0 of heuristics is listed below (Nielsen, 1993):

- Simple and Natural Dialogue
- Speak the user’s language
- Minimize user memory load
- Be consistent
- Provide feedback
- Provide clearly marked exits
- Provide shortcuts
- Provide good error messages
- Prevent errors
- Help and documentation

Four years later, after refining the heuristics on the basis of the investigation of 249 usability problems, Nielsen (1994b) published a revised version which has been extensively employed in both usability design and domain evaluation since then:

- Aesthetic and minimalist design

The unallied information should not appear in the dialogue, any irrelevant information will diminish the visibility of the other relevant units.

- Match between system and real world

Rather using the language, phrases, concept which is close to the real world situation, than the system specialise terms.

- Recognition rather than recall

Do not rely on users’ memory, the instruction or information should be retrievable if
it is necessary.

- **Consistency and standards**

  The words, actions, and situations within the system should not have different representations.

- **Visibility of system status**

  Moderate notification should be offered to remind or warn users at the right moment.

- **User control and freedom**

  Based on respecting users’ free will, allowing them to leave, redo, or undo during every state.

- **Flexibility and efficiency of use**

  Interfaces should be designed for both inexperienced and experienced users. Clear instruction should be given but users should also be allowed to make efficient actions. *Help users recognize, diagnose, and recover from errors*

  The error messages should be obvious, easy to understand, and clearly state the solution.

- **Error prevention**

  Better than offering clear error messages, is to prevent the occurrence of the errors in the first place, by for example, requiring further confirmation from users before crucial actions.

- **Help and documentation**

  The help documentation is still essential even for a well designed system. It should be
designed to cater to a user’s task, and be located somewhere noticeable.

According to Kantner & Rosenbaum (1997), the strengths of heuristic evaluation are that no special laboratory or equipment is needed, the diagnosed scope is broad, and it is easy to locate the obvious problems before laboratory testing takes place. On the other hand, one of the main problems with expert evaluation is that many of the evaluators are not actual users, so do not always accurately reflect all of the problems that users might encounter. In addition, evaluators control the effectiveness of the evaluation by their expertise and the subjectivity, when usability specialist lack of the specialise knowledge of testing targets; the evaluation results might be affected. Human factors are another concern with heuristic evaluation. An example would be that interface developers often strongly defend their designs, and might not accept the results of heuristic evaluation.

2.3.2. Observational evaluation

Observational evaluation is undoubtedly an important usability method, not only for task analysis in the early design stage, but also for obtaining usability information from the operated system (Diaper, 1989). The evaluation usually takes place with real or potential users, hence observational evaluation is also known as “User Evaluation”. As implied by the name, observation evaluation involves unobtrusively collecting data by observing how users interact with an interface. This kind of evaluation adopts various data collection techniques such as direct evaluation, video recording, software logging, interactive observation and verbal protocols (Preece, 1993). Before conducting a usability test, a test plan should be set up in advance (Kantner, 1994). As he points out, a good test plan should contains the goals of the test, the methodology employed in the test, the requirements of recruiting participant, the testing schedule,
procedure, resource, and the environment as well.

There are many advantages from having an observational evaluation, particularly when both quantitative and qualitative data is gathered which can be used to answer a wide range of questions. More users’ objections can be detected and their evaluations are extremely valuable when making critical decision such as choosing between alternative designs (Kantner & Rosenbaum, 1997).

However, the user evaluation still has some problems. For example, the data analysis can consume a great deal of time and resources, it may be hard to find participants that match the evaluation target, and participants’ awareness that they are participating in an evaluation might affect the results (Preece, 1993).
3. Methodology

In order to achieve the research objectives which were mentioned in the first chapter, this study aims to proceed in light of three aspects: feature comparison, usability test and retrieval performance evaluation. This chapter is going to describe the methodology that is adopted in these different parts.

3.1. Feature comparison

The purpose of this part of the research is to understand what the basic composition of a price comparison site is by comparing the features of different price comparison sites and additionally producing usability metrics for the study.

3.1.1. Experimental Design

3.1.1.1. Research targets

Wingo (2008) published the statistics of how many online shoppers visit a particular comparison shopping engine on a monthly basis in the UK. The statistics are shown in table 3.1.

<table>
<thead>
<tr>
<th>Jan-2008</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Unique Visitors (thousand)</td>
<td>33,254</td>
</tr>
<tr>
<td>Total Internet: Total Audience</td>
<td>51.4%</td>
</tr>
<tr>
<td>Comparison Shopping</td>
<td>17,091</td>
</tr>
<tr>
<td></td>
<td>51.4%</td>
</tr>
<tr>
<td>1 Shopping.com Sites</td>
<td>6,235</td>
</tr>
<tr>
<td></td>
<td>36.5%</td>
</tr>
<tr>
<td>2 Ciao Sites</td>
<td>3,685</td>
</tr>
<tr>
<td></td>
<td>21.6%</td>
</tr>
<tr>
<td>3 Shopzilla.com Sites</td>
<td>3,576</td>
</tr>
<tr>
<td></td>
<td>20.9%</td>
</tr>
<tr>
<td>4 ValueClick Sites</td>
<td>3,436</td>
</tr>
<tr>
<td></td>
<td>20.1%</td>
</tr>
<tr>
<td></td>
<td>Price comparison sites</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>Kelkoo Sites</td>
</tr>
<tr>
<td>6</td>
<td>Shopping.net Ltd</td>
</tr>
<tr>
<td>7</td>
<td>Nextag.com Sites</td>
</tr>
<tr>
<td>8</td>
<td>MSN Shopping</td>
</tr>
<tr>
<td>9</td>
<td>Shop.com Sites</td>
</tr>
<tr>
<td>10</td>
<td>PriceGrabber</td>
</tr>
<tr>
<td>11</td>
<td>COMARESTOREPRICES.CO.UK</td>
</tr>
<tr>
<td>12</td>
<td>Dooyoo Group</td>
</tr>
<tr>
<td>13</td>
<td>Google Product Search</td>
</tr>
<tr>
<td>14</td>
<td>GOCOMPARE.COM</td>
</tr>
<tr>
<td>15</td>
<td>Twenga</td>
</tr>
<tr>
<td>16</td>
<td>DoorOne Sites</td>
</tr>
<tr>
<td>17</td>
<td>Kelkoo Shopping on Yahoo!</td>
</tr>
<tr>
<td>18</td>
<td>SHOP-FOCUS.COM</td>
</tr>
<tr>
<td>19</td>
<td>Yahoo! Shopping</td>
</tr>
<tr>
<td>20</td>
<td>MOBILE-PHONES.CO.UK</td>
</tr>
<tr>
<td>21</td>
<td>BEST-PRICE.COM</td>
</tr>
<tr>
<td>22</td>
<td>AOL Shopping</td>
</tr>
<tr>
<td>23</td>
<td>SHOPPERUK.COM</td>
</tr>
</tbody>
</table>

Table 3.1 Price comparison sites market sharing rate in UK

It can be seen that *Shopping.com* is in first place with 36.5% of the comparison shopping market in the UK; the *Ciao* and *Shopzilla* sites are in second and third place respectively with each owning around 20% of the comparison shopping market. So as to accomplish the purpose of this part of study, the chosen price comparison sites
should be representative enough, thus the first three comparison shopping engines on
the list are the most suitable research targets. In addition to these three sites,
SHOPPERUK.COM, AOL Shopping, and best-price.com, the lowest ranked three sites
on the list, are also selected for inclusion in the comparison set.

3.1.1.2. Research Method

In this part of the study, a competitive analysis (mainly based on Cotler & Goto, 2005)
of the selected web sites was carried out. The analysis was conducted by the
researcher after examining the website in first place on the comparison shopping
engine market sharing list to set up a rough feature list, and then the target websites
were examined one after another against the feature list. When a new feature was
detected it was added to the feature list and eventually, the gathered information was
compiled into a feature grid.

The analysis of the price comparison site proceeded on the basis of two aspects:
1. Design of the price comparison site e.g. its layout, navigation, labels, colour,
   images and video used on the sites.
2. Functionality of the price comparison site, e.g. its search box, sort by function
   capability, product rating etc.

3.2. Usability and retrieval performance evaluation

After reviewing and examining the adaptability of the usability evaluation
methodology, this study decided to employ the user-oriented approach to identify the
usability problems with the two price comparison sites, and also actual efficiency and
effectiveness of the research targets. This part of the study evaluated both the usability
and the retrieval performance of the comparison shopping engines.
3.2.1. Theoretical Framework

The scenario-based analysis methodology was adopted for the aspect of usability. Levi and Conrad (1997) stated that “A scenario-based usability test involves presenting representative end-users with scenarios, or specific tasks, designed to cover the major functionality of the software system and to simulate expected real-life usage patterns.” Consequently, the researcher can obtain the necessary information for identifying the problems through observing users completion of the predetermined tasks. Additionally, in the ISO 9241-11 (1998), usability was described and defined as efficiency, effectiveness, and satisfaction; thus the chosen price comparison sites were examined and compared in terms of these three usability measures. First efficiency was measured with the time that participants used on the task; secondly there were several ways to present the effectiveness of aspects of usability, e.g. the number of features that participants use to accomplish the task, and the successful completion rate of the task. In light of the characteristic of the price comparison site, the number of search terms that participants employed to achieve task could be included as well. Amongst all these consideration, this study chose to measure the successful task completion rate and the number of search terms which were used to measure the effectiveness of the price comparison sites’ usability; lastly, a post session questionnaire has also been employed to gather users’ satisfactions with the research targets.

Meanwhile, this study also measures the retrieval performance of the chosen price comparison sites. The methodology of this part of the experiment was partially developed on the basis of the Su’s (2003) user-oriented evaluation model of web search engines in “A Comprehensive and Systematic Model of User Evaluation of Web Search Engines: I. Theory and Background”. Su’s model contains two categories
of measures and criteria: a) performance measures; b) non-performance measures. Nevertheless, since this study only focuses on the performance of price comparison sites retrieve information from the World Wide Web, thus just one of the “Relevance” criteria in the performance measures of Su’s model was met. Another criterion which was occupied in this study is the “Coverage”, as the main use of a comparison shopping engine is to generate a price list of a specific product from different online retailers, thus the numbers of the finding merchant is crucial. For this purpose, the coverage was also taken into account in this study.

3.2.2. Data collection, types of data, and data instruments

With the purpose of extracting information from the testing, both quantitative and qualitative data collection methods were used. Quantitative data helped to describe the participant profile, measure the usability and retrieval performance of the price comparison sites, and users’ satisfaction levels. On the other hand, qualitative data focused on the interaction between the web site interface and the user. As a result, the types of data used are: questionnaire data, observation data, and screen recording.

