UNIVERSITAT ROVIRA I VIRGILI

HOW USERS READ TRANSLATED WEB PAGES: OCCUPATIONAL AND PURPOSE-BASED DIFFERENCES

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Abstract

We know from previous research that translators read differently from ordinary readers. And we know that users rarely read the linguistic text in web pages - only when readers have to perform a certain task and a usability error happens do they read text. Even so, readers focus on only parts or specific text that will help them resolve issues. Previous research is thus basically on *non-reading*, as opposed to the way translations are actually read on some occasions. There has been increasing research on how to improve usability and bring excitement to web sites in terms of web design. However, there has not been much research on how readers read translated web pages, or indeed on how *translators* read translated web pages. My research thus examines reading-pattern differences between translators and non-translators, and also between those groups when reading with different purposes.

In order to compare occupational differences, the research used two reading groups: a "heavy-reading" group, whose participants are reading professionals such as translators, editors and proofreaders in Korean, and a "light-reading" group, whose professions do not involve intensive reading, such as chefs, engineers, and military personnel. Each group had ten participants, male and female, aged from 27 to 47. The participants in the heavy-reading group held a minimum of a Master's degree in translation, and they were proficient in both English and Korean, as their professions require. The participants in the light-reading group were proficient in Korean only.

The research studies how different reading purposes affect reading patterns. The participants in both groups completed four different tasks that were designed to provoke four different reading purposes: 1) reading without a specific task, 2) reading for studying subject matter, 3) reading for retrieving information, and 4) reading for sharing information. In order to learn more about how readers perceive translation errors and to test the relations between the reading patterns and the reading purposes, five different types of translation errors were planted in a web page. The errors were based on the categories in the LISA evaluation form: Mistranslation, County Standard, Style, Language and Consistency.

A web page from Apple was used for the test. The source text was about new features of iOS 7in English, and the officially translated and published version of the web page was used for the test, with some translation errors planted. The participants'

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screen activity was recorded by screen-recording software, and TAPs were used for their verbal reports. Analysis of the recording and TAP produced abundant data.

In-depth analysis of the results suggests that occupations and reading purposes have statistically meaningful impacts on the reading patterns of the translated web page. In particular, translation errors are perceived differently by readers when the reading purposes and occupations vary. The heavy-reading group showed very strict bottom-up approaches, with linear and thorough reading, whereas the light-reading group showed relaxed top-down approaches, with circular and not-thorough reading. The heavy group showed much higher error detection rates, with highly critical attitudes in most cases, while the light-reading group showed extremely low error detection rates, with relaxed attitudes. Mistranslation and Country Standard errors were considered the most serious by both groups. Surprisingly, the tolerance level of translation errors was much higher in the heavy-reading group, and the frustration level of incomprehension was much higher in the light-reading group. The authority of the company producing the site also heavily influenced the trust level of the light-reading group.

The current tendency of the localization industry is to concentrate on avoiding errors rather than seeking high usability in translation. The results here suggest that this approach can dramatically increase the frustration level among ordinary users. This frustration leads readers to stop reading, and can ultimately damage the authority that set in place the readers' initial presumptions. This can be even more critical for those companies whose names are not well-known, as ordinary readers' top-down reading pattern, combined with the influence of authority, can easily develop a negative image.

The research further asks whether exceptional reading skills are necessary to do translation. If a translator has low reading skills such as were found in the light-reading group, are the translators bound to produce low-quality translation? If the answer is yes, wouldn't it be only the heavy-reading group that would notice the problem anyway? If the answer is no, what would be the point at which the readers decide the translation is so bad that they lose trust in the web page and eventually develop a negative perception of the brand name? Determining that point may help companies decide where and how to invest their resources in localizing web pages and potentially other products. Finding answers to the questions will also lead to many interesting questions on the correlations between reading skills and translation techniques, and the relations between brand image and the threshold in reading frustration.

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I hereby certify that the present study *How users read translated web pages: Occupational and purpose-based differences*, presented by Yoonji Choi for the award of the degree of Doctor, has been carried out under my supervision at the Department of English and Germanic Studies of Rovira and Virgili University.

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Completing the doctoral thesis has been a long journey. After completing my minor dissertation on reading patterns in 2008, my life made a dramatic turn. A family of two became a family of five with the birth of triplets. Although I had to take many years off from writing my thesis, and it took even more years to complete the thesis, I take great pride in the fact that I finally completed this, and I am ready to do more research projects in the future.

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1. Introduction

1.1. Background of the research decision

I am a teacher and a professional translator and localizer. Working in the industry for almost 20 years and teaching translation for 15 years, I often, or almost always, hear, "how did you catch that translation error?" "so you read everything you see that way?" and "your translation is different." These questions are asking about two different components of translation: reading and translating approach.

Yes, I read differently from most people. Why? I have been translating, reviewing and assessing professionally translated content, and grading my students' translations, which requires a very thorough bottom-up reading approach in order to avoid mistakes, and also a top-down approach in order to get the clear idea of the overall structure and logical development as well as internalizing and visualizing the content. More importantly, translation requires a great balance of top-down and bottom-up approaches. Twenty years of practicing this complicated process must be linked to how I read now.

Yes, I translate differently. As a trained reader, I began to realize the moment I stopped reading. Reading speed is as important as writing speed for translators, and I had to admit that I hated poorly written texts. As a teacher and evaluator, I began analyzing what made me stop reading. I had to change many translation approaches in many cases, to avoid those factors that made me stop reading. Unfortunately, the change in translation approaches came with hefty consequences: longer time, more effort, and more explanation and persuasion. Nevertheless, I had an absolute belief that the new approach would help readers read my translation with less trouble. It was rewarding and I felt great satisfaction. I still translate that way. I still have to explain how my translation came out, and justify my decisions in some cases.

So, what does all these mean? It means that my profession trained me in how I read. It means I am a translator who tries to meet the expectations by different reading purposes. And it means that I translate what I comprehend with an unusual approach because I read differently. My doctoral thesis came from this background.

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To answer some of the questions, the research examined what affected reading patterns of translated web pages. I chose profession and reading purposes as main variants for different reading patterns. To quantify some of the findings, and to analyze how different users perceive information in translated pages, I planted translation errors on the web pages. However, the main focus of the research is to study how users read the web pages rather than how users perceive translation errors.

1.2. Industrial implication of research

As the academic implications of the research will be explained in Chapter 2, I will summarize only the current industrial expectation of translation and how my research can make some meaningful suggestions to the localization industry in this section. It is also well known that different text types require different approaches to translation. Determining successful approaches to any type of translation is a difficult task. This is even truer in today's localization market where product cycles are getting shorter, and expectations of the translators are getting higher. The ultimate purpose of any localization project is to satisfy users in target markets and to raise the reputation and awareness of a product and company. Therefore the term "user experience" is attracting more attention in the Information Technology field. Positive user experience is worded in many ways, but we will use the term "usability." Since usability is becoming one of the most important factors of localization, translation should also consider the usability of a product, specifically for target users.

One of the problems is that when it comes to localization, the issue of usability is given less attention than are other issues. Application developers and designers put high priorities on usability in prototype products, but do not apply the same principles to localized products. Once companies make overall usability decisions on prototype products, they try to apply the same usability decisions to all other localized versions of their products and they make minimal numbers of changes to avoid complications.

Even though the importance of usability and high-quality translation for enhancing usability has been well perceived in recent years, due to the "unexpected" high cost of translation, many companies in the U.S. attempt to reduce the cost of the

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process. According to the LISA or Localization Industry Standards Association (2003:20), translation and testing accounted for 57% of total localization costs. Most companies that intend to go global for the first time presume the cost involved in the localization process will be minimal, because they think the most expensive parts are the engineering of source codes and the application of different language environments, which they already have internally. When most companies realize that the cost of the translation and linguistic testing accounts for 57% of the total cost, the quality of translation often is put on a back burner as long as the cost can be kept low. This practice is very common and ways to cut costs of translation are actively discussed. Popularity of CAT and machine translation also is an example of such tendency.

Meanwhile, many translators who work in the localization field feel that they have to be highly productive and efficient to survive in today's localization market. The turnaround is extremely short, the volume is large, and the rates are low, compared to some other types of translation. Often, translations are sent to third countries where the labor cost is cheaper. Nevertheless, when a certain product does not gain expected market share, translations are often to blame.

In this situation, my research will examine how different users read localized web pages and feel about usability in their target environments, as well as what triggers difficulties or preferential advantages and disadvantages. What I am trying to achieve is not to suggest the best or highest-cost solution to increase usability. Instead, I am trying to show what affects reading patterns, and what kind of translation errors cause trouble in reading. Understanding how people read translated content can change how the industry sees the role of translation. I am hoping that my research can stir some discussion on how translated web pages are read among different groups of people and how the translation practice should change to adopt such reading patterns.

1.3. Structure

My thesis is composed of a total of six Chapters. Chapter 1 is *Introduction*, which explains the background and aims of the research and the industrial implications, and shows the general structure of this thesis. Chapter 2 is *Literature Review* where existing literature and research are introduced along with my personal observation in the localization industry. As my thesis includes many different aspects from many different

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fields, Chapter 2 is divided into three different main sections: translation in the localization market, reading, TAPs and other tools considered for the test. Chapter 3, *Testing Methodology*, explains how the test is designed in detail. It describes initial design, the pilot study, and design revision. Chapter 4, *Results,* describes the participants' statements, statistics, and comparison charts and tables. The results are analyzed and discussed in Chapter 5 *Discussion* concentrating on different reading patterns by occupation and reading purposes, and the relation between translation error detection and reading patterns. Finally, Chapter 6 concludes the research with a summary of general findings, limitations and shortcomings of the test, industrial recommendations, and research suggestions.

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2. Literature Review

Chapter 2 introduces the past and current studies on reading and translation studies, and explores various tools for the test. As the research is linked with many different topics from different fields, the review is also done in many different topics. Section 2.1 reviews the current view and process of localization based on my experience and literature review, and section 2.2 reviews general translation approaches and current evaluation practices in the localization market. Section 2.3 discusses general reading approaches and related theories, and introduces the difference between paper reading and web reading. Section 2.4 explores existing research on reading and translation.

2.1. Current view and process of globalization and localization

2.1.1. Current view of localization

Many scholars have different views on globalization. According to O'Riordan (2001: 26), globalization is primarily an economic, but also a social and political change, that encompasses the planet, resulting in greater homogeneity, hybridization and interdependency. He also associates globalization ideas of promotion of Western capitalism and the business decisions of growing multinational corporations such as Coca-cola or McDonalds. Belk (1998) also points out how homogenization is taking place around the globe, explaining how people have access to the same food, the same music, the same fashions, and so on.

These views explain why many IT companies have focused on the usability of the original products, but not on the localized products. Even though companies and vendors claim that they understand the importance of cultural adaptation, in reality cost and release deadline pressures come first. As a result, as long as localized products are "acceptable" in target countries in terms of functionality, readability, and cultural adaptation, that is enough to sell in target markets. This uniform idea comes

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from such homogenization views and this concept can hurt marketability, especially when competition in the target market is fierce.

On the other hand, Geert Hofstede's research on IBM employees in 52 countries in the 1980s suggests that consumer behaviors differ dramatically. Hofstede's research highlights an important aspect of localization, which is diversity and differences. He thinks people cannot just accept a new culture unless they unlearn existing behaviors. Hofstede says:

> Every person carries within him or herself patterns of thinking, feeling, and potential acting which were learned throughout their lifetime. Much of it was acquired in early childhood, because at that time a person is most susceptible to learning and assimilating. As soon as certain patterns of thinking, feeling and acting have established themselves within a person's mind, (s)he must unlearn these before being able to learn something different, and unlearning is more difficult than learning for the first time. (Hosfstede and Hofstede 2005: 4)

Appadurai (1996) and Robertson (1992) also emphasize the dynamic cultures and differences. Robertson emphasizes accentuating consciousness of differences (1992: 180). In today's market, in order to meet the different expectations of people around the globe, the globalization project is recommended to be initiated from the idea that understanding different cultures on where their product will be used and applying the findings on the products leads to better results in sales and consumer awareness. Linguistic testers in the U.S. are more often asked about the usability of the localized products than ever, when testing of localized products is performed. However, those findings are hardly considered in the final products because it is too late to accommodate the non-linguistic aspects of usability at the testing stage. Therefore, designing the products with localization in mind helps in implementing different usability requirements from various markets.

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2.1.2. Current process of localization

Most companies that want to expand their consumer base want to go global. However, the process of localization varies greatly in accordance with companies' marketing goals, financial situations, and both source and target market expectations. Localization projects require very specific skills. Most product developers have to learn engineering skills associated with localization and specialized linguistic experts need to be hired. Due to the complexities and the cost involved in the process, outsourcing has been a popular choice in the United States. The most popular form of localization project in the United States starts from the business' decision to go global. Once globalization is chosen, developers separate out the codes that need to be localized and send those to vendors. In this process, what they focus on is how fast the project can be done and how much it will cost, which are certainly important considerations. However, in many cases, the detailed discussions on how to increase usability in different target markets, which is the main factor in determining the overall cost, is discussed at a later stage.

After the client sends out the files to translate, vendors implement local-specific changes such as format and layout and have translations done. Vendors usually outsource translations to other vendors or individual contractors. The testing of merged files can be done on the vendor's side in collaboration with clients or on clients' sides. When linguists and/or testers certify the localized product, vendors deliver the files back to the client. When the client receives the files and approves the project completion, the process is considered finished.