3.2.2.1. Questionnaire

Two kinds of questionnaire were used in this study. The first is the participant profile questionnaire which was used to gather participants’ relevant characteristics and experience before the experiment started. The second questionnaire was used during the experiment and also after the participants finished the experiment. This questionnaire helped to measure the retrieval performance and understand the satisfaction level of the participants with the interface. Three types of questions were employed in the questionnaires: Boolean questions (checklist that gives options), 7
point Likert-scaled questions, and open questions for participants to fill in without obligation.

3.2.2.2. Observation note

In the qualitative part of this project, observation notes were taken during the experiment due to the user evaluation approach that was employed in this study. The purpose of taking notes was to monitor and record the specific aspects of the participants’ behaviour, such as the strategy of completing tasks, the problems that the participants encountered, and any unexpected actions. These notes helped to generate the hypothesis and interpretation of users’ behaviour and construct the usability problem lists later on.

3.2.2.3. Screen recording

Along with the observation notes, simultaneous screen recordings also took place through using screen-capture software. Screen actions were recorded from the clickstream of how participants interacted with the web sites, something which also allowed for the capture of quantitative data such as the number of terms that user used to search and time used to accomplish the task. Last but not least, the recording provided documentation as well.

3.2.3. Experimental Design

3.2.3.1. Experimental Scenario

This study engaged the user-oriented approach to evaluate the usability and the retrieval performance of the chosen price comparison sites. Two (2) price comparison
sites were evaluated to identify the existent usability problems: Shopping.com and best-price.com. Sixteen (16) participants were recruited to accomplish the task. Each participant was observed separately. The pre-session questionnaire was used to gather participants' personal information before the experiment started. In the testing, each participant had to accomplished two (2) of the five (5) tasks on each price comparison site. After participants finished a task there were retrieval performance questions for them to fill in. The task was assigned crossly against the participant. Each participant completed these tasks on the price comparison sites that were previously set by the observer. A different shopping engine opened each time when the participant finished all the tasks. The participants would instruct to accomplish the tasks as they would normally do in their life. Observation notes were taken during the usability test at the same time the screen recording was carried out to record the clickstream. The test was finished after a participant completed all the tasks and the retrieval performance questions. After the test finished, a post session questionnaire was given for participants to fill out.

3.2.3.2. Research Targets

It can be seen from the table 3.1; Shopping.com owns 36.5% of the comparison shopping market in UK. At the other end, SHOPPERUK.COM barely has 2% of the market. For the research objective described in the previous chapter, which aims to find the correlation relationship between the market share and the actual performance, Shopping.com and the SHOPPERUK.COM seem to be the best set for comparison, but the competitor analysis shows that the SHOPPERUK.COM doesn’t have the full set of features that Shopping.com has. Therefore, as these two websites could not be compared equally, best-price.com was chosen to replace SHOPPERUK.COM as the
*best-price.com* had the same functionalities as *Shopping.com*, and the similar market share as *SHOPPERUK.COM*.

3.2.3.3. Participants

According to Nielsen (2000), five test users are enough to catch 85% of the usability problem on any web site. However Spool and Schroeder (2001) argued that after five users participated in their study; approximately 35% problems are still undetected. Therefore this study decided to recruit sixteen (16) participants to enhance the effectiveness of the usability test.

The tests in a user evaluation should be the real or potential users, thus the participants in this study can be defined as “People who do their shopping online and want to get cheaper price by comparing several online suppliers”. In orders to sort out the qualified participants, two questions are asked before the conducted.

“Have you ever shopped on the Internet?”

“Have you ever used price comparison sites before?”

First question can help to recognize the potential users and the second one can tell the real users.

3.2.3.4. Task Design

The tasks in a usability test should accurately represent the actual use of the system. Likewise, the tasks should ideally cover all of the features of the interface and the tasks should also be slightly difficult but still achievable in the certain time (Nielsen, 1993).

Based on the rules above and the price comparison sites characteristics, the test tasks were established as shown in the following table:
<table>
<thead>
<tr>
<th>Task</th>
<th>Task Description</th>
<th>Task Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Please find the cheapest mp3 player which can contain at least 500 songs and has FM radio. Afterwards view the product information of the chosen item.</td>
<td>This task covers searching, a vital feature of the price comparison site. Participants were given the required feature(s) of a target product but not the brand or model. Participants were also asked to find the cheapest one, in addition to viewing product details.</td>
</tr>
<tr>
<td>2</td>
<td>Please list the mobile phone “Samsung Tocco” on both the O2 and Orange networks on a 18 month contract, and then narrow it down to only £35 tariffs.</td>
<td>This task simulates the situation where a consumer has already some particular product in mind, but wants to compare the offers of different retailers under certain conditions. This task covers the use of a feature list and a refined search box.</td>
</tr>
<tr>
<td>3</td>
<td>Please find all the “Bosch” brand products in the “Ovens” category only by browsing, and then view the information from one retailer who has 4 star rating.</td>
<td>This task was designed to test the usability of another vital feature of comparison shopping engine - browsing categories and also the finding of the online merchants’ rating and information.</td>
</tr>
<tr>
<td>4</td>
<td>You want to buy a book by “Khaled</td>
<td>This task was designed to</td>
</tr>
</tbody>
</table>
examine how well users use these two sites to achieve the regular shopping steps by using price comparison sites.

<table>
<thead>
<tr>
<th>3</th>
<th>Hosseini” which is about a boyhood friendship destroyed by jealousy, fear, and the kind of ruthless evil that transcends mere politics. Find it, check the stock, and purchase it.</th>
<th>Price is an important factor in customers’ use of comparison shopping engines alongside the comparison environment. Thus, this task tested the usability of setting the price range and making a comparison between two products.</th>
</tr>
</thead>
</table>
| 5 | You want to buy a laptop with a 13.3 inch screen. You don’t have any preferences, but you want the price to be between 600-800 pounds. Please find any two to compare their features. | 3.2.3.5. Retrieval performance measures

Two types of retrieval performance criteria were employed in this study. One is “Relevance”, and the other is the “Coverage”. According to Su (2003:1184), relevance is defined as “the degree of correspondence between a retrieved item (or a hit) and the user’s information, need or problem as judged by the user”. Su (2003) used three-point scale (RELEVANT, PARTIALLY RELEVANT, and NOT RELEVANT) to determine the relevance of the retrieval results. These three points on the scale were described as below:

RELEVANT (R): Any retrieval result that is directly related to the given tasks’ goal on the basis of the information it provides and the judgement of the participants.
PARTIALLY RELEVANT (PR): Any retrieval result that is only somewhat or in part related to the given tasks’ goal on the basis of the information it provides and the judgement of the participants.

NOT RELEVANT (NR): Any retrieval result that is not at all related to the given tasks’ goal on the basis of the information it provides and the judgement of the participants.

Based on this three-point scale, the measures were established as follows:

Measure 1.1: Precision ration #1 (P1): Su (1991) illustrated the precision as “the proportion of the retrieved documents or references that are relevant”, thus P1 represent the proportion of R and PR items among the first 20 items retrieved by the comparison shopping engine.

\[
\text{Precision ration #1 (P1)} = \frac{\text{Relevant items (R) + Partially Relevant items (PR)}}{20}
\]

The reason for choosing 20 as the number of the items taken into account was based on the study “A comparative study of web search service performance” (Ding & Marchionini, 1996).

Measure 1.2: Precision ration #2 (P2): P2 represents the proportion of R items among the first 20 items retrieved by the comparison shopping engine.

\[
\text{Precision ration#2 (P2)} = \frac{\text{Relevant items (R)}}{20}
\]

P2 doesn’t consider partially relevant items was because when the end-users have to comment on the satisfaction of interactive information retrieval system, those partially relevant items are not of concern to the users (Su, 1991).

Measure 1.3: Relative recall (RRC): originally, absolute recall is described as “the proportion of the relevant documents or references in the databases that are retrieved” (Su, 1991). However, due to the wide range of World Wide Web, it is hard to judge all the relevant items there. As a result, Su (2003) proposed “relative recall” to
measure the proportion of R and PR items in the first 20 items of a search engine’s results list among the whole R and PR items in the first 20 items of the test targets’ results lists, subsequently estimating the absolute recall:

Relative recall (RCC) = \( \frac{(R+PR) \text{ retrieved by a price comparison site}}{(R+PR) \text{ retrieved by all price comparison sites used}} \)

Another criterion is the “Coverage”, since a major function of the price comparison site is to find the cheapest price of one specific product from various online merchants, thus it is important to know how widely a price comparison site can cover the World Wide Web.

Measure 2.1: The number of merchants retrieved by the price comparison sites:
In this measure, participants recorded the number of merchants that were retrieved by the price comparison sites on a specific product. This measure helps to identify the effectiveness of the price comparison site. This was measured after participants finished the goal of the task and they filled out how many retailers that the shopping engine retrieved for the product.

3.2.3.6. Satisfaction level measures

This part of questionnaire consisted only closed questions. The close questions were used to understand participants’ satisfaction levels with the interface.

The questions were based on “Heuristics for the Web” which covers four major perspectives of a website; Content, Navigation, Interaction, and Layout.

3.2.4. Test Environment

The test took place in the group room of University of Sheffield’s Information Commons Library. The hardware used was an ASUS A8Jr laptop with CPU 1.8GHz, 2G Ram, 120GB Hard disk and wireless network in the Information
Commons library. The software used in the experiment included Microsoft Windows VISTA for the operating system, Microsoft Internet Explorer 7.0 for a web browser, and Camtasia Studio 5 for the screen recording.

### 3.2.5. Test procedure

1. Welcome participants
2. Briefly survey participant’s basic information (See Appendix 1)
3. Three Minutes were given to participants to explore Shopping.com
4. Participants complete the selected tasks on the Shopping.com (See Appendix 2)
5. Have them complete the retrieval performance measure after each finished task
6. Participants fill out Shopping.com’s satisfaction questionnaire (See Appendix 3)
7. (7.-10 same as 3.-6 above, but for best-price.com)
8. Three Minutes were given to participants to explore the best-price.com
9. Complete the given task on the best-price.com (See Appendix 2)
10. Fill out the retrieval performance measure right after finished each task
11. Fill out the satisfaction questionnaire of best-price.com (See Appendix 3)
4. Results and Analysis

This chapter includes two parts of the data analysis. The first part is the competitor analysis between the six chosen price comparison sites; the second part analyses the quantitative and qualitative data from the usability test and the retrieval performance evaluation.

4.1. Competitive analysis

The analysis of each selected site is presented ranked in order of the price comparison sites’ market share.