As seen here, three entities - client, vendor, and translators (or sub-contractors) – are main players in the project. Since many different entities have to cooperate in localization projects, cutting costs and increasing productivity is not only one entity's concern, but everyone's. According to a Localization Industry Standards Association report (LISA 2003:06), the twenty largest IT companies in the U.S. invested 1.5 billion USD in localizing their products to generate global sales of 15 billion USD. However cost is still a big factor in deciding every step of localization, which is a natural concern in business. Cutting costs and increasing productivity are major concerns in any industry, but how to do it in the localization field has not been very actively discussed.

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So far, Schäler (2004: 3) states that the localization industry has employed two methods to achieve financial profits. Original products are developed with the lowest common denominator (LCD) using globally acceptable standards, and localization is done reusing as much previously localized materials as possible. Using the lowest common denominator means that companies use one content that fits all users, therefore the localized product is acceptable (not excellent) in all target locales and there is no need for further adaptation or modification.

Leveraging as much as possible in translation means companies want to reuse the existing translations as much as possible. This is reasonable when changing one word in the original application means changing translations for all locales into which they want to localize. If a product is localized into 150 languages, this could be a big issue. The most common efforts to achieve the maximum leverage include using CAT tools, so that they can calculate match percentages among source text and among different versions of updates in translations.

Another common method is hiring cheap labor. Sub-contracting large-volume files to in-country or third-country vendors is commonplace these days if the labor is cheaper in those countries.

However, there is a limitation on these methods. Using globally acceptable content can hurt the reputation of the product in the long run if it does not accommodate the specific needs of each locale. CAT tools force translators to stay very close to the source text instead of the target text. CAT tools also become inefficient when translators have to spend so much time on reviewing the previous translation. Labor can go down only to a certain level. CAT tools are namely designed to facilitate and support the translation process by providing some automation, keeping consistency in terminologies and style, and using maximum leverage of existing translations. The CAT tool loads the source strings by certain units for translation and stores the translation entries, which is called translation memory or TM. TM is built while calculating string match percentages. Let's say there are 2 similar strings. One says "Your entry is invalid. Please try again," and the other says "Your input is invalid. Cannot proceed." In this case, the two strings are not exactly the same, but are similar. The CAT tool calculates the match percentages such as a 65% match, so that translators can edit the translation that they already entered instead of starting from scratch. Translators who work in the

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localization industry are required to use CAT tools in most cases in the United States. However, the real benefit of a CAT tool is on the business side. The repetition and match decreases the cost of translation significantly, especially when the translation is for updates. The situation is the same for machine translation.

I will attempt to answer these questions by suggesting how people read or use the localized web pages. By looking at reading patterns and studying users' usability (in this case, translation), preferences, and priority on the localization elements can be redefined and the translation trend can also change.

2.1.3. Usability

An increasing number of people understand the importance of usability in localization. However defining the exact meaning of usability and extending the usability concept to all user levels still remains a challenge, if not impossible. Usability is more than just fancy user interfaces and nice graphics. If a product is localized with perfect usability, no customer service will be needed in the target market. Therefore, the better the usability, the lower the customer-service cost. However, perfectly good usability does not happen, since all users have different backgrounds, mental models, and social and individual cultures. This section will describe the concept of usability and the cognitive system associated with it.

2.1.3.1. Concept of usability

The ISO 9126 standard (Iso Standards 2008: 9126-1, 2001) defines usability as a set of attributes that bear on the effort needed for use, and on the individual assessment of such use, by a stated or implied set of users. It also says usability must address all of the different user environments that the software may affect, which may include preparation for use and evaluation of results. Usability addresses both functional and cosmetic aspects of applications, but the main focus of this research is on the user interface.

The ISO 9126 standard states three categories for usability: learnability, understandability and operability. Learnability is the capability of a software product to enable users to learn how to use it. Understandability is how little effort users have to make to understand the product. Operability is the ability to keep a system functioning as intended.

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Jakob Nielsen (1994: 23) says the term "user-friendly" is not appropriate because the term is unnecessarily anthropomorphic and the term views users' needs in a single dimension. Every user has different needs; therefore, a single user-friendly application does not exist. Nielsen (1994: 24) explains "usability is a narrower concern compared to the larger issues of system acceptability, which basically is the question of whether the system is good enough to satisfy all the needs and requirements of users and others…" In short, he sees usability as a question of how well users can use the functionality. Dumas and Redish (1999: 4) explained the similar concept in a simpler way, saying, "usability means that people who use the product can do so quickly and easily to accomplish their own tasks."

Nielsen (1994: 26) suggests a framework for usability in five different categories: learnability, efficiency, memorability, errors, and satisfaction.

- Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design?

- Efficiency: Once users have learned the design, how quickly can they perform tasks?

- Memorability: When users return to the design after a period of not using it, how easily can they reestablish proficiency?

- Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?

- Satisfaction: How pleasant is it to use the design?

2.1.3.2. Linguistic and non-linguistic aspects of usability

The research will separate the translation from the overall user interface design, which can be referred to as "linguistic aspects of usability." In the research, the user interface (UI) is everything designed into a web application with which users may interact such as buttons users can click or graphics they see. Linguistic aspects of usability include all the words and punctuation marks users see in the user interface. In localized files, linguistic aspects of usability include all the translations and non-translated strings. Many experts state that the quality of linguistic aspects of usability is considered the most important since web users visit a site for its content, not for its design. Design and look are important, but not as important as content (Nielsen and Loranger 2006).

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Overall interface aspects other than linguistic aspects of usability are referred to as non-linguistic aspects of usability in this research. Non-linguistic aspects of usability include format, layout, graphics, data entry fields, and functionality such as buttons, hyperlinks, and graphics (not content). Non-linguistic aspects of usability can represent the look and architecture design of a web application. In other words, the sum of linguistic aspects of usability and non-linguistic aspects of usability makes one web application.

2.1.3.3. Definition of users, readers, and translators from usability aspect

The difference in terms between users and readers is not clear when describing the use of a web page. ISO 9126 says users may include operators, and direct and indirect users who are under the influence of or dependent on the use of the software. Even though it sounds simple, defining the concept of users is highly problematic, because people who use the product have different backgrounds, knowledge, ability to read, and so on.

In this research, the term "users" is used in a narrow sense, describing those who directly interact with a web application. The focus of the research is not on where or how the users use the product, but on the purpose of use. Separate from users, the term "reader" is used to refer only to the reading activities whether the material is online or in hard-copy form. Depending on the familiarity of reading, the term "professional reader" is used in the research. Professional readers refer to those who read professionally in their daily career activities such as translators, editors, proofreaders and so on.

Defining translation can be tricky as many different definitions exist. In this research, translators are those who convert the language of the source text into that of the target text. Those who actively advise and suggest cultural variations and adaptations to the client in the process are called "cultural consultants" in this research. The term "intercultural communicator" is used for those who perform both translation and cultural consultation. The term "language specialist" is suggested, and widely used, to include those who perform tasks on every cultural and linguistic aspect of localization such as cultural consultation, translation, evaluation, testing, and IT consultation.

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2.1.3.4. Human cognitive system

Understanding usability requires a certain amount of knowledge of human cognitive systems. Usability studies focus on users - how they see, read, react, and feel about a software product. Users' experience and satisfaction can be different even concerning the same product. Users' reading speed or coverage may also be different. Determining and analyzing users' preferences are complicated tasks and understanding a few cognitive system mechanisms can explain why users behave in certain ways in usability studies.

2.1.3.4.1. Sensory systems: Human sensory systems are running all the time. We just are not always cognizant of them. Human eyes move constantly even in sleep, but we only remember certain things. The same goes for ears. This is a natural protection mechanism that prevents overload of information. Such filtering helps humans select limited information voluntarily and involuntarily. Web users also tend to filter only information that they need and to find that information in the shortest time, and this is called "efficiency" these days.

In usability studies, three sensory filtering mechanisms are explained: threshold, the cocktail-party effect, and sensory adaptation (Byrne 2006: 109-111). A threshold is a point at which humans separate sensory input. Many factors act as stimuli in a threshold. Motivation, mood, or expectations can affect threshold. The cocktail-party effect allows humans to take in only information that is relevant to them. The term came from the analogy that people at a party notice certain communications that are relevant to them even when the party is continuously loud. Sensory adaptation means people get used to continuous stimuli and do not notice their presence until the stimuli are gone. For example, when people turn on a computer in the morning, they notice that the computer makes a loud sound. However as time goes by, people get used to the sound and stop noticing the loud sound until they turn off the computer. Then, they realize the computer had been making a loud sound.

2.1.3.4.2. Attention, focus, locus of attention: Since overload of information is naturally avoided, the underlying reason for filtering is attention, or selective attention as Preece (1994: 100) calls it. The content of the web pages are also competing to grab

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users' attention. Raskin (2000: 16) points out that users' locus of attention switches from one task to another instead of focusing on multi-tasking. He says when an event attracts attention, people do not gain an additional locus of attention, but the locus of attention is shifted. Therefore, people can have only one locus of attention.

Raskin (2000: 17) defines the term "locus of attention" as referring to the current object of our attention, regardless of how it came to be such. In short, locus of attention is the information that is being processed at the moment. This term sounds similar to the word "focus." However, he differentiates focus from attention, saying "focus" can be a verb, which means it implies some action on the individual's part. Therefore, using the word "focus" in place of "attention" violates the true nature of attention.

2.1.3.5. Usability and good writing

Most users go to a certain web site because they are either looking for some specific information or they are led to the web site from another web site. Either way, Nielsen and Loranger (2006: 258-283) say users pay attention to the utility of a web site rather than the design and look of the site, therefore good writing is an important part of usability. Nielsen and Loranger suggest that understanding the users is important in good writing. Since users do not read the whole text and they tend to identify cues that lead them to the wanted information, web writing should have a clear meaning and should not burn users with too much information or poor writing. The writing should make it easy for users to grasp the meaning quickly so that they can stay and decide whether the site is worth reading.

Nielsen and Loranger also suggest writing for readers. Web writers must be aware of "the interest, culture, needs and limitation of users in order to write for them." (2006: 259) This also includes the importance of using familiar terms for target users. The writing style and choice of words should differ depending on the target users of the application. For example, if a web application is designed for medical professionals, many professional medical terms will be appreciated. However, if a web application is designed for average users, plain terms will be much more appealing.

This suggestion has relevance for what our pilot study is designed to test. When it comes to localizing a web application, the numbers of the target-user group multiply by as many as the locales to which the application is to be localized.

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Unless web writers think all different users in different regions have the same interest, culture, needs and limitation, writing for users becomes a daunting task. If we can identify common interests and cultures and different interests and cultures among different user groups, the web writing can be more effective.

2.1.3.6. Discount Usability Engineering

Money fixes many usability issues. If companies can spend a lot of money to increase usability in localization projects, that would solve many existing problems. However, it would be much easier if the localization industry could apply inexpensive methods to improve usability. From this notion, the term discount usability engineering was created by Nielsen in 1989. He suggests four techniques for this discount usability engineering: user and task observation, scenarios, simplified thinking aloud, and heuristic evaluation.

2.1.3.6.1. User and task observation: Just as the wording suggests, this is a very basic way to find usability issues, just by quietly observing users at work.

2.1.3.6.2. Scenarios: Creating scenarios means simulating very simple user interfaces so that users can experience a part of the full system in a short time. Therefore, scenarios are cheap kinds of prototypes. This kind of scenario is so small and cheap that the format can change at any time and the test can accommodate more users with more diversified backgrounds and more varied versions of products.

2.1.3.6.3. Simplified think-aloud: Simplified thinking aloud involves one user at a time. One user performs one task using one system while asked to "think out loud." Nielsen says (1993: 18), "by verbalizing their thoughts, users allow an observer to determine not just what they are doing with the interface, but also why they are doing it." This additional understanding of how users think can eliminate the possibility of misunderstanding. This think-aloud protocol can be helpful in many usability tests that only use logging systems or eye-tracking systems, since the latter only record mouse movements, eye movements, and keystrokes.

Traditional think-aloud studies are conducted by videotaping the subjects and their actions and analyzing the recording. However, this provides un-naturalistic

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settings for the subject and the amount of time the experimenter has to spend to analyze the tape becomes an issue. In a simplified thinking aloud method, the experimenter can just take notes on the spot, and therefore save time that he otherwise would have spent while watching a videotape.

2.1.3.6.4. Heuristic evaluation: Heuristic evaluation is a method that chooses only a portion of usability issues for the test. The selection can be based on the certain purpose of the test. As the importance of usability is better perceived, thousands of rules exist to follow for usability enhancement. When there are too many rules, it is hard to determine which ones to consider and apply. Sometimes those principles are hard to implement if the readers do not have experience in usability. Therefore, the experimenter can select experts or even non-experts to do heuristic evaluations of a product to reveal remaining or preferential usability issues. The common method of heuristic evaluation is to choose a few users and use simplified think- aloud protocols so that different users can identify different problems.

2.1.3.7. General usability guidelines
Among so many similar guidelines, Molich and Nielsen developed in 1990 the following usability principles that can be applied to designing user interfaces. These principles are easy to understand and simple enough to read without much prior knowledge about usability.

2.1.3.7.1. Simple and natural dialogue. Dialogue should contain only necessary information. Any additional information will diminish the effect of dialogue. Dialogue should appear in a logical order.

2.1.3.7.2. Speak the users' language. All the content should be written in a clear way and use words with which users are familiar. System-oriented words or sentences do not speak users' language.

2.1.3.7.3. Minimize the users' memory load. Users should not have to remember too much information. Any information users need to know should be either visible on the application or easily searchable.

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2.1.3.7.4. Consistency. The application should use consistent words, settings, and actions and provide a consistent environment, so that users do not get confused.

2.1.3.7.5. Feedback. The application should let the user know or give feedback on what is going on within a reasonable time.

2.1.3.7.6. Clearly marked exit. When users are stuck in one situation and cannot go forward, they should be able to just leave the situation by pressing some kind of exit button without going through extended explanations of the problems.

2.1.3.7.7. Shortcuts. Many experienced users use shortcuts to expedite their work; shortcuts are therefore desired functions for enhancing usability.

2.1.3.7.8. Good error messages. Error messages should not display as code number such as error code: 0012. They should be written in plain language, indicating the problem and preferably suggesting a solution.

2.1.3.7.9. Prevent errors. Preventing an error is better than writing a good error message.

2.1.3.7.10. Help and documentation. An application with more than good usability will not need help or documentation. However, in reality, users need to look for ways to do certain tasks or to solve problems. Help files and documentation should be in a visible place and easily searchable. They should clearly indicate the problem and provide solutions in a detailed manner including what steps to take.

2.2. Translation theories and evaluation practice in the localization industry

2.2.1. Translation theories relevant to the localization practice

Larson (1991: 1) explains the ideal relationship between the practice and theory in translation by saying "Good theory is based on information gained from practice. Good practice is based on carefully worked-out theory. The two are interdependent."

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Defining and applying appropriate translation theories in technical translation has been very difficult because the approaches, rules, models, and methods are simply too diverse.

Technical translation includes manuals, instructions, specifications, patent documents, software UI, web pages, and so on. Since this pilot study will examine only web applications, we will analyze translation theories for web page translation purposes only. Web translations are fairly new, commercial, communicative, and consumer- and service-oriented. The relations between translated web pages and users are much more interactive than those between written translations and readers. Many visual effects such as graphics, video inserts, and flashes also affect the translation. Due to these characteristics, technical translation including web page translation has not been considered as mainstream in translation studies. Franco Aixelá (2004) performed a survey on a number of publications listed in the Bibliography of Interpreting and Translation (BITRA) multilingual bibliography of translation research. Out of 20,495 publications, only 1,905, 9.3%, addressed technical translation whereas 4,314 publications, 21%, addressed literary translations. Moreover, most technical translation research was focused on terminology and technical aspects as well.

However, Kingscott (2002: 247) says technical translation accounts for 90% of the world's total translation output each year. Given the surprising number, it is worth trying to determine what advantages translation theories can bring in the technical translation practices. As stated, no main translation theories are specially designed for web site translation, so we will examine general translation theories and try to find benefits and problems with the existing theories when they are applied to technical translations. We will attempt to divide the theories into two categories: source-oriented and target-oriented. Even though many theories fall in between, this attempt can be helpful given the nature of web page translation that the final product obscures the author to a high degree and is only left to be compared to other similar products.

2.2.1.1. Source-oriented approaches

The idea of equivalence represents the source-oriented approaches in Translation Studies. The notion that translators have to find equivalent terms in the source text that work in the target text shows that there is a link or relationship between the

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source text and the target text. Catford (1965) indicates that translation does not have to carry exactly the same meaning of the source text, but has to carry the maximum amount of overlap with the source text. The concept of overlap can be explained as likeness, sameness, and similarity (Halverson: 1997). However this is problematic when there is no maximum equivalence between two languages. To solve this problem, numerous concepts of equivalence have been proposed. In this pilot study, we will examine two major concepts of equivalence, formal and dynamic, proposed by Nida (1964).

Formal equivalence focuses on the form and content, which means that the target text should match the form and content of the source text as closely as possible. Therefore the translators preserve all different elements of the source text such as syntax and style when translating into the target text. On the other hand, dynamic equivalence focuses on the effect of translation. Instead of comparing the content and form of the source text and the target text, dynamic equivalence compares the audiences in the source language to those in the target language, because the target text should have the same effect on audiences as the source text has.

The restricted concept of equivalence moves to functionalism starting from Nida's dynamic equivalence. Reiss (1976) and House (1981) started to move the focus of translation from the concept of equivalence to the function of the target text. Byrne (2006: 31) says "such an approach […] involves pragmatic and situational aspects of the translation purpose." This functionalistic approach is important in that the purpose of text is considered crucial. However, Reiss did not abandon the importance of equivalence. Instead, Reiss (1971) indicates that the ideal translation is the one where optimum equivalence is achieved in terms of the conceptual content, linguistic form and communicative functions, functionalism, which still values the source text.

2.2.1.2. Applying source-oriented approaches on technical translation

Source-oriented approaches are problematic in web page translation for several reasons. First, even though dynamic equivalence focuses on the response of audiences in addition to the meaning and format, most source-oriented approaches do not address the communicative element of translation, which accounts for a big portion in

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web site translation. Byrne (2006: 29) supports this by saying "source-based approaches do not consider the full communicative situation in which technical texts are translated and used poses significant problems for the technical translator." Byrne (2006: 30) adds that not considering the communicative purpose of technical text makes it difficult to tell whether the purpose is served in the target market.

Second, the fact that translated web page texts stand independently and are continuously compared with other texts in the target culture is not fully considered in most source-oriented approaches. The source text disappears in web site translations and the responses of the audience matters the most in many cases.

Third, considering the function of the source text poses many explanations. Nord (1997: 23) argues that the function of the target text cannot be automatically driven from analyzing the source text. This is true in that the function of the source text does not necessarily have to be the same as that of the target text. Fawcett (1997: 107) says just because translators can identify the function of the source text, they do not have to make decisions based on the function. This is especially true when technical translators are required to use CAT tools to perform translation. Translators might know the function of the source and target texts, but it is hard to make decisions based on that knowledge because they have so many restrictions when translating segment-by-segment without looking at the whole picture. This is why translators are required to revert to source-text oriented approaches despite numerous problems.

2.2.1.3. Target-oriented approaches

The notion that target readers see the translation as an independent and autonomous text is well represented by Toury. Toury (1995: 26) says, "the position and function which go with a text being regarded as a translation, are determined first and foremost by considering originating in the culture which hosts them." The reason why this is important is that his statement explains how translations, especially web page translations, are viewed in the culture which hosts them. No users will read web pages in both the source language and in the target language unless there are specific reasons for comparison. In addition, if users could already read web pages in the source language, translation would not be needed. By examining several concepts and theories in target-oriented approaches, we will see how they can be applied to web page translation.

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First is the concept of relevance. Based on the relevance theory proposed by Sperber and Wilson (1986) that explains the second model of communication is inference, Gutt (1991: 22) emphasizes that translation effort should be approached from a communicative perspective. "Relevance" implies that "a translation should be expressed in such a manner that yields the intended interpretation without putting the audience to unnecessary processing effort" according to Gutt (1991: 101). Gutt also considers context as a psychological concept from the perspective of assumption about the world or cognitive environment.

Second is skopos theory. Similar to functionalism, skopos theory emphasizes the purpose of the target text. Vermeer (1978: 100) states that the methods and strategies used in translation are determined by the intended purpose of the target text. Skopos theory holds the notion that the skopos of the target text is determined by initiators and/or customers, which means the skopos of translation has to be clearly set before translation starts. In line with this, Vermeer (1987: 29) defines translation as the production of a text in a target setting for a target purpose and target addresses in target circumstances. Therefore, he (1987: 541) argues that source text is just "raw material." Pinchuck (1977: 21) also says that "a text will normally contain more information than is needed," adding that not all the information in the source text is needed (1997: 220).

A third approach is Pym's risk theory. Pym (2004: 27) says translators distribute their efforts differently depending on the risks involved. Pym defines (2004: 28) risk as "the possibility of not fulfilling the translation's purpose." Therefore, high-risk elements are the language that carries high importance to serve the text's purpose and low-risk elements are the language that is not relatively important to serve the purpose. He suggests three lessons based on his risk theory. First, translation elements can be divided into high-risk elements, low-risk elements, and moderate-risk elements. Second, analyzing the purpose of the translation determines the relative risks. Third, translators should focus on high-risk elements rather than on low-risk elements. What we have to bear in mind here is that his division of risk is not based on the source-text analysis, but on the purpose of translation. Pym suggests (2004: 30) that the degree of effort "should ideally correlate with the degree of risk involved," adding, "low-effort solution to high-risk problem is more advantageous than a high-effort solution to a low-risk problem."

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2.2.1.4. Applying target-oriented approaches to technical translation

The emphasis on communication efforts in relevance theory gives significant meaning to web page translation since the purpose of web page translation lies in communicating with users. Theories of minimum efforts and maximum results are absolutely true in web page translations. Users do not make an effort to read the text, which is proved in Nielsen's studies (2006) described in later sections. Viewing the source text as raw material is important in that it goes against the principle of being accurate or being equivalent to the form. This can also justify the omission or elimination of parts of the source text in the translation process.

Toury's notion that translation is an independent and autonomous text works very well in web application localization. We can easily think that average web application users will not spend time finding the original source language application and compare it with the localized sites to decide whether they want to revisit the localized web site. What they are expected to do is to compare the localized web applications to the similar regional ones to decide which one is better for them. This is also a part of what this pilot research tries to show.

However, Hönig (1997) points out that relevance theory does not consider how good or how bad the translation is as a translation since the source text is not considered. Many consider not being able to determine the quality of a translation problematic in assessing software translation quality. However, the concept of quality in translation can be expanded and interpreted as usability in web applications, since a translation cannot exist alone in localization without user interfaces and features, and more importantly, usability focuses on the satisfaction of users. In other words, usability can be a good evaluation category for quality of translation.

Pym's risk theory can also face realistic criticism in web site translation. Some believe all texts are important and therefore high-risk items, because any mistakes, regardless of risk level, can damage the trust relations with the client. This might be very true in many translations and it is also common belief in the translation and localization industry. Pym argues that (2004: 35) "translators are open to mistrust until proven trustworthy, and that mistrust can grow on the back of even the most apparently insignificant of errors." This kind of trust issue can easily be spotted in the localization industry. The belief that all texts are important is prevalent in many localization projects. As I will show in 2.2.2, the current evaluation practice

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of translation quality does not propose any notion of high-risk items or low-risk items in most cases. The evaluation form shows that the clients want all the text to be carefully read and translated. The evaluation form treats all the text on an equal footing, so whether the translator made a mistake on a high-risk item or a low-risk item, it is considered one mistake. However, understanding the high-risk elements and low-risk elements and discussing such concept with the client will be a good way of building and maintaining trust.

Pym adds (2004: 35) that "one of the implicit purposes of all translation is to create trust in the figure of the translator […] the attainment and maintenance of trust is so important," which is undoubtedly true. Without trust, translators will never have any latitude to explore different translation approaches, and the localization industry will never change its practices. In line with this, our pilot study will show what can be considered high-risk items and what can be considered low-risk items, and we will expand this idea to bring creative diversification methods in current localization practices.

2.2.2. Assessing the quality of web page translations

As there are so many different approaches to translations, measuring the quality of web page translations is also controversial. It is hard to say how clients evaluate translations because the needs and views of clients often are all different and subjective. In order to bring objectivity to the research, we have used the quality evaluation categories proposed by the Localization Industry Standards Association and used by many localization vendors. The pilot study will not go into detail about translation evaluation. What this study aims to show is what categories are being used to measure the quality of translation in the localization industry. The categories presented here will be reviewed later based on the findings of the research.

In the localization market, vendors who hire translators pay a lot of attention to the quality of translations because their clients usually are big companies who are very likely to keep needing vendors for future updates and maintenance. For that reason, screening translators and finding better translators is more important now than ever. Many localization vendors hire evaluators who can edit the translation and determine the quality of the translation before they send the deliverables to their

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clients. Some vendors have a certain form with both quantitative and qualitative entries for evaluators, and some vendors just have qualitative entries for evaluators.

Having a certain form with data entry helps evaluators and translators stay objective and follow suggested rules, but it limits other approaches that might help enhance usability. When translators know that their work will be evaluated based on the form, their exploration of creativity significantly decreases. In other words, having a set of categories predetermines the translators and evaluators' focus. The existing evaluation form always contains the common categories: accuracy and/or mistranslation, style, consistency, grammar, and terminology. The form usually has minor error and major error sections and evaluators are supposed to enter the number of errors they find in those sections. At the end, the total mistakes are automatically calculated.

Luz International, a localization company based in San Francisco, California, and many other localization companies use the form that LISA proposes. The cover has instructions, the second page includes quantitative entries, and the third page has qualitative entries for evaluators as shown in Fig 2.1 and Fig 2.2.

Fig 2.1. Quantitative evaluation used by Luz (originally proposed by LISA)

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Fig 2.2. Qualitative evaluation section of evaluation by Luz

If we look into the details of categories that companies or the localization industry find important in evaluating translations, we can see what kind of translation approaches the industry expects from translators. The first two categories in the evaluation are mistranslation and accuracy. Mistranslation literally means finding out changes or deviations from the source text meaning. Accuracy means how faithfully the translators convey the exact meaning of the source text without any omissions or additions. These elements consider the source text so heavily that it does not give translators much room to employ different approaches. Translators are required to stick to the source text to make sure their translation renders as equivalent a meaning as possible.