4.1.1. Shopping.com

Shopping.com has the greatest market share of the comparison shopping engines in the UK. Picture 4.1 is the homepage snapshot of the Shopping.com.
Picture 4.1 Homepage of Shopping.com
4.1.1.1. **Design of Shopping.com**

The homepage of Shopping.com is simple and clear. The important “Search” feature is placed in an obvious position on both the top and bottom of the page. The category list is placed on the left, and the most popular categories are set apart from the others and placed at the top of the page. In the middle is an advertisement for a sale promotion.

4.1.1.2. **Functionality of Shopping.com**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search box</td>
<td>This is the major feature of a price comparison site helping shoppers find products quickly and precisely.</td>
</tr>
<tr>
<td>Recent searches</td>
<td>This function provides the information of the previous search terms, assisting shoppers with a quick review.</td>
</tr>
<tr>
<td>Shop by category</td>
<td>This classifies all the searched products into various categories for customers.</td>
</tr>
<tr>
<td>Flash Ad.</td>
<td>The site has an advertisement that uses Flash technology.</td>
</tr>
<tr>
<td>Promotion of popular items</td>
<td>There is an area specially built to present the more popular items on the site.</td>
</tr>
<tr>
<td>Shop by brand</td>
<td>Users can use a product’s brand as the first access point for product browsing.</td>
</tr>
<tr>
<td>Store information</td>
<td>The sites provide the merchants information, such as customer service details, contact information and descriptions of payment methods</td>
</tr>
<tr>
<td>Company information</td>
<td>About the history, operation, and contact information.</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Merchant channel</td>
<td>A platform for merchants to login, and keep the product information up-to-date from retailers’ data feed.</td>
</tr>
<tr>
<td>Merchant directory</td>
<td>The site organizes all the merchants that collaborate with the company into a directory for customers to easily obtain reviews and merchant information.</td>
</tr>
<tr>
<td>Help instruction</td>
<td>Information about how to use the site and the frequent Q&amp;A.</td>
</tr>
<tr>
<td>Price range</td>
<td>When searching for a product, there are some pre-set price range options, or the user can input the range themselves.</td>
</tr>
<tr>
<td>Brand</td>
<td>When customers type the search term into the search box, the results can be classified and displayed by brand.</td>
</tr>
<tr>
<td>Sort by</td>
<td>The results can be sorted and displayed through “Best match”, “Price”, “Product rating”, “Store name”, and “Store rating”.</td>
</tr>
<tr>
<td>Showing</td>
<td>The numbers of items that should be displayed on one page.</td>
</tr>
<tr>
<td>Additional feature</td>
<td>The results can be sorted with additional features based on the characteristic of the product that the users are searching for.</td>
</tr>
<tr>
<td>Product image</td>
<td>The image of the product.</td>
</tr>
<tr>
<td>Product description</td>
<td>Brief, but vital information of the product.</td>
</tr>
<tr>
<td>Product review</td>
<td>The site provides customers’ critical reviews of the product.</td>
</tr>
<tr>
<td>Product detail</td>
<td>The full description of products’ details and features.</td>
</tr>
<tr>
<td>Product rating</td>
<td>The average rating of the product by customers.</td>
</tr>
<tr>
<td>Store review</td>
<td>Reviews of the store by customers.</td>
</tr>
<tr>
<td>Store rating</td>
<td>Customers’ average rating of the store.</td>
</tr>
<tr>
<td>Stock information</td>
<td>A simple “in stock”, or “not available” notice for customers to distinguish the inventory information for the product.</td>
</tr>
<tr>
<td>Product Bundling</td>
<td>The same products from different online stores are organized</td>
</tr>
</tbody>
</table>
onto one page for customers to compare the price easily.

<table>
<thead>
<tr>
<th>Compare function</th>
<th>Users are allowed to choose more than one product to compare the features on the same page.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related searches</td>
<td>The site suggests alternatives to customers’ search phrases.</td>
</tr>
<tr>
<td>Product location</td>
<td>Gives the information about the location of the product so users can have an approximate idea of the shipping time.</td>
</tr>
</tbody>
</table>

Table 4.1 Function list of Shopping.com

4.1.2. Ciao

*Ciao* not only assists online shoppers with products price comparisons, but also emphasises the interaction between users. *Ciao* builds up a community platform for customers review products, merchants and even the usefulness of other customers’ reviews. This not only helps with the purchasing decision, but it also gives customers a sense of belonging to the site, thus encouraging them to return to the site more often. Another notable aspect of *Ciao* is in addition to comparing tangible products’ prices; it also covers other domains such as travel information, such as accommodation bookings and even restaurant and the event reviews and recommendations. *Ciao* combines all of this and the price comparison functions together in a new concept.
Picture 4.2 Homepage of Ciao
4.1.2.1. Design of Ciao

*Ciao* puts the search box at the most obvious position of the homepage, as does *Shopping.com*. However, unlike *Shopping.com* which sets the category list on the left side, *Ciao* sets the category list horizontally in the middle of the page. Another noticeable element is that *Ciao* separates the categories of the more popular product out from surrounding text, and places them at the head of the page with a representative image making them even more distinct. Furthermore, the entire site was built based on the colour white, making the site easy to view and read.

4.1.2.2. Functionality of Ciao

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciao list</td>
<td>The list is created by registered members who make suggestions on particular products or topics.</td>
</tr>
<tr>
<td>Product reviews</td>
<td>The site allows registered members to write reviews and evaluate products.</td>
</tr>
<tr>
<td>Reviews photos</td>
<td>When writing a review, authors are permitted to post actual photos of the product, giving other customers a better understanding.</td>
</tr>
<tr>
<td>Review videos</td>
<td>In addition to photos, authors can also post video clips.</td>
</tr>
<tr>
<td>Similar products</td>
<td>Suggestions for products which are similar to the ones that customers are looking at.</td>
</tr>
<tr>
<td>Auctions</td>
<td>The site not only retrieves the product from the online shops, but also from the online auctions sites such as ebay.</td>
</tr>
<tr>
<td>Help instruction</td>
<td>Help instructions on Ciao are slightly different than other</td>
</tr>
</tbody>
</table>
websites and are presented as a tour, showing customers how Ciao works step by step.

| Gift idea | Another type of advertisement. |

Table 4.2 Functions of Ciao
4.1.3. Shopzilla

Welcome to Shopzilla
1. Compare millions of products and prices from thousands of online stores.
2. Our customer ratings of stores online enable you to make the smartest choice.
3. 18 years helping the world shop online.

Make your resolutions come true
- Link your dreams and turn your resolutions into a reality. If your bedroom is boring and drab, home-furnishings equipment and healthy, natural improvements can make it all come true.
- Outdoor equipment
- Kitchen equipment
- Bathroom equipment
- Bedding equipment
- Office equipment
- Personal equipment
- See all health & beauty supplies

Women’s fashion for this season
- Treat yourself to a new look. Beat the crowd and the weather by shopping for stunning dresses, shoes & bags here.
- Women's dresses
- Women's bags & accessories
- See all women's clothing

Enjoy the latest movies with a brand new DVD player
- Let us help you find the best deal on the right DVD player, for everyone in your family.
- Portable DVD players
- Touchscreen DVD players
- Baby DVD players
- See all DVD players

Winner sports clothing and equipment
- Whether you’re going to the Allen for soccer or enjoying rugby or cricket at the local club, have fun in the fresh air with great winter sports equipment.
- Winter equipment
- Rental equipment
- Running equipment
- See at www.misfolia.com

Upgrade to a new printer
- Don’t let your work down with a poor-quality printer. We have a full range of laser, bubble jet, Bluetooth, infrared, inkjet, and laser printers.
- LaserJet printers
- Bubble jet printers
- Canon Printers
- See all printers

Stride through the puddles in new boots or shoes.
- Whether you’re looking for boots or shoes, go hiking, or out on the town in, dishes through for our great selection.
- Hiking boots
- Running shoes
- See all men’s shoes

Fantastic offers on washing machines & tumble dryers
- This is the place to find a bargain on new washing machines & tumble dryers. See our latest collection.
- Washers
- Dryers
- See all washing machines & tumble dryers

Picture 4.3 Homepage of Shopzilla
4.1.3.1. Design of Shopzilla

One of the good designs features on the Shopzilla site is that when a user clicks on the “More” label of the additional features, instead of refreshing and opening on the same page like other sites, a new window appears and more options are there for users to select from. After the users click on one of the additional options, they return to the original page. Another good design feature of Shopzilla is that on the product sale page it displays information such as stock, store rating, and price separately, unlike some other sites which try to put all the information together. Although this affects the way the site looks, it allows users to easily find the information they need to make a decision.

Picture 4.4 The price comparison page of Shopzilla
### Functionality of Shopzilla

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shop list</td>
<td>Users can add desired products to a shopping list for retrieving later and users can also compare their attributes and features.</td>
</tr>
<tr>
<td>Enlarge photo</td>
<td>The product image can be enlarged for a better view.</td>
</tr>
</tbody>
</table>

Table 4.3 Functions of Shopzilla
4.1.4. best-price.com
4.1.4.1. Design of best-price.com

Reflecting the way the online forum has become one of the vital sources for buying information in the online shopping environment, best-price.com tries to combine the online forum and the price comparison together. Their vision that online shoppers can stay in one place on their site at the both information gathering stage and the actual purchasing stage clearly has advantages, but the way best-price.com actually does this has many problems. The first issue is that some of the ambiguous and uninformative labels are contradictory and may make users confused about the meaning behind the labels. For example, it is difficult to tell the difference between “review”, “group” and the “forum”. This may be particularly true for the label “groups” for users who are fresh or unfamiliar with this site and who may not be able to separate it from the words which might be suggesting something similar to them. Another problem with the site is the unclear category. The purpose of a category is to enable comparison shopping engine users to browse the products as well as searching for them. Therefore in many consumers’ minds, the category should only include items for purchase and nothing else. However, best-price.com has a category named “shopping” which contains not the products that are unrelated to this topic but actually refer to online shops instead. In the same way, Alternatively, Shopping.com uses the “merchant directory” to present similar information and it is put at the bottom of the homepage, potentially leading to less confusion than the way it is presented on best-price.com.

Overall, Best-price.com has many outstanding features which allow users to make purchasing decisions, however the design of the site does not necessarily support the features very well.
### 4.1.4.2. Functionality of best-price.com

<table>
<thead>
<tr>
<th>Features</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forum</td>
<td><em>best-price.com</em> provides an online forum to let registered users express and share opinions different products.</td>
</tr>
<tr>
<td>Group</td>
<td>A “Group” teams up website members with the same interests in a particular product. The group members can exchange information and opinions with other members.</td>
</tr>
<tr>
<td>Actual product images</td>
<td>Members of the best-price.com are permitted to upload the actual photos of the products as well the default image provided by the best-price.com.</td>
</tr>
</tbody>
</table>

Table 4.4 Functions of best-price.com
4.1.5. AOL shopping

Picture 4.6 Homepage of AOL Shopping
4.1.5.1. **Design of AOL shopping**

*AOL shopping* places two major functionalities for searching and browsing in two different positions on the homepage: the search box is on the top right corner, and the products shopping category is on the left-hand side, reflecting the most common layout on price comparison sites.