The next three evaluation criteria are terminology, language, and style, which value target texts more than source texts. These areas give translators some room to determine the appropriate terminology or style for the translation, and translators can apply language-specific rules to the translation. The next item is Country. This means that translators should be able to identify country-specific issues such as systems of measurement and currency conversion. This is more about simple localization issues than applying a cultural concept. The last element is consistency,

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which means translators should keep the same terminology and style throughout the application.

The qualitative section shown in Fig 2.2 is provided for evaluators to write down more details on the errors they found. The form has an 'Error Severity' section, which is somewhat related to the notion of risk. Evaluators are required to decide whether the mistakes that translators made are severe or are not severe. However this does not fully address the notion of risk items in translation, since the evaluators are still supposed to "count" all the errors based on accuracy and then explain about those on this section.

One noticeable and recent practice is that vendors usually allow both translators and editors to make comments on each other's work and open communication channels among everyone involved. Therefore, if translators feel like they need to explain the rationale behind their decisions, they can write down their comments and it is often helpful for final decisions.

As explained here, the current method of evaluating web site translation focuses very much on source text and the concept of equivalence. The evaluation category does not include any communication or cultural adaptation elements, which means the web site translators are not required to think about how communication and cultural adaptation should be incorporated into their translation. The pilot study will show that the selection and relative weight of the categories needs reconsideration. At least in the U.S. market, similar categories are used for all the texts regardless of their purpose, and it is up to the evaluator to decide where and how to put the numbers and comments. Setting up different categories or redefining the terms in localization can change the methodologies and mindset of translators and evaluators and help raise the quality of the products. The main purpose of software localization needs to be considered in translation as a form of usability. Usability is not a proprietary word for engineers but also a word that localization translators need to keep in mind when they translate. What to consider and how to apply will be suggested at the end of this research.

2.2.3. Expectations of translators and current practice

More and more clients have started to realize that word-for-word translation is not always a perfect solution destined to please users in target markets. These days,

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translators are required to be more dynamic and creative. However, automated tools designed to cut costs and translation efforts hinder translators' efforts to apply more dynamic approaches. Vendors use CAT tools either in the form of software or of a web-based real-time application to create translation memory, coordinate work flow, and cut costs. In that case, translators have to read the source text line by line and enter translations for each specific line. Sometimes, a CAT tool picks up only fragments in the source text such as "to" or "with" and translators are supposed to translate those fragments. However, not every language has prepositions. In that case, translators are required to translate the source text very literally, almost on a word-for-word level. Translators are also required to conform to a glossary. Consistency and conformity are considered important in localization translation, which is true if the consistency is applied to set technical terms. However, in many cases, sticking to existing translation memory and a glossary takes away a very high degree of latitude from translators. One of the reasons for the popularity of CAT tools is that accuracy and uniform style are given more weight than culturally different style adaptation or communication efforts.

2.3. Reading

Studies on usability are becoming very popular, but often the scope is limited to technical or engineering design and architecture. Some usability studies have been conducted on cultural dimensions, but not enough to cover issues in Translation Studies. Many raise the question, "is localization necessary to enhance usability?" but not "how can we enhance usability in localized products." As part of the effort to analyze the current studies, this section explains the definition of reading, major researches on readings in general, reading patterns and reading rates on web sites.

2.3.1. Definition of reading

Reading or the act of making meaning is a highly complicated process, yet 1.5 billion people can read or have learned to read (Hudson: 2007). Reading means "dealing with language messages in written or printed form," according to Urquhart and Weir (1998:

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14). They emphasize a reader is required to construct the meaning from a written text. Wolf (2007:16) defined reading as "neuronally and intellectually circuitous act, enriched as much by the unpredictable indirections of a reader's inferences and thoughts, as by the direct message to the eye from the text." A wider definition of reading focuses more on the cognitive operation of reading and therefore includes interpreting context and even situation. For example, Barton says (2007: 18) "[r]eading can go from the mechanical uttering of the newsreader to the innumerable levels of interpreting any text. In the sense of understanding meanings, reading has always been applied to the wide range of phenomena, including the reading of barometers, tea-leaves and facial expressions". As the Internet became more accessible to many people around the globe, reading is synonymous with "reading the web" (Boardman 2004; Wolf 2007) especially to those who have grown up in the digital era.

2.3.2. Reading conceptualization and models

Hedgcock and Ferries (2009: 33) explain "reading conceptualization" in terms of how people relate to three guiding metaphors, known as bottom-up, top-down, and interactive approaches. They intentionally use the term "metaphors" rather than models or theories because the latter "represent metaphorical generalizations that stem from comprehension research" (Grabe and Stroller 2002: 31). They explain that rather than using one metaphor, readers' reading strategies vary and advance to another one, as their reading proficiency improves. Bottom-up approach begins from grammar, vocabulary, and oral recitation whereas top-down approach focuses on schema activation, background knowledge, cultural experience, and experimental knowledge, believing that reading comes from the reader, not from the words. We will examine the three metaphors and a few more theories that explain the cognitive reading process.

2.3.2.1. Bottom-up Views

As the term indicates, "bottom-up" proposes that the reading begins at the bottom level of text structure such as words, graphemes, and other visual units. This linear process of reading word by word or even letter by letter is the process in a "fixed order, from sensory input to comprehension and appropriate response" (Hudson 2007: 33). During 1700s, Francis Bacon views considering meanings begin from words was the mainstream in reading process. From 1700 to 1825, reading focused on spelling,

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pronunciation and oral recitation (Venezky 1989). Robinson et al (1990: 16) described that reading holds memory, and "the ability to communicate the written text effectively through oral reading indicated the reader had mastered the meaning of the text". Until 1930s, the most common way of verifying the understanding was to have the reader provide oral representation of texts, because it was considered to be "convenient, economical and objective" (Readance and Moore 1983). However, around 1930s, focus began shifting from an oral reading to silent reading as Jones concluded that silent reading is more efficient than oral reading (Jones 1912 as cited in Wilson 2011). Strong proponents such as Gouch assert that the fact that we read serially from left to right and we instantaneously recognize symbols and then convert them into phonemic equivalents are proof of bottom-up processing (1972: 338).

LeBerge and Samuels (1974) proposed a more developed bottom-up model by explaining the atomization of reading skills. Readers practice macro-level processing skills such as grapheme identification in a deliberate way in the beginning. With practice, processing skills gradually become automatic, thereby relieving demands on working memory (Anderson 1995). LeBerge and Samuels (1974) compared reading to ball-handling in basketball. Ball-handling requires multiple tasks on a macro-level. A player has to dribble, pass, catch, and shoot simultaneously. Experienced players do all these automatically without making individual efforts on a conscious level. Gough (1972) and LeBerge and Samuels (1974) all agree that readers associate the visual representation of spelling patterns, words, phrases, and sentences with phonological memory and then with semantic memory as in the following schematic (Hedgcock and Ferries 2009):

GRAPHEM -> PHONEME -> SEMANTIC REPRESENTATION (MEANING)

LeBerge and Samuels (1974) emphasize the automatic processing of reading and freeing up cognitive capacity, mainly memory, and consider background knowledge to comprehend the meaning. Grabe and Stroller (2002) argue that this bottom-up model overlooks other vital functions such as knowledge sources, motivations, attitudes, and purposes associated effective reading.

Another bottom-up view is that of Just and Carpenter (1980, 1987). They consider the text to be the most essential component of reading, because the text is much more discursive, with cohesion and coherence features. They stress that reading is non-linear and acknowledge that readers choose specific passages for reading.

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2.3.2.2. Top-down Views

Even though top-down views contrast with bottom-up views in many ways, those two views are not dichotomous. Rather, these two show overlapping. The main difference in the top-down view is that reading is primarily directed by reader goals and expectations (Grabe and Stroller 2002). This view suggests that readers process the text according to their anticipation and constantly compare the text with their expectation to see if they match. If not, they adjust the reading strategies or revise anticipation.

2.3.2.2.1. Guessing game: Reading as a "guessing game" is the term Goodman coined in his 1967 paper "Reading: A psycholinguistic guessing game" to explain how readers use grammatical and lexical knowledge to reduce the dependence on the decoding of graphemes. Goodman emphasizes the "cognitive efficiency involved in a reliance on existing syntactic and semantic knowledge" (cit. Hudson 2007: 37). Some leading researchers have gone against this view, saying that good readers seldom engage in a guessing game while reading (Gough and Wren 1999, Pressley 1998, Stanovich and Stanovich 1999). However, many agree that the human brain has a limitation on how much information it can contain, store and process. Due to such saturation, top-down supporters claim that the bottom-up approach focusing on graphemes, monophemes, and words cannot be efficient.

Smith (2004: 3) dismissed the bottom-up approach, arguing "all learning and comprehension is interpretation, understanding an event from its context (or putting the event into a context)." He stated that all reading is interpretation, an act of trying to make sense of print, not an act of focusing on specific letters or words.

2.3.2.2.2. Cueing Systems Theory: People use signs to express themselves. Signs are defined as anything we use to express meaning such as words, pictures, gestures, songs and any other objects. Humans can naturally interpret and create meaning out of those signs. Every sign has a common set of cues to create meaning in that form of representation. The form of representation refers to how we symbolically communicate our private conceptions about the world and is often used interchangeably with the phrase "sign systems" (Eagleton and Dobler 2007). Goodman (1996) and Clay (1991) state that there are at least three major cueing systems used to make sense out of the text: graphophonic, syntactic, and semantic. These perspectives, often depicted as a

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Venn diagram (Figure 2.3), show how cueing systems interact with one another to promote a comprehension process. Syntactic cues will ask "does it sound right in terms of sentence structure and grammatical use of language, semantic cues will ask, "does it make sense in terms of context," and graphophonic cues will ask "does it look right in terms of how the letter relates with the sounds?" (Eagleton and Dobler 2007)

Fig 2.3. The Three Cueing System of the Reading Process from the New South Wales Department of Education, 1978
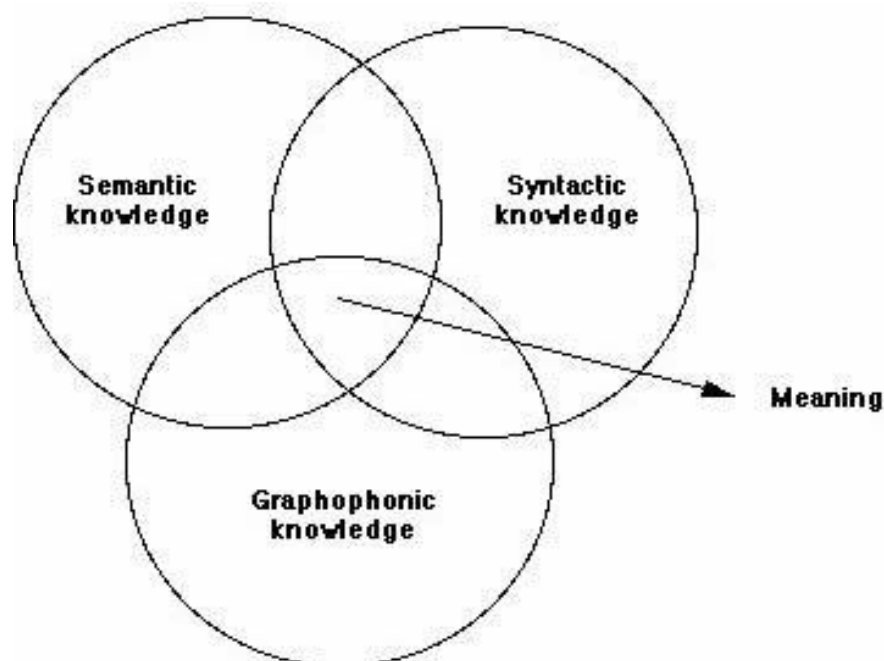
Supporters say effective readers apply these cueing systems simultaneously by making connections. Goodman introduced the term "miscue analysis" to represent how readers make sense of grapheme cues in print (See Hedgcock and Ferries 2009). Miscue analysis examines the errors made by readers while reading aloud. Farris et al. (2004) explain that miscues take place when the expected response and the observed response do not match. By analyzing the miscues, readers' error patterns can be identified and the resulting profile should show how readers make sense of print messages and convert them to meaning (Goodman 1965). The knowledge that helps readers predict and from which they construct meaning, which is referred to as schematic knowledge, should also be considered in miscue analysis. Schema theory states that anticipations "are externally constructed and impose external constraints on the way in which we understand messages (Schiffrin 1994: 104). In this sense, schemata determine text comprehension.

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2.3.2.2.3. The Whole Language movement: The Whole Language movement is another top-down view that we need to examine. The WL movement values wholeness, saying the whole is always greater than the sum of its parts (Fountas and Hannigan 1989) and it is "the whole that gives meaning to its parts (Shrum and Glisan 2005: 193). It values understanding the whole picture rather than breaking words down into pieces (Ferris et al. 2004). The WL movement was heavily criticized in 1980s and 1990s in the US for neglecting the importance of bottom-up skills such as phoneme-grapheme correspondence, phonemic awareness, word recognition, word analysis, and so on (Hedgcock and Ferries 2009).