The menu for the categories works so that when a category is clicked, sub categories extend from it in the area which is circled in red in picture 4.7.

![Picture 4.7 Category list of AOL Shopping](image-url)
It can also be seen from picture 4.7, that after access to the category, most of the page is taken up by advertisements of the suppliers. With only three items listed on the bottom of the page, it would seem that the priority of the AOL shopping is to focus on advertisements rather than merchandise browsing.

Picture 4.8 The product comparison page of AOL shopping

In the page of search results shown in picture 4.8, the additional features options are placed on the left. The product image, product name, brief product description and the product price are displayed horizontally, and the different products are separated by the frames.
When it comes to the price comparison page, the description is on top along with the image of the chosen products which is set up by the AOL shopping, and below after that are the offers from different online shops which are listed vertically and separated by the frames.

In general, it seems that the design of the AOL shopping is adopted from the shopping.com since they have partnership, and also because AOL shopping is an additional feature of the major portal site AOL (American Online), the design appears to come from the original site as well.

The navigation of AOL shopping can be primarily divided into two parts. The first part is about category selection. It can be seen from the picture that when a category is selected, it changes to darker colour helping users easily recognise which category
they have selected. Additionally, there is also a reminder of where the user is on the top of the page, listed with the hierarchy of the category as the circled area in picture.

Nevertheless, there is one problem with the consistency of the labels. It can be seen from the circled area of picture 4.11 that the first category name is “Digital Camera”, but in fact the label name on the category list is “Cameras and Camcorders”. This contradicts one of the usability heuristics “Consistency and standards” (Nielsen, 1994), and the idea that all the information within the site should consistent to avoid users’ misunderstanding and confusion.

Another design issue is that users may believe that the website logo represents a way of linking to the homepage of the site. In this case, the logo represents the homepage of the AOL portal and not AOL shopping. Users may waste time clicking on the logo in an attempt to go back to the shopping home page, something which achieves nothing.
4.1.5.2. Functionality of AOL Shopping

As AOL shopping is provided by Shopping.com, the functionalities are very similar to those on Shopping.com. The one significant difference to other competitors is that originally AOL was a portal site, thus some of the functionalities are adopted from the portal, such as the web, image and video searches.
4.1.6. ShopperUK.com

Picture 4.12 Homepage of ShopperUK.com
4.1.6.1. Design of ShopperUK.com

The site of the ShopperUK.com is based on a primarily purple colour-scheme. Although the colour seems attractive, actually it might actually visually overload the users with so much strong colour. The special effects of the labels on the top of the homepage may also affect the ease of readability.

The position of the search box and the category list follow the conventional type of price comparison site with the search box on both the top and the bottom, and the category list on the left hand side. The rest of the area is taken up with promotion of the products. Another problem that can be seen here is that the category list is too long causing the page to become hard to read in full-scale.

In addition, the search results are presented in a sequence from the top to the bottom with every unit separated by a frame. On the left side of the frame is the product image, in the middle is the product description, and the price is on the right which can as seen in picture 4.13. Another potential problem here is that the delivery cost is put under the description but not under the price, possibly causing consumers confusion.
and to miscalculate the total price of the product.

![Picture 4.14 The search box of ShopperUK.com](image)

For these reasons, the navigation of the ShopperUK.com is less well designed than some of the other sites seen so far. In addition, users are not allowed to change the category freely under the hierarchical menu. The only way that users can discriminate the current category from other categories is rely on the search box options as shown in picture 4.14. However, this form of navigation can only be used with the search results and if the user browses within the category then the navigation indicator will not work.

**4.1.6.2. Functionality of ShopperUK.com**

For its shopping comparison, *ShopperUK.com* only adopts the search function has no category browsing, nor any other additional features. Instead, *ShopperUK.com* gathers a great number of online shops and categorises them into directories on the basis of the characteristics of their merchandise. The selected items are not only the tangible products, but also financial services such as insurance, mortgages, and the tourism related products such as accommodation booking, flight tickets etc. Even though it is a good attempt to group various online retailers together in one convenient place, it means that *ShopperUK.com* becomes more like a portal for other sites than a traditional price comparison site. Another finding here is that besides being able to search within *ShopperUK.com*, users are can also search on Web too from the site. Nevertheless, the search outcomes are not like the usual results of a search engine. The first few items are still the products that related to the search term, but the rest are
links that retrieve further information from the Web. The question is that it is one of
the search mechanism that price comparison sites crawl on the Web to retrieve the
related products, In this way, ShopperUK.com it separates the product search and the
web search.

4.2. Usability and retrieval performance evaluation

4.2.1. Introduction

In this study, total sixteen users participated in both the usability and retrieval
performance evaluation experiments. All of the participants completed the
experiments and returned the questionnaires. In this part of the chapter, the
participants’ profile is first presented, and then both the qualitative and quantitative
data of usability and retrieval performance are presented and analysed.

4.2.2. Participant’s profile

Each participant’s profile is divided into several parts on the basis of the
characteristics of the questions. The first two questions are related to personal
information. The third question is about their computer and internet knowledge.
Questions four to five focus on their shopping experience and shopping frequency on
the internet. Question six to ten investigates the experience and frequency of
comparison shopping engine use by the participants.

4.2.2.1. Personal information

Among the sixteen participants, eight were male and eight were female. Eight of them
were between twenty one to twenty five years of age, seven were between twenty six
and thirty, and one of the participants was over thirty. All of the participants had more
than five years experience of using the Internet.
4.2.2.2. *Shopping experience on the Internet*

According to one of the conditions of the usability test, all of the participants who took part had experience of online shopping. According to their estimated averages, seven of them shop online once per month, four every three to six months, and the remaining five no more than once per year.

4.2.2.3. *The experience of using price comparison sites*

Interestingly, even though all of the participants have experienced online shopping before, only six have used price comparison sites before and the of other ten participants who have never used such sites, five of them had never even heard of a comparison shopping engine before.

In addition, among the six participants who have had the experience of utilising a price comparison site to assist their shopping decision, three of them used the site about once a month, two every three to six months, and one every seven to twelve months. However, even if they had previously used a shopping engine, none of them had used either Shopping.com or Best-price.com.

4.2.3. *Quantitative data analysis*

The method used for evaluating the usability of comparison shopping engines was based on the task analysis, in order to avoid any possibility of affecting the results of the experiment, nine of sixteen participants’ operating tasks were assigned differently. For example, if a participant was assigned task 1 and task 2 for *Shopping.com*, then two other tasks which were different from task 1 and 2 were assigned for *best-price.com*. In contrast, if six participants were assigned an overlapping task: two did the same two tasks on both *Shopping.com* and *Best-Price.com*, and other four did
just one. Subsequently, for the pilot, the first participant was asked to do all five tasks on both of the two targets.

Moreover, for the purpose of covering all the tasks, the chosen tasks were cross allocated to the participants. The status of task allocating can be seen from the Appendix 4. By sorting the number of times that each task was executed on two price comparison sites from the table, it can be seen that each task was allocated equally for a total of seven times.

4.2.3.1. Efficiency

Task 1: Please find the cheapest mp3 player which can contain at least 500 songs and has FM radio. Afterwards view the product information of the chosen item.

The intention of this task focuses on locating the product with certain limited conditions without giving the specific search term and also the checks the ability of obtaining the product information.

The minimum, mean and the maximum time that it took each participant to accomplish task 1 on each site is shown in the figure 4.1 below.
It can be seen from the figure 4.1 that there was no significant difference between the two sites for the minimum and maximum time it took to accomplish the task, (the difference was less than one minute). However, for best-price.com, the time was 1.21 minutes less than Shopping.com for the mean, suggesting that when finding and obtaining the product information with these particular conditions, best-price.com allowed for greater speed and efficiency than Shopping.com. In this case, the mean time for task 1 was 9.155 minutes.

Task 2: Please list the mobile phone “Samsung Tocco” on both the O2 and Orange networks on a 18 month contract, and then narrow it down to only £35 tariffs.

This task included several parts. Besides inputing the specific search term, the usability of the feature list and the refine search box to narrow down the search results was also tested. When participants could not finish the task (meaning a measured time
of zero) or when the time was excessively long, they were regarded as outlier data. Therefore, two participants’ tests were removed from this task: one of the participants could not load best-price.com and the other could not find the £35 tariff for the O2 network on best-price.com.

The figure above shows the minimum, mean and maximum times of task 2. It can be seen that the minimum time taken on both sites was very close, but there were large gaps for the mean and max times between two sites (3.89 and 4.83 minutes respectively). This suggests that for using the feature list, best-price.com was faster and more efficient than Shopping.com. The overall mean time of task 2 across two sites was 9.82 minutes.

Task 3: Please find all the “Bosch” brand products in the “Ovens” category only by browsing, and then view the information from one retailer who has 4 star rating.
This task focused on the browsing ability of the price comparison site, and also the way the rating and information of the online shops was presented.

None of the seven participants failed in task three on both sites, thus no data was eliminated. From the figure, although the maximum time on Shopping.com was much higher than best-price.com by almost two minutes, the minimum and mean time measure, shopping.com was clearly superior (in both cases around three minutes). According to this, shopping.com could be considered that it was more efficient on the aspect of browsing products.

Task 4: You want to buy a book by “Khaled Hosseini” which is about a boyhood friendship destroyed by jealousy, fear, and the kind of ruthless evil that transcends mere politics. Find it, check the stock, and purchase it.
This task was designed to test the usability of finding a product with only the
description of the content and one specific search term. In addition, the regular
purchasing pattern was also included in this task.

![Task 4 - Min, mean, max per site](image)

Figure 4.4 Min, mean, and max accomplished time per site on task 4

The figure 4.4 above illustrates that when testing the standard purchasing route,
best-price.com appears to be faster than the Shopping.com by 1.33 minutes.
Nevertheless the maximum accomplished time on best-price.com, the time was
relatively high with a mean time of over ten minutes. This may be explained by the
fact that one participant spent a great deal of time switching between the online shops
in an attempt to find the description about the book without noticing that the product
could be located by using a search function. The rest of the participants all used the
search function in the beginning, making their time much quicker with an overall
mean time of 6.32 minutes for task 4.
Task 5: You want to buy a laptop with a 13.3 inch screen. You don’t have any preferences, but you want the price to be between 600-800 pounds. Please find any two to compare their features.

All of the participants had to locate a product within the given price range and with the specific given feature. Furthermore, they had to compare any two of the qualified products against their features.