2.3.2.3. Interactive and integrated views of reading

There are no sharp distinctions between bottom-up and top-down views. As Hudson (2007: 34) states, both the strict bottom-up and top-down models are too naïve and simplistic. Combining those two views has been suggested, especially in teaching reading. However such a compromise spawns pitfalls. Grabe and Stroller (2002: 33) say that "one can take useful ideas from a bottom-up perspective and combine them with key ideas from a top-down view." This poses a self-contradictory issue because efficient automation processing in working memory, which is an indispensable process in the bottom-up view, is "incompatible with strong top-down controls on reading comprehension (Grabe and Stroller 2002: 33). As a remedy, Grabe and Stroller introduce modified interactive models, which account for the automatic process that the reader carries out "primarily in a bottom-up manner with little interference from other processing levels or knowledge resources" (2002: 33). Mainstream interactive models tend to focus on how readers simultaneously activate multiple knowledge sources (e.g., graphology, orthography, vocabulary, syntax, schemata). (Hedgcock and Ferries 2009).

2.3.2.3.1. Interactive Compensatory Model: The Interactive Compensatory Model introduced by Stanovich (1980) assumes that when readers have to tackle an underdeveloped skill area or knowledge source, they compensate for those areas with reliance on another, more automatized skill area. For example, if a reader encounters a technical word they do not understand, they try to understand the word from the context, background knowledge, etc. In contrast to many top-down approaches, which presuppose that less-skilled readers seldom use higher-level processes, the

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compensatory model predicts that less-skilled readers deploy both high and low-level strategies to overcome reading difficulties (Hedgcock and Ferries 2009).

2.3.2.3.2. Transactional Theory: Kucer (2001) and Rosenblatt (1978) state that the act of understanding takes place in the transaction between the reader and the text. This view, first introduced by Rosenblatt in 1938, was articulated by Rosenblatt later in 1985 by claiming the meaning cannot be just created at the text level. Instead, she says the meaning is created when a reader interacts with the text. According to Rosenblatt , transactional theory focuses on "the reading act as an event involving a particular individual and a particular text, happening at a particular time, under particular circumstances, in a particular social and cultural settings, and as part of the ongoing life of the individual and the group" (1985: 100). Another key idea with Transactional Theory is Reader Response Theory, which claims the reader's stance (i.e. purpose and perspective) heavily influences the way they read and how they make sense of the text. An aesthetic stance focuses on a reader's sense of enjoyment and personal connections made with the text, and an efferent stance focuses on the information or the details gathered from the text. These stances are not mutually exclusive, but rather help readers move seamlessly throughout the reading process (Eagleton and Dobler 2007).

2.3.2.3.3. Connectionist: Connectionist theories are often referred to as parallel distributed processing (PDP). Supporters claim that mental operations in reading take place in parallel rather than serial fashion, claiming that a serial process takes too much time and a faulty step in the operation would short-circuit the entire comprehension process (McClelland, Rumelhart and Hinton 1986). Koda (2004) and Bernhardt (2005) state that the connectionist theories posit text processing as an intelligent system that can operate without explicit rules. They are bottom-up approaches by nature, but recent researchers explain that PDP-oriented views are considered interactive models as they account for how graphic, syntactic, semantic, and schematic influences interact while explaining the computational aspects of reading (Hudson 2007). Connectionist theories therefore could provide insight? on how the reader's cognitive system considers multiple options from different levels of knowledge at the same time (Hedgcock and Ferries 2009).

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2.3.2.3.4. Verbal Efficiency Theory: Verbal Efficiency Theory views reading as "incrementing a store of graphemically accessible words" (1991: 33) and claims that the efficiency of local process at the text level Perfetti restricts comprehension (Prefetti 1985, 1988). The model is based on bottom-up approaches, as Perfetti (1991: 34) explains: the "restrictive-interaction model […] allows no influences from outside lexical data structure, no importation of knowledge, expectancies, and beliefs. Skilled word recognition is context-free." However Perfetti specifiess that local text process and text-modeling processes are interactive and integrative as readers have to consider all the possible meanings related to a word and then choose the best fit for the word. The selection takes place in the local context where the word appears.

2.3.2.3.5. Rayner et al's interactive approach: Rayner et al's interactive approach is similar to Verbal Efficiency Theory but they examine the relationship between eye movement and fixation time. The model assumes that eye fixation triggers the reader's lexical access, with access proceeding directly from textual processing or indirectly through phoneme-grapheme correspondences, and that eye movement and lexical access take place serially (Hedgcock and Ferries 2009). Rayner et al (1989) claim that the inner speech mechanism constructs a literal, semantic, and syntactic representation of the text, and enables the reader to detect inconsistencies and revise the reading operation. This overlaps with Goodman's (1986) guessing game model. When readers encounter inconsistency or unclear messages, they redirect their eye movement to find answers to read relevant texts, and find a new interpretation of the message in question by consulting working memory (Rayner et al 1989). Rayner et al's interactive approach is meaningful in that it attempts to explain the comprehension process by observable means such as eye-movement and fixation (Hudson 2007).

2.3.2.3.6. Comprehension-as-construction: The comprehension-as-construction model focuses on how readers use text to negotiate meaning. The Pearson and Tierney model (1984) assumes that readers compose the meaning as they read, rather than just process the text. Pearson and Tierney (1984: 144) state that a reader "reads as if she were a writer composing a text for yet another reader who lives within her." This assumes that authors provide enough clues with the text meaning so that readers can reconstruct the intended message (Hudson 2007). Pearson and Tierney stipulate that readers perform four roles simultaneously: planner, composer, editor, and monitor. This view coincides

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with Flower and Hayes (1981), who posit that writers move back and forth between the reader and writer perspectives in the writing process.

2.3.3. Reading strategies

Readers orchestrate, consciously and unconsciously, many internal processes to understand the meaning of the message they read. The processes are also affected by the purpose of reading, as all readings are purposeful. Good readers execute multiple processes with clear goals in their minds. Efficient comprehension occurs when a reader knows when, why and how to use a reading strategy (Paris, Lipson, and Wixson 1983). Many different reading strategies and skills have been introduced. MacLachlan and Reid (1994) talk about *interpretive framing* which can be categorized into 4 structures that affect reading skills. First, external framing is to use background information and experience to understand the text. Second, intertextual framing is to use cues such as headings, sub titles, and referential words to make connections between the sentences. Third is circumstantial textual framing which derives information from the cover, title and sub-headings of the books. Fourth, intertextual framing is to use previous readings to make connection to the current readings. As such, readers need to be active while they ready and utilize different skillsets. Useful skills, proposed by UEfAP (Using English for Academic Purposes), are understanding text structure/organization, understanding conceptual meaning such as cause and effect, understanding reference in the text, dealing with difficult words and sentences, and critical reading including evaluating arguments, weighing evidence, and recognizing implications. (http://www.uefap.com). Eagleton and Dobler (2007) also introduce more specific strategies.

2.3.3.1. Prior Knowledge

Reading is an information-gaining process. This means readers try to gain new information by connecting prior knowledge with the text and with the world. Readers can expand their own knowledge if sound understanding of the text takes place. When there is little or no prior knowledge, understanding new information becomes more challenging because there is no point of connection and reference in the reader's head. Duke and Pearson (2002) explain that good readers employ prior knowledge to check whether their construction of meaning matches with what they already know about the

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topic and structure of the text by developing connections among the text, themselves, and the world.

2.3.3.2. Prediction

When readers are equipped with a good level of prior knowledge, they make predictions before, during, and after reading. Accurate predictions rely on a sensitive balance of prior knowledge of the topic, other experiences with similar types of text, and a sense of wonderment or curiosity (Pressley 2002) The process of prediction happens in three steps, according to Eagleton and Dobler (2007): making the prediction, gathering information to confirm or refute the prediction, and making a judgement about the accuracy of the prediction. Beers (2004: 4-5) said if accurate prediction does not take place, or if predictions that readers made are not confirmed in the texts, readers feel disconnected or lost, which can disrupt the understanding, especially if this occurs too often and is not corrected.

2.3.3.3. Prioritizing Important Ideas

Before reading the main text, skilled readers make predictions by scanning the title, illustrations, keywords, etc. While reading, they verify whether their predictions were correct and reasonable. While verifying the predictions, experienced readers prioritize the meanings to the degree of importance; they summarize and remember important ideas while they pay little or no attention to unimportant details (Afflerbach and Johnston 1986). The ideas that readers consider important are incorporated and added to the main idea while unimportant ideas tend to drift and disappear. The degree of importance can differ among readers, as the purpose of reading varies.

2.3.3.4. Synthesizing

Synthesizing is the combining of separate ideas to create a new understanding, which happens in everyday life beyond reading. Keene and Zimmermann reiterated the importance of this process, saying "Synthesis is about organizing the different pieces to create a mosaic, a meaning, a beauty, greater than the sum of each shiny piece. It is a complex process in which children, even the youngest, engage very naturally every day" (1997: 28). Readers change their thinking by understanding the text, as they gain new information and possess or own new ideas. Such synthesizing in reading is considered the most challenging part of comprehension because it requires the reader to bring

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together an awareness of the reading process and an understanding of the text (Dole et al 1991, Harvey and Goudvis 2000). Skilled readers stop occasionally while reading to examine whether their reading is consistent with their predictions, and to prioritize the importance of new information, in order to form one complete picture in their heads.

Research in the area focuses on the step of summarization, and holds that clear and concise summarization leads to synthesis. The term "crunching" that Afflerbach and Johnston (1986) use well describes the way a reader reduces text to more manageable units of important information. The crunching process becomes automatic and unconscious for skilled readers, which makes it difficult to observe and analyze. However, it is obvious that the synthesizing requires various comprehension strategies. Harvey and Goudvis (2000) compared the complexity of the synthesis process to the simultaneous process of critical and creative thinking. They consider a synthesis as an idea that evolves slowly but happens only when the reader tries to make meaning out of the text.

2.3.3.5. Monitoring

According to Pressley (2002), skilled readers with meta-cognitive skills of mentally summarizing and chunking the text are more careful in reading and spend more time on difficult parts of the text. They know when to exert more effort to make sense of a text. Experienced readers first scan the text quickly to note headings, keywords, and any noticeable details to make predictions, and then try to match their reading with their initial predictions, and adjust reading rates as they encounter parts that are not easily understandable (Eagleton and Dobler 2007). Poor readers are typically less attentive to the details, and often do not recognize the meaning distortion or loss. This is mainly because they do not have effective strategies to get their reading and understanding back on track, according to Eagleton and Dobler (2007).

2.3.3.6. Repairing

The repairing or so-called "fix-up" strategies are an indispensable step for readers to recover the lost meaning. Skilled readers select an appropriate mental tool or strategy to repair confusion (Garner 1987). The strategies may include rereading, skipping ahead, or searching for context clues (Eagleton and Dobler 2007). Skilled readers show

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flexibility in using and changing these skills to compensate for the lost meaning. Some use more than one skill simultaneously as a solution bundle (Eagleton and Dobler 2007).

2.3.4. Difference between paper reading and web reading

Reading a webpage is different from reading a paper, due to its layered and various formats. In addition to the static content, there are graphics, moving texts, hyperlinks, videos, and many other visual effects are used on the web, which means readers have to alternate their conventional reading strategies to differentiate visual images, decode the meaning, and to process the multi-layered information at once. Reading web-based text permits nonlinear strategies of thinking, allows nonhierarchical strategies, offers non-sequential strategies, requires visual literacy skills to understand multimedia components, is interactive with the reader able to add, change, or move text, and enables a blurring of the relationship between the reader and writer (Sutherland-Smith 2002).

Nevertheless, web reading requires the same fundamental process. Readers rely on their prior knowledge, employ the same kind of prediction and synthesis. However, the non-linear and multi-layer characteristics of web pages pose challenges to the readers, especially those who are not used to web reading and web page structures. Often cases, when readers do not have much prior knowledge or something does not match with the prior knowledge, readers tend to escape from their texts (web page) and try to search for the idea from a search engine or another page. In this case, reading becomes an intermittent process of reading and stopping, allowing the smooth acquisition of information fragments, but disrupting the thought process. Web readers should also be able to make good predictions on where and how they can locate the information they are looking for. Readers should predict which links will lead to what information, and where the core information is located on the page they are reading. As a result, confirming or disconfirming the prediction requires a multi-faceted processes compared to paper reading. If such prediction is misled or if readers click different links randomly, readers will waste their time and effort just to navigate the web pages and find the corresponding information. Such prediction strategies are closely related to the experience level on web reading.

Another consideration is that web pages use many emphasis techniques such as bold colors, different text formats, and visual effects which could distract readers from finding and prioritizing important information. Some pages even use pop-ups and

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banners in the middle of the pages, which can be disruptive in reading flow. Therefore, it is important for readers to keep the predictions in their minds, and screen non-linguistically unimportant information by getting accustomed to web page structures. In addition, knowing how to go back to the original text that they were reading after being interrupted, by using the back button, opening a new window, or finding the page in the browsing history are unique skills that are required in web reading.

First proposed by Eagleton, the QUEST model illustrates the cyclical and multi-step nature of Internet inquiry (Eagleton and Dobler 2007).