![Task 5 - Min, mean, max per site](image)

Figure 4.5 Min, mean, and max accomplished time per site on task 5

This task was the only one where Shopping.com was superior to best-price.com on every measure (even the worst one had a gap of 1.43 minutes on the mean time). For the minimum and maximum time, the difference was 2.42 and 4.25 minutes respectively. This demonstrates that when comparing products, users on Shopping.com were faster and more efficient than when using best-price.com. Moreover, the average time taken for task 5 was 8.56 minutes.
4.2.3.2. Effectiveness

1. Completion rate

Both Shopping.com and best-price.com performed well on the effectiveness of completion rate. For four of the five tasks, the completion rate per site was 100%, meaning that none of the participants failed on finishing those given tasks. On the other hand, there was one task where the completion rate was not 100%. On task 2, participants were asked to list a list of a particular model of mobile phone but for different networks with the same contract month and tariff price. In the evaluation on best-price.com, two participants were unable to complete the task. One failed to complete the task because the site could not be loaded in the middle of the test, and the other participant could not find the specified product and after struggling for 30 minutes gave up. These two participants’ results were not included in the effectiveness measure, and the completion rate of best-price.com on task 4 was 71.4%.

The figure 4.6 below shows the completion rate for each task.

![Completion rate per task](image)

Figure 4.6 Completion rate per task
2. Number of search terms

Figure 4.7 displays the numbers of search terms which were employed by participants to accomplish the task during the test. Task 3 was not included due to the restriction of not using the search function in this task. From figure 4.7, it can be discovered that, on tasks 1 and 5, participants used more search terms on Shopping.com than best-price.com (the two tasks where the tasks had unspecified search terms). In contrast, participants used fewer search terms on average on Shopping.com than best-price.com on task 2 and 4, even though the difference was only 0.6.

4.2.3.3. Satisfaction

The last measure in ISO 9241-11 is satisfaction. A post-section questionnaire was adopted in this study to reveal the satisfaction level of participants with each of the target sites. The questionnaire was structured in accordance with the usability of Web – Content, Navigation, Interaction, and Layout.

The analysis of the satisfaction was split into two aspects. The first aspect focused on
determining if the participant had pointed out the significant positive or negative response to each of the questions. The chi-square analysis was employed in the first part of analysis; p-value was calculated with the expected and the actual values to indicate the significance of positive or negative. For this purpose, the answer options of the questions were categorized to negative or positive in terms of the number: Numbers in the range of 1 – 4 was regarded as a negative response; numbers between 5 – 7 were regarded as positive.

1. Content

The first three questions pertained to the “Content” in the heuristic of the Web: (1) Please rate how well you are satisfied with the language used on the site; (2) Please rate how sufficient the product descriptions are on the site; (3) Please rate how well the product images represents the products on the site. Table 4.5 shows a significant difference with 95 percent and 99 percent confidence levels reported between the expected and actual means on both sites.

<table>
<thead>
<tr>
<th>Question implication</th>
<th>Site</th>
<th>N</th>
<th>Neg</th>
<th>Pos</th>
<th>p-value</th>
<th>.05</th>
<th>.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>The language used</td>
<td>Shopping.com</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>0.0455</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>The sufficiency of the product information</td>
<td>Shopping.com</td>
<td>16</td>
<td>7</td>
<td>9</td>
<td>0.617075</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>16</td>
<td>13</td>
<td>3</td>
<td>0.012419</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>The product image</td>
<td>Shopping.com</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>16</td>
<td>11</td>
<td>5</td>
<td>0.133614</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.5 Satisfaction level of content
At the 99 percent confidence level, neither Shopping.com nor best-price.com was found to rate significantly positive or negative across all three questions. At the 95 percent confidence level, positive or negative responses for all three questions on Shopping.com were not found to be significant. But, for the questions regarding the language use and sufficient levels of product information, the negative rating of best-price.com was found to be significant.

2. Navigation

Question (4): Please rate how well you satisfied with the label description on the site, and question (5): Please rate how well you satisfy with the navigation indicators on the site which are related to “Navigation”. It can be seen from the table that neither shopping.com nor best-price.com had significantly positive or negative results at both the 95 and 99 percent confidence level.

<table>
<thead>
<tr>
<th>Question implication</th>
<th>Site</th>
<th>N</th>
<th>Neg</th>
<th>Pos</th>
<th>p-value</th>
<th>.05</th>
<th>.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Label description</td>
<td>Shopping.com</td>
<td>16</td>
<td>6</td>
<td>10</td>
<td>0.317311</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navigation indicators</td>
<td>Shopping.com</td>
<td>16</td>
<td>7</td>
<td>9</td>
<td>0.617075</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.6 Satisfaction level of navigation

3. Interaction

There was only one question regarding “Interaction”. The question asked participant to indicate the satisfaction level of the given feedbacks by the sites.

<table>
<thead>
<tr>
<th>Question implication</th>
<th>Site</th>
<th>N</th>
<th>Neg</th>
<th>Pos</th>
<th>p-value</th>
<th>.05</th>
<th>.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Given feedbacks</td>
<td>Shopping.com</td>
<td>16</td>
<td>9</td>
<td>7</td>
<td>0.617075</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4.7 Satisfaction level of interaction

Table 4.7 shows that best-price.com had a significant result for the satisfaction level only at the 95 percent confidence level. Notably, Shopping.com was found to have neither positive nor negative results at both the 95 and 99 percent confidence levels.

4. Layout

In the layout part, participants were asked to answer the questions according to the following: (7) please rate how well you are satisfied with the layout of the sites. (8) Please rate how well you are satisfied with the appearance of the sites.

<table>
<thead>
<tr>
<th>Question implication</th>
<th>Site</th>
<th>N</th>
<th>Neg</th>
<th>Pos</th>
<th>p-value</th>
<th>.05</th>
<th>.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layout</td>
<td>Shopping.com</td>
<td>16</td>
<td>7</td>
<td>9</td>
<td>0.617075</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>16</td>
<td>10</td>
<td>6</td>
<td>0.317311</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>Shopping.com</td>
<td>16</td>
<td>9</td>
<td>7</td>
<td>0.617075</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>16</td>
<td>10</td>
<td>6</td>
<td>0.317311</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.8 Satisfaction level of layout

Table 4.8 illustrates that none of the selected sites had a significant negative or positive rating at the 95 percent confidence level, and was the case with the 99 percent confidence level.

5. Overall

The last question was related to the overall satisfaction to the shopping.com and best-price.com which was displayed in table 4.9.
Table 4.9 Overall satisfaction level

*best-price.com* showed a significantly negative response at the 95 percent confidence level for the overall satisfaction.

The second part of satisfaction analysis was comparing each question in accordance with the mean score which was extracted from the participants’ response on the questionnaires against the chosen sites. It is displayed in figure 4.8.

It can be distinguished from the figure 4.8 that Shopping.com had higher scores for all of the questions. Additionally, according to the independent t-test results, it can be seen that question one (t=2.07, p=0.047), two (t=3.898, p=0.001) and six (t=2.341, p=0.026) had statistically significant differences. This is particularly true of question two which is related to the sufficiency of the product information where *Shopping.com* had a mean score of 4.6875, which was the highest difference- 1.75
points higher than best-price.com. For the navigation indicators in question five, although shopping.com still scores higher than best-price.com with 0.4375, it is the lowest of all its scores across all of the nine questions.

4.2.3.4. Retrieval performance measure

Two types of measure were included in this study for the retrieval performance evaluation. The first were the relevance measures and the second is the coverage measure.

Relevance measures:

As previously stated, this study had three relevance measures: 1). Precision ration #1 (P1): the proportion of RELEVANT and PARTIALLY RELEVANT items among the first 20 items retrieved by the comparison shopping engine. 2) Precision ration #2 (P2): the proportion of RELEVANT items among the first 20 items retrieved by the comparison shopping engine. 3) Relative recall (RCC): the proportion of RELEVANT and PARTIALLY RELEVANT items in the first 20 items of a price comparison site’s results list among the wholly RELEVANT and PARTIALLY RELEVANT items in the first 20 items of the two price comparison sites’ results lists. Relevance in this study was determined as “Any retrieval result that is related to the given task’s goal on the basis of the information it provides and the judgement of the participants.”

1. Precision #1

The search targets in the tasks were designed taking into account the popular categories of product that online shoppers purchase online. The implied products
categories were 1) Electronics 2) Mobile phones 3) Kitchen Appliances 4) Books and 5) Computers.

During the test, task 4, which referred to the book category, it was found that the search results total less than twenty items. A requirement of the relevance measures is that input should be divided into groups of twenty, so the search results must number more than twenty to avoid bias. As a result, task 4 was abandoned in this retrieval performance evaluation.

Table 4.10 displays the mean scores of P1 by the price comparison sites across the product genres. It can be seen that Shopping.com generally had higher mean scores (65.83%) on Precision #1 than best-price.com (64.24%). However, according to the results of independent t-test, there was no significance difference (t=0.156, p=0.877) between Shopping.com and best-price.com.

When it comes to the comparison across the product categories in accordance with the shopping engines on P1, although it showed that Shopping.com had a higher score on electronics (73.57) and mobile phones (55.71%) than best-price.com, the independent t-test results again show there is no significant difference in the electronics category (t=0.338, p=0.741), and close but not a significant level on mobile phones (t=2.223, p=0.052). Similarly on best-price.com, there was no significant difference in the kitchen appliance and computer category.

Furthermore, the tukey post hoc comparisons of a two-way ANOVA indicated that the users who searched for kitchen appliances (92.5%) on best-price.com was significantly higher than the mean for Mobile phones (27%).
<table>
<thead>
<tr>
<th>Product Genre</th>
<th>Site</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>Shopping.com</td>
<td>0.7357</td>
<td>7</td>
<td>0.34486</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.6750</td>
<td>7</td>
<td>0.35051</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.7054</td>
<td>14</td>
<td>0.34665</td>
</tr>
<tr>
<td>Mobile Phones</td>
<td>Shopping.com</td>
<td>0.5571</td>
<td>7</td>
<td>0.23705</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.2700</td>
<td>7</td>
<td>0.20797</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.4136</td>
<td>14</td>
<td>0.26123</td>
</tr>
<tr>
<td>Kitchen Appliances</td>
<td>Shopping.com</td>
<td>0.8833</td>
<td>7</td>
<td>0.28577</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.9250</td>
<td>7</td>
<td>0.15000</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.9042</td>
<td>14</td>
<td>0.23094</td>
</tr>
<tr>
<td>Computers</td>
<td>Shopping.com</td>
<td>0.4571</td>
<td>7</td>
<td>0.37907</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.6917</td>
<td>7</td>
<td>0.32622</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.5744</td>
<td>14</td>
<td>0.36193</td>
</tr>
</tbody>
</table>
## Table 4.10 P1 by price comparison sites cross product genres

<table>
<thead>
<tr>
<th>Product Genre</th>
<th>Site</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>Shopping.com</td>
<td>0.6583</td>
<td>28</td>
<td>0.34081</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.6404</td>
<td>28</td>
<td>0.34819</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.6424</td>
<td>56</td>
<td>0.34077</td>
</tr>
</tbody>
</table>

2. **Precision #2**

<table>
<thead>
<tr>
<th>Product Genre</th>
<th>Site</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>Shopping.com</td>
<td>0.2786</td>
<td>7</td>
<td>0.22887</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.225</td>
<td>7</td>
<td>0.31736</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.2518</td>
<td>14</td>
<td>0.271241</td>
</tr>
<tr>
<td>Mobile Phones</td>
<td>Shopping.com</td>
<td>0.2714</td>
<td>7</td>
<td>0.12199</td>
</tr>
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<td></td>
<td>best-price.com</td>
<td>0.1</td>
<td>7</td>
<td>0.10607</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.1857</td>
<td>14</td>
<td>0.141421</td>
</tr>
<tr>
<td>Kitchen Appliances</td>
<td>Shopping.com</td>
<td>0.7417</td>
<td>7</td>
<td>0.40301</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.7125</td>
<td>7</td>
<td>0.33758</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>0.7136</td>
<td>14</td>
<td>0.358391</td>
</tr>
</tbody>
</table>
Table 4.11 P2 by price comparison sites cross product genres

As the table above shows, Shopping.com (39.61%) had a higher mean score overall than best-price.com (30.73%) on P2. However, the difference among the two price comparison sites was not significant (t=1.198, p=0.237) according to the independent t-test result.

Furthermore, the two-way ANOVA revealed the significant effects of both price comparison sites by product categories (F=4.171, p=0.001). Tukey post hoc comparisons indicated that for users who searched for kitchen appliances, the mean for both Shopping.com and best-price.com was significantly higher than all the other three categories.

And for the same category but compared to different sites, Shopping.com overwhelming higher than best-price.com for all categories; but the independent t-test
result indicated that there was no significant differences between them.

3. Relative recall

<table>
<thead>
<tr>
<th>Product Genre</th>
<th>Site</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronics</td>
<td>Shopping.com</td>
<td>0.5506</td>
<td>7</td>
<td>0.5909</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.4409</td>
<td>7</td>
<td>0.5993</td>
</tr>
<tr>
<td>Mobile Phones</td>
<td>Shopping.com</td>
<td>0.6763</td>
<td>7</td>
<td>0.1717</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.3237</td>
<td>7</td>
<td>0.1717</td>
</tr>
<tr>
<td>Kitchen Appliances</td>
<td>Shopping.com</td>
<td>0.5220</td>
<td>7</td>
<td>0.0441</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.4780</td>
<td>7</td>
<td>0.0441</td>
</tr>
<tr>
<td>Computers</td>
<td>Shopping.com</td>
<td>0.3368</td>
<td>7</td>
<td>0.1378</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.6632</td>
<td>7</td>
<td>0.1378</td>
</tr>
<tr>
<td>Total</td>
<td>Shopping.com</td>
<td>0.5214</td>
<td>28</td>
<td>0.1647</td>
</tr>
<tr>
<td></td>
<td>best-price.com</td>
<td>0.4764</td>
<td>28</td>
<td>0.1687</td>
</tr>
</tbody>
</table>

Table 4.12 RRC by price comparison sites cross product genres

The table above indicates that *Shopping.com* had a higher mean rating (52.14%) for
relative recall than best-price.com (47.64%). The independent t-test result showed no significance (t=0.631, p=0.531) in RRC among the two price comparison sites.

When it comes to the same category but different sites, the independent t-test revealed that Shopping.com was significantly higher than best-price.com on electronics (55.06%) and mobile phones (67.63%) in terms of RRC. On the other hand, best-price.com (66.32%) was also found to be significantly higher than Shopping.com (33.68%) for computers.

The wo-way AVOVA indicated that the main effects of different price comparison sites by product genre was significant (F=7.071, P=0.000). Tukey post hoc comparisons to follow the significant main effects of different price comparison sites by product category indicated that, for Shopping.com users, the mean response for electronics (55.06%) and mobile phones (67.63%) was significantly higher than for computers (33.68%). Conversely, for best-price.com users, the result was totally the other way around, with the mean for computers (66.32%) significantly higher than for electronics (44.09%) and mobile phones (32.37%).

Coverage measure:
Another retrieval performance measure is the retrieved coverage for the online shops and the total number of retrieved online retailers for a specific product was taken into account. Unfortunately, during the test, it was discovered that the products retrieved by Shopping.com and best-price.com were exactly the same, which meant there could be no comparison between the sites. Nevertheless, according to the numbers of the retrieved online shops, the comparison could be accomplished between the product categories. The results were shown in figure 4.13.
It can be seen from the figure that there were an average of 8.1 online shops in the kitchen appliance category, which was the most of all the categories. At the other end of the scale, mobile phones had the lowest mean of 1.0. In addition, the one-way ANOVA test results ($F=14.013$, $p=0.000$) showed that the kitchen appliance category had a significantly greater mean compared to the other three categories.

4.2.4. Qualitative analysis

The qualitative data was primarily extracted from observations which took place during the test. After an analysis of the data, the results can be used to point out the usability problems and assist in understanding users’ behaviour patterns when they are operating the system. The results were displayed in terms of the task on each site.
4.2.4.1. Shopping.com

Task 1

A total of seven participants finished task 1 on Shopping.com. Only one accomplished it in the way that the researcher hoped. Surprisingly, more participants browsed for what they were seeking (five) than used a search facility (two). Most of the users knew how to use features on the sites to assist their task, but there were still three participants who did not find a way to sort the results with numbers of songs and the radio feature. Instead, they filtered the manually filtered the conditions by checking the product information one by one.

Presentation problems

- On the comparison page, the listed items ideally should be the same product. However, during the completion of the task, one user found that several listed items were not the same product, again going against the consistency rule in the heuristics of usability. One participant regarded the feature list as an additional function of the site, and did not appear to be concerned with the search results.

- On the price comparison page, even when the product has been arranged by the price, it sometimes did not count as the highest or lowest result as the same product might have different prices.

- During the experiment, a user located a problem with the way a product’s image was not consistent between the one provided by the site and the one from the merchant. In addition, some of the products’ details lack a consistent format and some of the features are missing in different models of the product. This might
affect users’ understanding of the product information.

Interaction problems

- Participant attempted to access the product information by clicking on the product image.
- Participant was confused about why it leads to another site when the product title was clicked.
- Participant attempted to obtain the information just from the summary on the product page.
- Participant clicked on the category navigation link, and attempted to return to the previous page.
- Participant tried to refine the search results, but through the main search box.

Task 2

All seven participants participated in this task. None of the participants failed to complete the task. Additionally there were several notable discoveries, especially in the interaction domain where three of the seven participants wrongly presumed that the “sort by” function was for sorting the tariff price. Furthermore there were also two participants misused the main search box in an attempt to refine the search results.

Presentation problems

- Because of the layout design of the page, the sponsor listing seen in the picture below, can make users disregarded the fact that there are more items below while they are scrolling the browsers.
The additional feature options were not obvious enough to always catch users’ attention. One participant even totally neglected the additional features on the left hand side.

The same product sometimes had an inconsistent product title, for example some of the titles are “18 months”, but the others are “18 mth”, possibly affecting search results.

As shown in the circled area in the picture below, there is no way to narrow down the results, although by using the search box below, the results can still be filtered. The instruction may lead to user misunderstanding.
A user misread the label “x store reviews” (as can be seen from the picture 4.17) for the number of online shops offered for this product.

The label “select more than one” in the picture 4.18 did not clearly represent its function, even though the participant noticed that the contract suppliers’ options, it was not be beheld.
One participant did not notice the tick box of the options, possibly reflecting users’ expectations that the alteration of selecting the “select more than one” label should be in the main frame instead of being on the side.

Interaction problems

- The participant used the main search box to try to refine the search results.
- The participant attempted to use the “sort by” function to sort out the tariff price, without noticing that is for the product price rather than the tariff price.
- The participant assumed that the price range options in the additional features could be used for filtering the results for the tariff price which is used to sort out the product price.

Task 3

Even if shopping.com allows users to shop by brand, only one participant used this feature to accomplish the task. Strikingly, four participants of the total of seven assumed that the online shops’ logo represented access to online shop’s information.

Presentation problems

- Even though there is an option for sorting the items by product rating on the product page, there is no indication, that some products are not rated yet. This might cause confusion with the rating system.
- At times, the category options are not noticeable enough; one of the participants initially chose the product brand first, but after all the products of the brand were listed, she was not aware of the category alternatives which are circled in the picture 4.19 below.
Besides the “See store info” label on the product comparison page, there is an alternative way of accessing store information on the shop review page, as seen in the picture below; nevertheless, none of the participants noticed this, even if some of them actually went to the review page.

On the homepage of the Shopping.com, the categories “Home and Garden” and “Appliances” are listed together (see picture 4.21, 4.22); nonetheless when the “Home and Garden” category was selected, the “Appliance” was included in the “Home and Garden” as well, against the navigation principle for the heuristics for the Web.
Interaction problems

- There was a navigation problem when two participants did not notice that a new window was opened when the product was clicked. As a result, the participant kept clicking on the previous page button to try to go back to the site, not finding out their mistake until sometime later. In addition, three of the seven participants assumed that the online shops’ logo would lead them to the retailer’s information,
but it did not.

Task 4

Presentation problems

- The presentation of the number of the search results is incorrect; it can be seen from the red circled area of the picture 4.23, that there were five items in the total search results of “the kite runner”, but as the categories showed, there were eight items under the “Books” category. Due to this, one participant mistakenly supposed that the results were merely five and didn’t look for further books.

Picture 4.23 Item presentation

- The stock information is short of clarity and detail. As a result, one participant
assumed that the store reviews as shown in picture 4.24 were actually the stock level at first glance and it took a while for the participant to discover the real stock information.

![Picture 4.24 Stock information](image)

- Besides the stock information, a participant also considered thought that the number of reviews in picture was the numbers of how many online stores offered this product.

- Some phrases which were used on the site were too brief for the user to understand. For instance, one participant wondered what the “P&P” in the picture 4.25 below stands for.