Fig 2.4. The QUEST Model of Internet Inquiry. Eagleton and Dobler 2007.
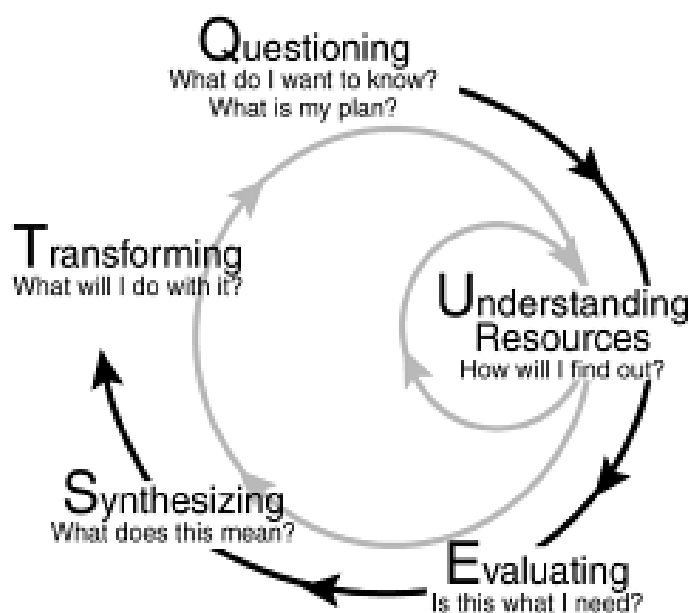
As seen in the diaphragm, Q stands for Questioning, U stands for Understanding Resources, E stands for Evaluating, S stands for Synthesizing, and T stands for Transforming. The questions in the reader's head takes place in the sequence of QUEST. First readers ask "what do I want to know? What is my plan?" followed by asking "How and where will I find out?" U might have been an important question in the past, but now U automatically assumes the web these days, as the number of people who search the web to find solutions and answers is dramatically increasing. According to a research conducted by Erdelez (2002), college students relied almost exclusively on electronic resources to accomplish their assigned task of searching for specific information. The most often used were free Web-based resources, and they had more

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success finding information on the Web than in the commercial online databases. After the decision about the resource is made, readers will search the web and determine whether what they are looking at are the pages they need. This part is called Evaluating, which does not mean evaluating the comprehension. Synthesizing is the step in which readers ask the meaning of new information to themselves. The last step of the model is Transforming, which means readers ask what they will do with the new information. The QUEST model is similar to existing concepts in the models of information literacies (e.g., Eisenberg and Berkowitz 2001, Kuhlthau 1993, Macrorie 1988), but is based on the observations of hundreds of learners and uses specific terminologies to explain the concept. The model is designed to "scaffold all aspects of the Internet inquiry process until learners are able to self-reflect and self-regulate" according to Eagleton and Dobler (2007: 52).

2.3.5. Reading Patterns on web pages

There are a few reading patterns that explain web users' eye movements. Depending on the types of texts and the purpose of web browsing, the patterns vary. However there are also common factors in reading patterns.

2.3.5.1. General reading pattern

The Consumers' reading pattern research institute, Eyetrack III (2003), released a general reading pattern of newspaper homepage readers. They recorded the eye movements of 46 readers while they read several newspaper homepages. Even though the homepage designs had small differences, Eyetrack III researchers noticed a common pattern: The eyes most often fixated first in the upper left of the page, then hovered in that area before going left to right. Only after perusing the top portion of the page for some time did their eyes explore further down the page. The movement directions can vary if the web page design is completely different; however the general direction from left to right, top to bottom remains the same. This movement is colored with arrow tops in Fig 2.5.

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Fig 2.5. Reading patterns of new web page readers
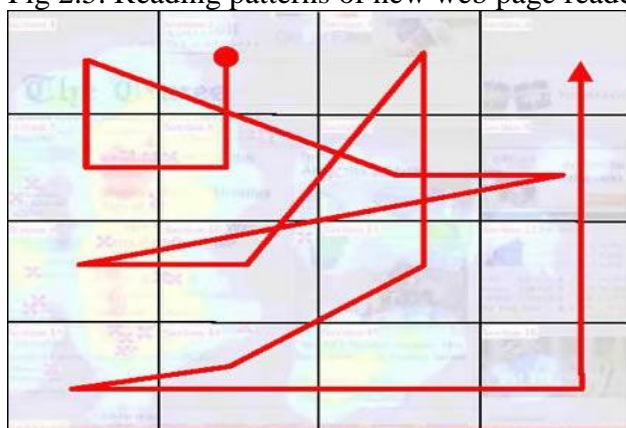
2.3.5.2. F-shaped reading pattern

Nielsen (2006) ran a test on 232 users to determine how they actually read content-based web pages by using an eye-tracker and found that they tend to read in an "F" shaped pattern as shown in Fig 2.6. Red colors mean the most viewed, yellow colors mean less viewed, blue colors mean hardly viewed, and grey colors mean no fixation at all. Not all the texts are read F shaped. Sometimes users read one more horizontal line, making an E shape or one less line, making an inverted L shape.

According to Nielsen (2006), users first read in a horizontal movement, usually across the upper part of the content area. This initial element forms the F's top bar. Next, users move down the page a bit and then read across in a second horizontal movement that typically covers a shorter area than the previous movement. This additional element forms the F's lower bar. Finally, users skim the content's left side in a vertical movement. Sometimes this is a fairly slow and systematic skim that appears as a solid stripe on an eye-tracking heat map. Other times, users move faster, creating a spottier heat map. This last element forms the F's stem.

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Fig 2.6. Nielsen's study on F shape reading (2006)

Knowing the type of the web page is important to evaluate the pattern. Most of the left text is "About us" on corporate web sites. As seen in the heat map, readers read the first paragraph the most, spend less time reading the second, and none after the third paragraph. The middle text is a "Product" page of a manufacturing company. Users had high fixation on the graphic box and also allocated significant fixation time to a box in the upper right part of the page where the price and "add to cart" button are found. The right-most text is a web search result page. As seen in the heat map, users click the first three to five headlines along with the sponsored links on the right. After that, no fixation is shown.

The implication of this shape is that readers do not read thoroughly and only the first line and paragraph matters to users. It seems that users focus on the first few lines of a web page and then wait for something to grab their attention. At this point, visual effects including graphics, boxes, and different colors are important to catch readers' eyes. Even bullet points or dots can be effective to carry the intention of product makers. In other words, how and where to position certain text is crucial to gain users' attention. For example, when people use a search engine to find certain information, they are involuntarily led to click headlines that stand out. Usually the visual effect is so subtle that users do not know why they are clicking the headlines. However, most visited links are usually in different colors or fonts, or appear in different sections.

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The heat map in Fig 2.6., from Nielsen's 2006 research, shows bright red in the top right corner. Users who are used to reading left-to-right would not read that part voluntarily. Therefore, that space becomes wasted space. Less page means less maintenance and cost, so web developers found a clever way to use the space. They implement some visual effect, such as a text box, a different background color, or a different font, on that spot to catch readers' attention. The result looks successful as all the top right corners are glowing red in the heat map.

Human sensory systems, described previously, can explain these heat map patterns. When users see texts filling up their whole monitor screens, they feel they have too much information to process and the filtering process starts, both voluntarily and involuntarily. If users were looking for certain information, they want to find the most relevant information and filter out irrelevant information. The cocktail–party effect can explain this process. If users were just browsing the web pages without any tasks, anything that grabs their attention will make users focus on certain content. That content becomes a locus of attention (Raskin 2000) in this case. Finding out what that "anything" is an important part of usability testing.

2.3.6. Reading Rates on web pages

Nielsen (1999: 101) states that reading from computer screens is about 25% slower than reading from paper, adding that people usually have unpleasant feelings when reading online texts. He says that users therefore skim text and pick out keywords and sentences of interest, while skipping over those parts of the text about which they care less. He gives four reasons for users' skimming behavior (1999: 106). First, even though higher-resolution screen will mitigate this problem as technology develops, reading from a screen is tiring for eyes and 25% slower than reading from paper. Second, users feel that the web is a user-driven medium so they need to keep moving and clicking: they want to feel active while they browse the web. Third, when each page is competing with many other web pages, users do not want to commit their time and effort to one web page until they are sure that the web page is what they are looking for. So users tend to pick the tastiest segments of each web site they visit. Fourth, people simply do not have time to read all the information available on the web.

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In relation to this skimming behavior, Nielsen (2008) carried out a very interesting study on how higher-literacy users read web pages. He recorded 25 users' web-reading activities with an eye-tracker and found that participants only read 20 to 28% of the total information per visit. More interestingly, 17% of web browsers stayed on one page for less than 10 seconds.

Weinreich et al (2008) also tested the maximum number of words that users read during an average visit. They used pages with different word counts and found that the more content the page has, the less likely users will read.

Fig 2.7. Word count and percentage of user reading, from Weinreich (2008) and Nielsen (2008)
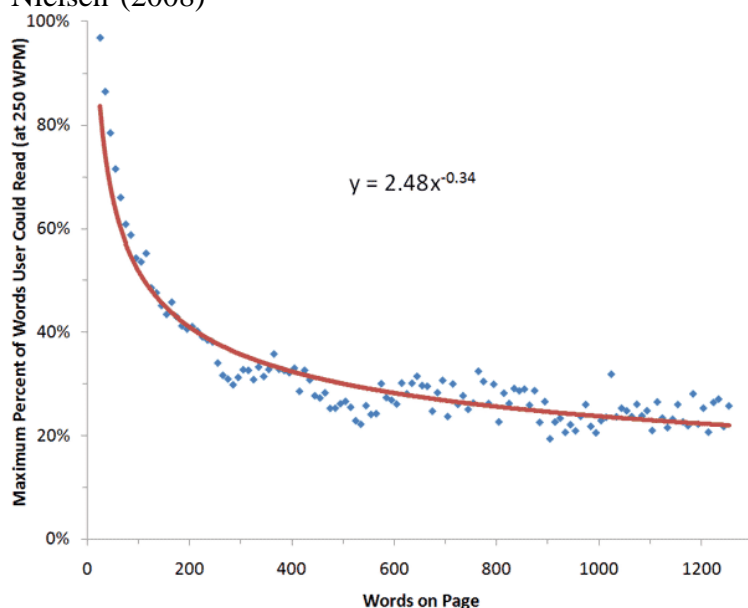
As seen in Fig. 2.7, users read about 50% of the information when the word count is 111. Decreasing word counts by using short sentences and maximizing visual effects can bring about more reading. This research also shows that users tend to skim the information rather than reading. The most frequently used interaction during the browsing is hyperlinks; the second is buttons, and the third is the "Back" button. These tests were conducted in a natural way, so users were not given any task and were asked to freely surf the web. The user groups were also professionals, including subjects such as college-level instructors.

Another study conducted by Nielsen (2006) shows a similar pattern. He conducted 42 users' reading rates on a newsletter. Users received a newsletter in their email system and they were asked to read it. He found that users are extremely

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fast in reading newsletters: the average time users spent on reading the newsletter was 51 seconds, but they read only 19% of newsletter. The predominant user behavior was skimming. Often, users did not even scan the entire newsletter: 35% of the time, participants only skimmed a small part of the newsletter or glanced at the content.

Users tend to skip the introductory texts in newsletters. Although this text was only three lines long on average, the eye tracking recordings revealed that 67% of users had zero fixations within newsletter introductions.

2.3.7. Implications for web page translation (with emphasis on the case of Korean)

These findings are also important for web page translators. F-shape reading patterns suggest that headlines and titles must stand out. Some languages prefer eye-catching headlines but others do not. Some cultures prefer neutral headlines. In those cultures, even though the headlines in the source text are eye-catching, experienced translators would try to make them more neutral in consideration of readers in the target market. That strategy is absolutely reasonable, but will it work on web page translations?

The F-shape reading pattern also suggests the first two to four paragraphs should contain the most important messages. This might work in English or any other languages that share similar logical development in writing. However, some languages such as Korean do not place important messages at the beginning. They place important messages at the end. In many cases, translators in those cultures reshuffle the whole paragraph to give the effects that readers expect. The first few paragraphs this might not contain any important information. If this is done, we might think people in different language environments have different reading patterns.

Naver UX Lab, which specializes in eye-tracking recoding of web users in Korea, published in 2008 a reading pattern of users, as shown in Fig 2.8. They recorded eye- tracking movements on two different web sites. The one on the left is a content page of a portal web site called Naver, and the one on the right is a search result page of Google Korea.

Fig 2.8. User's reading pattern on Korean portal site Naver (Naver UX Lab 2008)
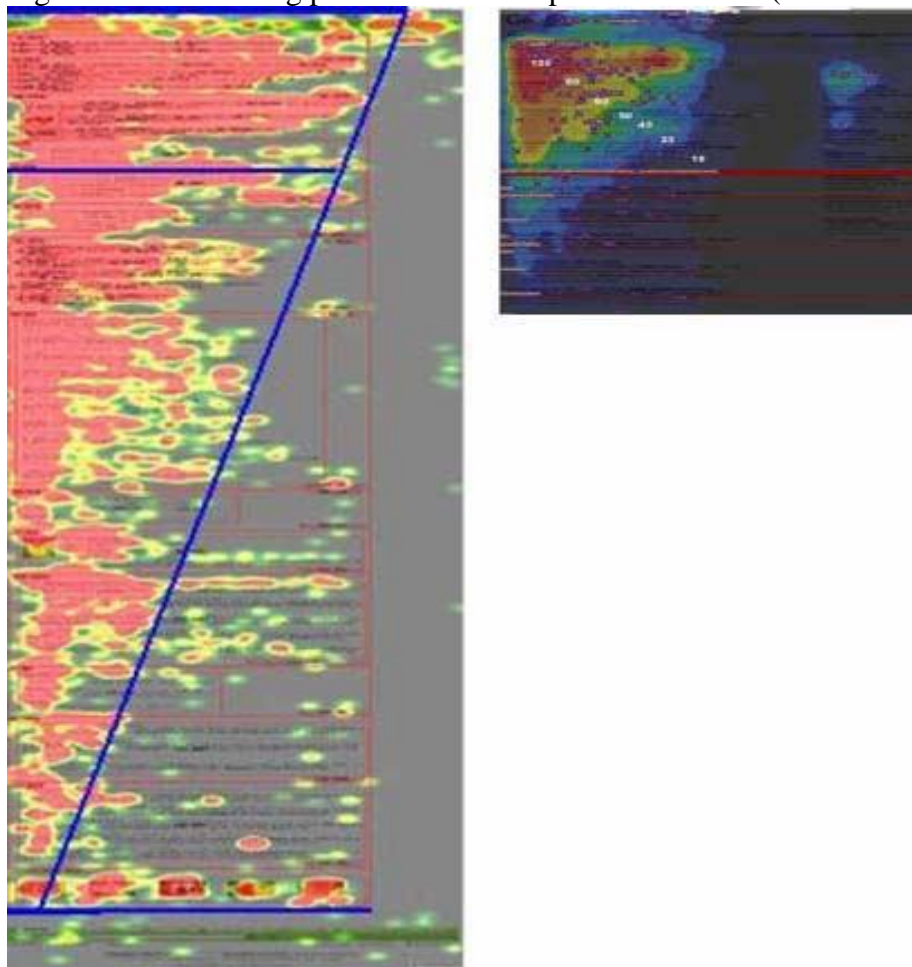
The reading pattern shows that Koreans also read similar to readers in the U.S., who use a completely different language structure. The inverted pyramid style shown in Fig. 2.8. can give significant insight to Korean web writers and translators. Korean web writers might have to abandon Korean's conventional logical development in writing and place important parts at the beginning to satisfy users. Translators do not have to reshuffle the source text any more if the source text is written to fit this purpose.

Word count threshold is another factor to consider. It seems that the overload of information threshold is much lower for web pages than for written materials like books or journals. The threshold word count on web pages can thus be crucial for web content developers and translators. If the word count threshold for web pages is so low, "short sentences" could be one of the categories that measure the quality of translation. The total word count for the source text is seldom the same as that of the target text, since some languages are lengthier than others.

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For example, the Korean language uses several different honorific forms in each sentence for formality. It has many different honorific conjugations for each component of a sentence, depending on the age differences between the writer and reader. Imagine how long the translation would be if translators tried to formalize the text and use all the honorific forms. Knowing that lower word counts attract more users, translators can skip all those complicated honorific forms and make the translation much shorter. The result might not be grammatically perfect or might not be formal, but this approach can work in certain situations. In this case, keeping sentences short can be more important than having perfect grammar, at least from a usability perspective.

2.4. Research in Translation Studies

In 2000 Jääskeläinen pointed out the Translation Studies had been focused on texts, languages, and cultures, with much less emphasis on cognition, perhaps because "process-oriented research efforts may lack the explanatory power required to draw reliable generalizations which are necessary for building viable theories and creating testable hypotheses" (2000: 27). Since then, there has been increasing research on how the human mind works, although texts, languages, and cultures are still popular areas of study. Major issues with process-oriented research include designing robust methodologies, establishing testable hypotheses, and establishing and maturing cooperation with Interpreting Studies, linguistics, psycholinguistics, cognition science, and other sister disciplines (O'Brien 2011).

Slow progress in cognitive-oriented research stems from the fact that those who are engaged in Translation Studies are not cognitive experts, biologists, or psychologists (O'Brien 2011). As Cronin puts it (2003:112), we may have to engage in "disciplinary nomadism" to bring progress to this new area of study.

2.4.1. Methodological framework in cognitive research in Translation Studies

The methodological and theoretical framework in cognitive Translation Studies began from cognitive psychology and Ericsson and Simon's use of think aloud protocols

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(1984/1993). Since then, a few frameworks have been developed and used. Each has its own strengths and weaknesses, but when combined, these frameworks can provide abundant and meaningful data. In order to do so, understanding what the frameworks are, and how they should be used and controlled, is critical.

2.4.1.1. Think Aloud Protocols (TAPs)

In order to gauge the internal process of reading, it is now quite common to consider readers speaking out loud what they were thinking, seeing, doing, and feeling while performing the task. This technique is known as Think Aloud Protocols (TAPs) or concurrent verbal reports. TAPs are widely used in the study of reading, writing, translation, decision making, and usability, where the data cannot be gathered directly. The concept of TAPs was first introduced to the usability field by Lewis and Rieman in their *Task-Centered User Interface Design: A Practical Introduction* (1993). The method was further developed in *Protocol Analysis: Verbal Reports as Data* by Ericsson and Simon (1993), who believed human cognition is information processing. They assumed that human beings can accurately report what is being processed in their working memory at any point in time. If the reporting takes place at the same time the reporter is doing a task, it is called concurrent verbalization, and if the reporting takes place once a task is complete, it is called retrospective verbalization (Ericsson and Simon 1993).

In *Usability Engineering* (1993: 195), Nielsen states that "thinking aloud may be the single most valuable usability engineering method." On the other hand, Göpferich et al. (2009) argue that TAPs that only include verbalization do not fully describe what Translation Studies need to investigate; they propose the term TTP (Translation Process Protocol), which includes actions such as consulting dictionaries or doing online research.

According to Ericsson and Simon (1993), information is stored in two different memory units: short-term memory (STM) and long-term memory (LTM). STM stores consciously processed information, and is easily accessible but has limited space, whereas LTM stores unconsciously processed information and is more difficult to access, but has more space. Ericsson and Simon admit that automation speeds up the processes and makes the "intermediate products unavailable to STM, hence unavailable also for verbal reports" (1993: 15). Only the non-automatic cognitive processes that can be controlled and regulated are heeded and are therefore reportable. Ericsson and Simon

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emphasize that "with increase in experience with a task, the same process may move from cognitively controlled to automatic status, so that what is available to the novice may be unavailable to the expert" (1993: 90).

TAPs in the early days were conducted on foreign-language learners or translator trainees. Lörscher (1991: 76) saw a translation strategy is a potentially conscious procedure for the solution of a problem with which an individual is faced when translating a text segment from one language into another. He reported a TAPs study conducted on 48 German learners of English as a foreign language. The participants were asked to do sight translation, producing oral translations while they read. From the observation, Lörscher recognized a number of translation strategies that contain a sequence of core elements in translation. The general conclusions from Lörscher's study are that TAPs provide reliable and useful data when they are interpreted in a systematic and methodologically controlled way; regardless of differences in individuals and in translation processes, there are patterns that are repeated often enough for taxonomies of translation strategies to be established.

While TAPs are inexpensive, convincing, and easy to implement, they have their downsides. As mentioned previously, the automated cognitive process that goes into LTM is not accessible. Krings (2001) proved that TAPs slow down the speed of a task, and cannot be used if the task requires a verbally demanding activity. For example, in the case of simultaneous interpretation, the interpreters won't be able to make any verbal reports, as they have to keep interpreting and the mental capacity would not allow other verbal reports. If TAPs take place retrospectively, memory failure becomes another issue. On retrospective verbalization, Muñoz Martín (2010) raises the question whether the translators can tap exactly the same mental process when verbalizing the action as retrospective verbalization involves thinking about what happened, reconstructing the process with knowledge that the participants have.

However, even when TAPs are not robust enough to guarantee the validity of results, the design and administration of TAPs can be rigorous (Bernardini 2001). According to Bernardini, subject and task variables should be controlled as closely as possible and it is important to set up the least invasive environmental conditions. Once the design and experiments take place, experimenters have to transcribe and code the transcripts before they even begin the analysis, which can be very time-consuming and labor-intensive. Consequently, the tendency is to transcribe and code partially for the

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features relevant to the hypotheses. Such an unsystematic collection process involves risks of bias in the results. According to Bernardini (2001), TAPs can end up supporting virtually any claim, if a selective, unconstrained coding procedure is applied to it.

Another downside is that TAPs are unnatural, as most people do not talk while they do a certain task. This is especially true for the Koreans, who tend to internalize the thought process. In general, North East Asians perform and focus much better when they do not explain the thought process, while some Westerners perform and focus much better when they do explain the thought process (Educational Broadcasting System 2009). Detailed analysis on how cultural differences affect the TAPs results will be given in the next sector. Another downside is that the participants might also try to filter their comments so as to make themselves sound smarter. And, there are individual differences; some are better in verbalizing their actions than others.

2.4.1.2. Cultural considerations in TAPs

Defining "culture" is complicated. According to Nisbett (e.g. Nisbet et al 2001, Nisbet 2003), culture is a means of distinguishing regional differences in a cognitive style. Nevertheless, most research on usability evaluation methods presupposes that usability evaluation is unaffected by cultural issues (Clemmensen et al. 2009): as the cultural background of experiment participants is rarely reported, the task scenarios do not consider cultural bias.

However, the fact that TAPs is a tool borrowed from Western cognitive science (Lewis 1982) and now widely used in East Asian countries including China, Japan, and Korea should pose a question on cultural consideration.

According to Brown (1991) – also in Pinker (2006) - basic human psychological characteristics are often seen as universal, meaning the perception and reasoning of people are the same or similar across the world. However, Westerners and Easterners might perceive the same web page, but the information process might differ. Nisbett (2003) and Nisbett et al. (2001) provide compelling evidence against such universalism and argue that cultural-historical differences in physical environment, upbringing, education, and social structure shape how people from different regions of the world perceive objects and situations (Clemmensen et al. 2009).

In order to investigate how cultural differences affect the outcome of TAPs, Kim (2002) conducted a study on task performance by comparing 41 Westerners (people whose parents are both born and raised in the U.S.) and 34 Easterners (second-

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generation Americans whose parents are both immigrants from East Asian countries). The research showed that the number of tasks solved correctly by Westerners was not impaired by using TAPs, but their performances in silence were significantly impaired. This suggests that Westerners may habitually use talking as a means of supporting their thinking. In contrast, Easterners' performances were significantly impaired by using TAPs, but not by working in silence. Easterners gave incorrect answers to about 34% more tasks when thinking aloud (9.24 correct out of 20 tasks) compared to when they performed without thinking aloud (12.35 correct out of 20 tasks). Thus, thinking aloud appears to be foreign to Easterners, to the extent that their task performance is degraded significantly.

This aspect of behavior was further studied in Kim (2002). Twenty-two East Asian American (8 women and 14 men) and 23 European American (12 women and 11 men) undergraduates at the University of California, Los Angeles had to solve ten tasks while staying silent or while verbalizing their activities, and while doing something unrelated, in this case, reading out the alphabet. European Americans showed improvement in performance while they verbalized their activities, as expected. However, their performance was hindered greatly by reading out the alphabet. On the other hand, Asian Americans' performance was greatly hindered by verbalizing their activities, but not by reading out the alphabet. One of the reasons suggested by Kim was that European Americans habitually support their action by verbalizing the reasons, while Asian Americans depend less on verbal representation of their thought processes.

Similar differences are also observed in the interview section of TAPs, according to Briley et al (2000). In the case of Easterners, even when they chose one option before the interview, they tend to choose the middle option when asked for reasons for their choices. Conversely, Westerners stick to the option they chose, when asked for reasons for their choices. Briley et al. explain this outcome in two ways. First, the result shows how Westerners' analytic thought processes favor one option, whereas Easterners' holistic thought processes favor the middle option. Second, such cultural influence prevails only in a certain situation where, in this case, the participants are asked to provide reasons for their choice. Verbally asking participants to provide reasons shifts their focus from searching for the best option to searching for the best reasons. Thus, asking Eastern TAPs participants to provide verbal reasons is likely to affect the research results in culture-dependent ways.

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2.4.1.3. Keyboard logging and screen recording

Despite the weaknesses of TAPs described above, TAPs are still are being used in cognitive Translation Studies. However, other tools such as keyboard logging, screen recording, and eye-tracking have been introduced to supplement or even replace TAPs.

Keyboard logging is used to log every key pressed on the keyboard by using a software program. It shows keyboard entries including deletions, scrolling of the page, users' inactivity, and others. Keyboard logging is a technique used in Human-Computer Interaction research (Lazar et al. 2010) and in writing process research (Waes and Leijten 2006). Translog is designed specifically for translation process research (Jakobsen and Schou 1999) and it records the process of translation by producing a log file that can be easily analyzed. As keyboard logging records all the keys pressed, it has been widely used to investigate the translation and revision process. It can show the number and locations of deletions, and the number, location and duration of pauses, which signals what influences such actions. Translog also produces a screen recording that allows playback, so that it provides evidence of what the subject did, instead of relying on what they think they did.

2.4.1.4. Eye-tracking systems

Another popular tool that can be used to examine reading patterns is an eye-tracker, which measures eye movement and point of gaze. There are a number of methods for measuring eye movement, but the most popular variant uses video images from which the eye position is extracted. Infrared light is reflected off the eye and records the eye movement using software. Other methods use search coils or are based on electrooculography. The early eye-tracker used a sort of contact lens with a hole for the pupil, and then used beans of light that were reflected off the eye, and then recording them on film.

Against the assumption that reading is a smooth sweeping of the eyes along the text, Louis Émile Javal and Hjalmar Schiötz (1881) observed that reading is a series of short stops (fixations) and quick movements (saccades). This observation raised questions of when and how long the fixations and saccades are, and how they affect the overall process of reading. Subsequent research took place in the 1990s.