![Picture 4.25 P&P description](image)

Interaction problems

- Participants kept clicking on the product title in an attempt to access the product information.
Task 5

During the observation on task 5, some interesting behaviours of users were found. For instance, on the interaction between the user and the site, four of seven participants not only entered the product name or description into the search box, but also the constraints such as the price range given for this task. Another finding was that only four of seven participants spotted and employed the “compare” feature to make the comparison and the other three judged the features of the target by opening both products’ details page in a new window at the same time.

It can be seen from the home page of Shopping.com, that there was a graphic prompt for the popular products. Even though this task’s goal was a laptop which was also included in the promotions section, just one user noticed and used this as the entry for the laptop category.

Presentation problems

- Owing to the fact that different online retailers might have different product images for the same product, some participants misunderstood that the different product images represented a different product.

- The custom price range box is not obvious enough; a participant knew how to use the default price range, but did not notice that the price range can be set up manually. In the end, it took 10 minutes for the participant to spot the custom price range function.

Interaction problems

- Two participants clicked on the compare feature only after ticking one product. It was explained later by one participant that he expected that after selecting one
product, a new window would open and the user would be asked to choose one or more other products for the comparison.

- When it came to comparing two products, the users often hesitated between the “Compare price” and the “Compare” buttons as shown in the picture 4.26 below. Even when the participants chose the “Compare” function eventually, it generally after a great deal of time was spent figuring it out.

![Picture 4.26 "Compare" and "Compare prices" buttons](image)

4.2.4.2. Best-price.com

Task 1

Presentation problems

- During the test, a participant discovered that the number of items has the inconsistent problem. As picture 4.27 shows, the number of items priced below 30 pounds should be nine, but actually there was just one when it was selected and shown on the next page.
Although the participant chose the right category “electronic”, they did not notice that the mp3 player is under the “portable audio” category, even though there is a representative image.

The participant clicked on the “Groups” in the further results as is shown in picture, but they expected further search results, not the results in “Groups”.

Even though the participant chose the label “Catalogue” after the search results was listed, the participant still did not notice the category options, and the attention was on the items below.

The participant was confused about the first and second halves of the search results.

During the experiment, it can be seen that the product information of most of the products is either basic or lacking.

It can be seen from the picture 4.29 that the layout of the product page can be
regarded as two parts. The first half is related to the product review and the second half refers to the online shop offers. However, during the test, most of the users were only aware of the first part and not notice that there was more.
### Picture 4.29 The presentation of product page

**Choosing an MP3 player?** Read impartial MP3 player reviews and decide what to buy. [www.reviews.co.uk/MP3-players](http://www.reviews.co.uk/MP3-players)  
**MP3 Player** Find cheap UK deals on MP3 Players - [www.dealtime.co.uk](http://www.dealtime.co.uk)  
**Buy Portable MP3 Players** Find the lowest prices, Compare UK retailers, get great deals! [www.dealtime.co.uk](http://www.dealtime.co.uk)

<table>
<thead>
<tr>
<th>Picture</th>
<th>Name</th>
<th>Rating</th>
<th>Recommended</th>
<th>Latest review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philips GoGear SA1330 1 GB</td>
<td>4.00/5 (4)</td>
<td>100.00%</td>
<td>Write the first review</td>
<td></td>
</tr>
<tr>
<td>SanDisk Sansa c249 1 GB</td>
<td>4.00/5 (5)</td>
<td>100.00%</td>
<td>Write the first review</td>
<td></td>
</tr>
<tr>
<td>Creative Zen V 2 GB</td>
<td>4.00/5 (5)</td>
<td>100.00%</td>
<td>Write the first review</td>
<td></td>
</tr>
<tr>
<td>Apple iPod Nano 4GB Second Generation</td>
<td>4.50/5 (13)</td>
<td>100.00%</td>
<td>Write the first review</td>
<td></td>
</tr>
<tr>
<td>Apple iPod Nano 4GB Second Generation</td>
<td>4.50/5 (13)</td>
<td>100.00%</td>
<td>Write the first review</td>
<td></td>
</tr>
<tr>
<td>Apple iPod 30GB Fifth Generation</td>
<td>4.00/5 (7)</td>
<td>100.00%</td>
<td>Write the first review</td>
<td></td>
</tr>
<tr>
<td>SanDisk Sansa e260</td>
<td>4.00/5 (6)</td>
<td>100.00%</td>
<td>Write the first review</td>
<td></td>
</tr>
<tr>
<td>Creative Zen Vision M 30 GB Green</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowon D2 2GB</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Archos MP3 player</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trextor i Beat goonad RS 2GB</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apple iPod 90 GB Black</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creative Zen MicroPhoto 8 GB Red</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trextor i Beat 128 TGB</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sony Network Walkman NW-MS11 120 MB Silver</td>
<td>0 Reviews</td>
<td>Write the first review</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

71 Offers found for "Portable MP3 Players" in online shops

**Price Range**  
- Below £39 (3)  
- £39 - £40 (4)  
- £40 - £50 (7)  
- £50 - £60 (4)  
- £60 - £90 (5)  
- £90 - £100 (2)  
- £100 - £150 (1)  

**Storage Capacity**  
- At least 50 GB  
- At least 60 GB  
- At least 70 GB  
- At least 80 GB  
- At least 90 GB  
- At least 100 GB  
- At least 120 GB  
- At least 160 GB  
- At least 200 GB  
- At least 250 GB  
- At least 300 GB  
- At least 320 GB  
- At least 400 GB  
- At least 500 GB  
- At least 600 GB  
- At least 700 GB  
- At least 800 GB  
- At least 900 GB  
- At least 1000 GB  
- At least 1200 GB  
- At least 1400 GB  
- At least 1600 GB  
- At least 1800 GB  
- At least 2000 GB  

**Brand**  
- Archos (15)  
- Revo (1)  
- Jumbo (1)  
- Samsung (7)  
- Sony (1)  

**Or by**  
- Audio Format  
- Weight  
- Main Storage Type  
- Additional Features  
- Number of Songs  
- Video Format

**Offer**  
- £110.00 - £110.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00
- £109.00 - £109.00

---

**Show all results**
Interaction problems

- As the circled area in the picture 4.30 shows, the participant clicked on the “more” to try to obtain further information on the product, not noticing that this was already on the description page and this meant there was no change when it was clicked.

![Picture 4.30 Description page]

- The participant clicked on “more”, rather than “description”.

- Participant looked for the “sort by function” by clicking on the label in the circled area of picture 4.31.
Task 2

Surprisingly, best-price.com saw fewer problems with task two than was seen with shopping.com, with the exception of the excluded outlier data of the participant who could not load the site loaded, and the participant could not find the target. There was only really one outstanding problem: As with Shopping.com, participants mistook the prior set up price range options for the tariff price range.

Task 3

Presentation problems

- As with the previous task, a participant was not aware that the first half part of the page was the category entries, and was still looking for the entries on the second half of the page.

- As can be seen from the picture below, the brand names were not arranged in alphabetical order. This affected the speed and efficiency of users’ location of the brand. One participant also complained about the font size which they found
The products were not fully categorised and as a result, two participants could not find the target in the beginning because the uncategorized items led them to misunderstand that they were already under the last level of the appliance category; thus they failed to detect the ovens category; this also illustrated that the presentation of category was not clear to users. Other problems included how the product reviews and retailer’s review was hard to distinguish- one participant mistakenly thought that the product review was the retailer review. Similarly, the “appliance” label is inconsistent with the category title below, possibly affecting users’ judgement of the category.
The page above of the product and shop description seemed to be too much alike and it resulted in the participant being unable to distinguish the difference between these two pages. During the test, one of the participants mistakenly regarded the description label on the retailer’s page for the information of the product, and it took some time for the participant to realise their mistake. Both the product description and online shop description pages are shown in picture 4.34 and picture 4.35.

- Picture 4.33 Category labels
- Picture 4.34 Retailer's description page

Appliances Online

- Picture 4.34 Retailer's description page

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Interaction problems

- The participant clicked on the supplier’s logo in an attempt to get the supplier information, however it lead the user to the web site of the chosen merchant instead.

Task 4

Some notable findings of users’ behaviour was seen in this task. After they could not find the information of the selected book within the site, three participants started to input some keywords of the book description into the search box.

Interaction problems

- Same as with the other tasks, most of the participants tried to access the product information through clicking on the product image.

Task 5

As reflected by the statistics discussed in the quantitative section, even though it took
longer for participants to complete task 5 on best-price.com than on shopping.com, no significant problem was detected during the observation of this task and the participants still successfully accomplished the task without encountering too much difficulty.
5. Discussion

This chapter will begin to answer the research questions in light of the results which were presented and analysed in the previous chapter and discuss their further implications.

5.1. Results discussion and implications of feature comparison

The intention of this part of the study is to answer the research question 2: *What are the features a good price comparison site should have?*

At the end of the competitive analysis, a feature grid as can be seen at Appendix 5 which was generated with the aggregation of functionalities among all of the six price comparison sites. The functionalities were categorized into many different aspects, and arranged with the order of the priority refers to a price comparison site from the top to the bottom. It can be seen that all six sites have a main search and only *Ciao* and *ShopperUK.com* do not has a “refine” search box. Furthermore, four of the six price comparison sites show recent searches, but only *ShopperUK.com* can search on the Web. Overall, the following features were considered important for the search function: 1). Main search box, 2). Refine search box 3). Related searches.

As for the browsing, browse by category is definitely the primary feature for a price comparison site and five of the six sites have this feature. Additionally, when it comes to the presenting of products, the name, price, image and description all appeared to be fundamental. Likewise, it also can be discovered that although not all of the six sites have product reviews, ratings and stock information, these features would also appear to be important to shopping engines. Only one site did not list the same product with different retailers, reflecting the tendency by the comparison sites to
provide alternatives for users.

Additionally, the store name and the store logo could be considered a popular feature since all six sites included one. Although store reviews ratings were only taken into account by four sites, the price comparison sites in the first three positions of the market share list all featured them, indicating their possible value to a site.

Furthermore, in order to allow users to more precisely search according to products’ characteristics, five of the selected target sites set up the price range, brand, and other additional features to enable users to narrow down their search results. Only the sites in the first three positions of the market share list had the features of sorting the items by price, rating and popularity, possibly helping to contribute to their popularity over the other sites.

The remaining features appear to be standard for the types of websites which were studied, e.g. site maps, help instructions, and company information. Nevertheless, one noteworthy finding here is that even the top price comparison site in UK did not include tourism business into the comparison target, while the four other sites did; thus the tourism business might be a potential feature to a good price comparison site.

5.2. Results discussion and implication of usability test

The results of usability test were used to answer the two parts of research question 3: *Between these two price comparison sites, which site has better usability in the user’s view? And what are the existed usability issues within these two price comparison sites?*

The usability comparison between Shopping.com and best-price.com took place in light of three aspects: efficiency, effectiveness and satisfaction.
5.2.1. Efficiency

In the efficiency measure, the data analysis showed that *best-price.com* performed more efficiently than *Shopping.com* on task 1, 2 and 4. All three tasks, which were related to the search function, showed notable results, particularly task 2 which assumed the user would use a feature list and the refine search box to narrow down the search results. From the picture 5.1 and picture 5.2, it can be seen that *Shopping.com* and *best-price.com* presented their feature lists differently.
On Shopping.com, the feature list is on the left side next to where the products are presented. In contrast, best-price.com places the feature list above the products and is displayed horizontally. The test results suggest that a horizontal presentation the feature list might better than a vertical format.

In addition, the data analysis shows that Shopping.com was more efficient than best-price.com for tasks 3 and 5 in the areas of browsing categories and comparing products aspects. This might relate to the usability issues which were discovered during the observations of the test about how the category and the label descriptions on best-price.com were unclear.

5.2.2. Effectiveness

Generally, both Shopping.com and best-price.com were found to be effective at normal using behaviours for users throughout the test. Except the connective problem for best-price.com on task 2 which lead to uncompleted tasks. The task completion rates were all 100% through the rest four tasks. And when it comes to the number of search terms to be used for achieving the task, due to the data analysis, it revealed that if price comparison sites users do not have specific search term in mind, Shopping.com could help them locate the product more effectively than best-price.com.

5.2.3. Satisfaction

In the post-session questionnaire, participants concluded that overall, Shopping.com was more satisfactory than best-price.com. The mean scores of Shopping.com were higher than for best-price.com on every question, especially for the significant difference in language use, the sufficiency of product information and the given feedbacks. Although Shopping.com was not graded as significantly negative or positive, participants did express their dissatisfaction about best-price.com on those
three subjects as well where the evaluation was found to be significantly negative. Overall, best-price.com was graded by sixteen participants as significantly negative.

5.2.4. Usability Issues

As the data analysis, it could be known that there are still many usability issues on the price comparison sites; and the two most common problems are the presentation of the products and the category description.

5.3. Results discussion and implication of retrieval performance evaluation

Research question 4 was between these two price comparison sites, which site has better retrieval performance in user’s view? The results of P1, P2, PRC and the number of retrieved merchants all referred to this question.

5.3.1. P1

In general, there was no significance difference found in P1 among Shopping.com and best-price.com, according to the data analysis. This means that despite the differences of product categories, the performance of Shopping.com and best-price.com were roughly the same. However, for kitchen appliances the users’ mean score for best-price.com (92.5%) was significantly higher than the mean score for mobile phones buyers (27%). This suggests that best-price.com could retrieve more relevant or partially relevant kitchen appliances than products it could for mobile phones, perhaps making it a more appealing option for kitchen appliance buyers than for mobile phone buyers.

5.3.2. P2

As was seen with P1, the data analysis revealed that there was no significant difference between Shopping.com and best-price.com in terms of P2. Nevertheless,
for kitchen appliances the users mean scores for both Shopping.com and best-price.com was significantly higher than it was for the electronics, mobile phones, and computer users. This indicates that both Shopping.com and best-price.com could retrieve more relevant products from kitchen appliances than the other three categories, meaning that for those seeking kitchen appliances, either Shopping.com or best-price.com was a good search medium.

5.3.3. RRC

It was discovered from the data analysis that in terms of RRC, the performance of Shopping.com and best-price.com were roughly the same regardless of the differences in product categories as there was no significant difference found. However, due to the fact that the mean score of RRC on electronics (55.06%) and mobile phones (67.63%) on Shopping.com was found to be significantly higher than best-price.com, it would seem that consumers can have the opportunity of better retrieval ability across the database in these two categories on Shopping.com than best-price.com. In contrast, best-price.com was found to be significantly superior to Shopping.com for retrieving the genre of computers.

5.3.4. Coverage

The coverage shows the ability of a price comparison site to retrieve information from online shops which offer the same product. Through the test, it can be seen that the online merchants which were retrieved by Shopping.com and best-price.com on a specific product were precisely the same. It could be assumed that Shopping.com and best-price.com might have the same database for merchants or search algorithm on retrieving online shops. It was also determined from the data analysis that out of the categories of electronics, mobile phones, kitchen appliances, books and computers, the number of merchants that provided kitchen appliances was significantly higher.
than for the other four genres.
6. Conclusion

This study employed the user-oriented approach to evaluate and compare usability and the retrieval performance of the Shopping.com (1\textsuperscript{st} position of the price comparison site market share in UK) and the best-price.com (similar market share rate as the last place of the list). The usability test indicated that Shopping.com has better efficiency on the browsing, and the best-price.com was more efficient on searching due to the format of the presentation. As effectiveness, both sites performed well, except the connection problem of the best-price.com lead to two participants could not completed task 2. Moreover, when it comes to the satisfaction, Shopping.com was rated more satisfied than best-price.com by participants. Although Shopping.com was not found significantly positive on any engaged satisfaction question, best-price.com was graded significantly negative on language using, the sufficiency of product information and the given feedbacks. Last but not least, in usability aspect, there were still many issues were detected and listed in chapter four through the test. This showed that for a price comparison user, the site was not regarded as performed well in usability perspective.

In retrieval ability, generally speaking that Shopping.com and best-price.com had the similar performance despite the genres of the searching product. But if it split into the product genres, best-price.com was found could retrieve more relevant and partially relevant items on kitchen appliances category than mobile phones. Moreover, both Shopping.com and best-price.com was found to be significantly retrieved more relevant items on kitchen appliances than electronics, mobile phones and computers. Besides, Shopping.com and best-price.com were also discovered that might have the same merchant database or the crawling algorithm. Another finding of the coverage is
the number of merchants that provided kitchen appliances was significantly higher than for the other four genres; it means that for kitchen appliances buyers, there are more alternative choices of online shops. Finally, Shopping.com need more search terms than best-price.com on the topic of electronics and computers.

To conclude, this study could not prove the correlation relationship between the market share rate and the actual performance since both sites have their own strengths and weaknesses on usability and retrieval performance aspects. However, this is for sure that there are many existed usability problems need to be solved. For the future work, it is suggested to redesign the sites in light of the detected usability issues in this study, and evaluate again to figure out the effective improvement. Nevertheless, the demarcation between commercial factors and the usability will be another topic.
Bibliography


Education.


The Nielson Company. (2008). Over 875 Million Consumers Have Shopped Online - the Number of Internet Shoppers Up 40% in Two Years [Online]. http://www.earthtimes.org/articles/show/over-875-million-consumers-have-

Appendix 1

Participant Profile Questionnaire

Participant number ______

1. Your gender is
   □ Male  □ Female

2. Your age is
   □ Under 21 □ Between 21 - 25 □ Between 26 – 30 □ Over 30

3. How long have you used the Internet?
   □ None □ Less than 3 years □ Between 3 – 5 years □ More than 5 years

4. Have you ever shopped on the Internet?
   □ Yes □ No

5. How often do you shop on the Internet?
   □ Daily □ About once a week □ about once a month □ every 3-6 months □ every 7-12 months

6. Have you ever used price comparison sites before?
   □ Yes (to question 7) □ No (to question 10)

7. How often do you use price comparison sites?
   □ Daily □ About once a week □ about once a month □ every 3-6 months □ every 7-12 months
8. Have you ever used Shopping.com before?
   ☐ Yes ☐ No

9. Have you ever used Best-Price.com before?
   ☐ Yes ☐ No

10. Have you ever heard about price comparison sites before?
    ☐ Yes ☐ No

11. Do you know how to use price comparison sites?
    ☐ Yes ☐ No
Appendix 2

Task 1.
Please find the cheapest mp3 player which can contain at least 500 songs and has FM radio. Afterwards view the product information of the chosen item.

Shopping.com
Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: __________________________

Partially relevant items (PR) within first 20 items: __________________________

The numbers of the retrieved merchants: __________________________

Best-Price.com
Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: __________________________

Partially relevant items (PR) within first 20 items: __________________________

The numbers of the retrieved merchants: __________________________

Task 2.
Please list the mobile phone “Samsung Tocco” on both the O2 and Orange networks on a 18 month contract, and then narrow it down to only £35 tariffs.

Shopping.com
Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: __________________________

Partially relevant items (PR) within first 20 items: __________________________
The numbers of the retrieved merchants: ________________

Best-Price.com

Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: ________________

Partially relevant items (PR) within first 20 items: ________________

The numbers of the retrieved merchants: ________________

Task 3.

Please find all the “Bosch” brand products in the “Ovens” category only by browsing, and then view the information from one retailer who has 4 star rating.

Shopping.com

Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: ________________

Partially relevant items (PR) within first 20 items: ________________

The numbers of the retrieved merchants: ________________

Best-Price.com

Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: ________________

Partially relevant items (PR) within first 20 items: ________________

The numbers of the retrieved merchants: ________________
Task 4.

You want to buy a book by “Khaled Hosseini” which is about a boyhood friendship destroyed by jealousy, fear, and the kind of ruthless evil that transcends mere politics. Find it, check the stock, and purchase it.

Shopping.com

Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: __________________________
Partially relevant items (PR) within first 20 items: __________________________
The numbers of the retrieved merchants: __________________________

Best-Price.com

Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: __________________________
Partially relevant items (PR) within first 20 items: __________________________
The numbers of the retrieved merchants: __________________________

Task 5.

You want to buy a laptop with a 13.3 inch screen. You don’t have any preferences, but you want the price to be between 600-800 pounds. Please find any two to compare their features.

Shopping.com

Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: __________________________

118  __________________________
Partially relevant items (PR) within first 20 items:

The numbers of the retrieved merchants: ________________________

Best-Price.com

Please fill in the blanks below with the results of your relevance judgement:

Relevant items (R) within first 20 items: ________________________

Partially relevant items (PR) within first 20 items: ________________________

The numbers of the retrieved merchants: ________________________
Appendix 3

Please rate how well you satisfy with the language using
Shopping.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory
Best-Price.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

Please rate how sufficient the product descriptions are
Shopping.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory
Best-Price.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

Please rate how well the product images represent the product
Shopping.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory
Best-Price.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

Please rate how well you satisfy with the label description
Shopping.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory
Best-Price.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory
Please rate how well you satisfy with **the navigation indicators**

**Shopping.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

**Best-Price.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

Please rate how well you satisfy with **the given feedbacks**

**Shopping.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

**Best-Price.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

Please rate how well you satisfy with the **layout**

**Shopping.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

**Best-Price.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

Please rate how well you satisfy with the **appearance**

**Shopping.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

**Best-Price.com**
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

**What is your overall satisfaction**
Shopping.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory

Best-Price.com
Extremely unsatisfactory □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 Extremely satisfactory
### Appendix 4

**Shopping.com**

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