Alfred L. Yarbus (1967) showed that the task given to a subject heavily affects the subject's eye movement: "All the records [...] show conclusively that the character

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of the eye movement is either completely independent of or only very slightly dependent on the material of the picture and how it was made, provided that it is flat or nearly flat" (1967: 190). Yarbus added that the pattern in the examination of pictures is dependent not only on what is shown on the picture, but also on the problem facing the observer and the information that the observer hopes to gain from the picture (1967: 194). Yarbus noticed that the observer's attention is usually held only by certain elements of the picture. These elements are not necessarily important information, but rather unusual, unfamiliar, incomprehensible information. He argues (1967: 190) that eye movement reflects the human thought processes: the observer's thought may be followed to some extent from records of eye movement. It is thus possible to determine from these records which elements attract the observer's eye, in what order, and how often.

In the 1970s and 1980s, eye-tracking devices were mostly used for research on reading. In the 1980s, Human-Computer Interaction began using the method to investigate how users use commands on computers. Then the scope expanded to study how users perceive user interfaces and software design.

As the data gained from eye trackers are represented visually, interpreting them requires quantitative analysis. A commonly used representation for the exploration of the eye movement patterns are gaze plots or heat maps. Heat maps show the zones with higher density, where the users focused their gaze with a higher frequency, which also are called "hot zones." A heat map shows different densities in different colors. Due to the easy interpretation of colors, heat maps are the best-known visualization technique for eye-tracking studies (Nielsen and Pernice 2010). In addition to the eye movement, the eye-tracking system can also show cognitive effort by measuring pupil dilation (Rayner 1998, Radach et al. 2004).

Eye-tracking systems have been used in some important research in Translation Studies. Investigating the forward and backward saccades in reading processes provided information on the comprehensibility of texts (cf. Rayner 1998), the reader type (Hyönä and Nurminen 2006), and the expertise of the reader (Moravcsik and Kintsch 1995, Kaakinen et al. 2003). Studying longer sweeps of the eye can provide evidence of attention shifts between the source text and the target text (O'Brien 2011, Jensen 2011).

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2.4.2. Prior research on reading pattern variation

Research on reading as a cognitive activity in translation has not been discussed much. The popular topics of current Translation Studies are based on the relationship between the ST and TT. This trend comes from an assumption that translation can be somehow investigated by analyzing the ST and TT pair. Toury (1982: 25) has commented on this relationship, using the term "black-box":

> Translated texts and their constitutive elements are observational facts […] translation processes, those series of operations whereby actual translations are derived from actual source texts, though no doubt also empirical facts, and as such part of the object-level of translation studies, are nevertheless only indirectly available for study, as a kind of "black box".

Recently, the black box of the translation process has become a focus of empirical research. Many efforts have been made under the assumption that translation requires reading and writing skills in at least two different languages, and that it uses these skills in some kind of combination. Studies seek to identify how translators draw meaning from the ST and how they represent the meaning to TT, and how the information understood transfers to production.

2.4.2.1. Shreve et al.

Shreve et al. (1993) made a first attempt to examine the role of reading in the process of translation. They studied reading patterns for different purposes: reading for translation, reading for paraphrasing, and reading for comprehension. They assumed that the general readers who read for comprehension will respond to the text in various ways, i.e. agreeing, disagreeing, contradicting, or asking, whereas the translators would react less to its content and more to its linguistic and text-systemic characters. Their reader orientation did not preclude agreeing, replaying, contradicting, or other reader attitudes, but was expected to other concerns such as word choices and sentence structure (1993: 27). Given these assumptions, the hypothesis was that if reading for comprehension is embedded in a translation task, quantitative measures of the reading process will indicate the influence of the translation task.

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Shreve et al.'s research (1993: 27) focused on three quantitative measures: reading time per clause, number of problems identified in clauses and number of times clauses were identified as having problems, and correlation of reading time with translation problem identification. Three groups of subjects were tested on different tasks (1993: 28):

— TRANS: 10 translators who were in the first year of a Master's level translation program, who were to read the text in anticipation of translating it.

— PARA: 10 Master's and doctoral degree students of English, who were to read the text in anticipation of paraphrasing it.

— COMP: 13 Master's and doctoral-level graduate students in psychology, who were to read the test for general comprehension.

The text they used for the study was the essay "A Second Yalta?" by William Safire in the *New York Times* (06.03.1989), which talks about how the United States had to respond to political developments in Eastern Europe. The reason for the selection was that the article already had various types of translation errors and presented difficulties in reading, as it required a historical and political background. The text also had unusual collocations, ad-hoc phrases, and other issues.

A portion of text used for the study.

A SECOND YALTA? By William Safire New York Times March 6, 1989*	1
In foreign affairs, Moscow is on the march,	2
Persian Gulf: In Iran, far more important than Afghanistan,	3
The Soviets are exploiting the Ayatollah's anti-Western fever.	4
Fundamentalist Islam and "godless Communism" may be strange bedfellows,	5
But the enemy of my enemy is my friend;	6

As above passage indicates, the test was divided into clauses and each clause was marked with a number. The clauses were presented one by one on a computer screen, as the authors wanted to compare the profile of reading times across the 97 presentation clauses. The recording time was measured from when a clause was presented to the subjects (initiation) to when the subject pressed the backspace key to move onto the next clause (termination). Subjects were allowed to go back and re-read, in which case the time spent on back-tracking was also measured.

Each group was told they would translate, paraphrase, and comprehend what they read and that they could back-track as many times as they wanted, and they would

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have enough time to do their given tasks. After the reading, the TRANS and PARA groups were asked to circle the areas they were not able to understand on a paper copy of the text and annotate the reasons. There actually was no translation or paraphrasing in the test, even though the subjects expected to do those activities while they read.

Shreve et al. (1993) initially assumed that the translators would either not read or just skim the ST, then begin the translation and attempt to read and understand simultaneously. The total reading time (initial reading time plus back-track time) was measured and calculated on a sec/word and words/min basis. The TRANS group (597 msec/word) and the COMP group (564 msec/word) took longer to read than the PARA group (455 msec/word). That is, the translators spent more time on reading the ST than initially expected, as they tried to anticipate the problems that can happen while translating the ST. Those who read for comprehension also took longer than those who read for paraphrasing, as they tried to read very carefully to understand the text so that they could answer the comprehension questions properly. The reading time profile across the presentation clauses for each subject was correlated with the profile for other subjects. (1993: 30). The resulting correlation matrix was drawn by extracting certain factors representing similar profiles among subgroups of subjects. The test identified four factors that accounted for 58% of the variance in the matrix of correlations (Table 2.1).

Table 2.1. Mean factor loadings by Group and Factor (Shreve et al. 1993)

Group	Factor			
	I	II	III	IV
TRANS	.23	.26	.29	.30
PARA	.21	.32	.45	.28
COMP	.48	.36	.22	.10

Factor 1 (17% of the variance) was extracted by the cases when the COMP group showed the highest association. Given the fact that TRANS and PARA showed similar factors, both groups used similar reading strategies compared to the COMP group. Factor II (15% of the variance) was a general language-processing factor where all three groups showed similar reading speeds. Factor III (15% of variance) was most highly associated with the PARA group, meaning some of the reading strategies PARA used were not fully used in the TRANS and COMP groups. Factor IV (11% of the variance) was a task-anticipation factor where the subjects were expecting to do translation or paraphrasing after reading as TRANS and PARA showed relatively higher factors than

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COMP. Shreve et al. (1993: 31) state that the fact that Factor IV failed to represent the TRANS group alone indicates that the reading time profiles of the TRANS group were not as homogenous as were those of the PARA and COMP groups, which means translators use diverse approaches for the translation task.

As for the problems in reading, translators identified more problems (297) than the paraphrasers (214). They detected more errors multiple times at a lower linguistic level than the paraphrasers, i.e. word choice, lexical-sematic and collocational problems (Shreve et al. 1993: 32). Paraphrasers identified problems in larger textual units of sentences. Shreve et al. (1993: 32) found that there is a correlation between reading time and translation-problem identification, but this correlation does not mean that the sentence with the greatest number of problems had the most reading time. Some clauses yielded a significant difference between the reading time and the number of problems identified, for example there were instances where the reading time was high, but the number of problems detected was low, or vice versa (1993: 33).

Shreve et al. (1993) conclude that there is no single translation process common to all translators, and translators show a greater diversity of processing in reading comprehension than do paraphrasers and comprehenders, based on the factor analysis. However, they find that the translation task does influence the reading for those who postpone their full comprehension of specific parts of the text to later phases of the translation activity. They say the way a person reads, and the result of that reading (some sort of mental representation of the text or text segment), will depend on the readers' purposes and motivations. Shreve et al. ask, based on the research, whether reading skills and translation skills are related. More precisely, they ask whether, as translators improve their translation skills, their reading skills improve as well.

2.4.2.2. Danks and Griffin's comparative analysis

Danks and Griffin (1997: 175) compared reading for translation with general monolingual reading in two different groups: novice translators and experienced translators doing conceptual research "in their armchairs." Their comparative analysis of reading and translation used three classes of factors: i) the task that makes demands on the cognitive system, ii) the text that constitutes the input to the whole process, and iii) the person who uses his or her skills to accomplish the task (1997: 164).

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The task for the translators is primarily producing a TT based on an ST. The process is complicated because translators cannot simply follow word equivalence or syntax match to produce the translation. The translation task is allowed to take more time compared to general reading, as "readers are under the pressure of implicit social norms about how long it takes to read a text" (1997: 164). The task can be influenced by both ST and TT. Determining how text is understood, and how the final output is going to be, influences the translation approach. Additionally, output criteria (where the translation) is going to be used, are also likely to affect the translation approach. Danks and Griffin (1997: 167) emphasize the metacognitive status of the task. They define "metacognitive" as "the extent to which the person considers the text consciously as an object, as opposed to being consciously aware only of the meaning being communicated" (1997: 167). They take the example of children's language acquisition. Children acquire spoken language focusing on the meaning in the beginning, but they are taught to read the language as an object. What this implies is that a translator who learned a second language as an adult sees the second language as an object, and this attitude dominates the translator's reading, even when the focus of meaning is necessary. Danks and Griffin state that maintaining two perspectives together – language-as-object and language-as-meaning –is an indispensable part of translation task (1997: 168).

Text characteristics are important for translation-task analysis. Technical difficulties in the text require background knowledge and technical terminologies; style (whether it is a speech or academic paper) also affects how readers understand the text. Readers' comprehension and ability to "form an adequate mental model of the text determine the depth and flexibility with which the reader can use the information" (1997: 169). In this context, translators' conceptual difficulties should not be confused with the technical difficulties of the text, as a text on a familiar topic can be conceptually difficult and a text on a highly technical topic can be conceptually easy.

Studying individual differences among readers received relatively less attention in this study, but the language competence of a reader certainly affects comprehension. Developing reading skills to an automatic level is an important requirement to be an advanced reader, according to Danks and Griffin (1997: 169). The automation of translation skills is also important for translators (Jääskeläinen and Tirkkonen-Condit 1991). Danks and Griffin suggest that novice translators use a formal equivalence (word-for-word) technique, whereas experienced translators use contextual approaches

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based on a meaning-to-meaning technique, adding that the differences in the conceptual ability might come from the difference in the intellectual ability of translators (1997: 172). These individual differences are found in general intelligence and also in verbal ability in the native language. Therefore, Danks and Griffin (1997) argue that there is an interaction between the level of translation skills and the translation process, and this leads to the assumption that there is an interaction between the level of reading skills and the reading process.

2.4.2.3. Research by Jakobsen and Jensen, and Alves et al.

Research on reading time has continued since Shreve's attempt in 1997. Jakobsen (2002) studied reading as the starting point (orientation) of the translation process. He used two groups of participants, novice translators and experienced translators, to examine the merits of three phases of translation: orientation (reading), drafting, and revision. He found that of the three phases, participants spent the least amount of time in orientation, compared to the other two. Alves (2005) and PACTE (2005) also supported this finding, stating that orientation was almost non-existent or existed for the shortest amount of time. However, the empirical data from all the research did not offer directly traceable evidence: the results were on the basis of means without statistical significance (O'Brien 2011). Macizo and Bajo (2006) also found that reading for translation requires more processing than does reading for repetition, as reading for translation triggers a partial reformulation of reading process for translation among the readers.

Jakobsen and Jensen (2008: 103-124) study how two groups read differently for different reading purposes. They used a group of six professional Danish translators and a group of six Danish translation students. They read four similar texts on a topic of which they had no previous knowledge (some samples are shown below).

Source Text I used in Jakobsen and Jensen experiment 2008

Historic day as Blair surrenders power and Brown finally moves into No 10.

Tony Blair surrendered on his own terms today as Gordon Brown ushered in a new radical era of change. Ending a decade of relentless controversy, wars and even a police inquiry, Labour's longest-serving Prime Minister was set to stroll out of No 10 with his head held high. It is also the day Mr. Blair is expected to announce that he is turning his back on British politics for good to take up a job as special envoy to the Middle East. He is poised to resign as an MP on the same day he steps down as Prime Minister - triggering a by-election in his constituency of Sedgefield, which could be held as early as July 19.

His decision to stand down after 24 years in Parliament will allow him to 'throw himself' into the role as

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the international community's key peacemaker in the Middle East, his close allies said. Today at Downing Street, crowds of well-wishers, and protesters were gathering in Whitehall to watch, cheer or jeer his final progress from Downing Street to the Commons for his final Prime Minister's Questions.

Source text II used in Jakobsen and Jensen experiment 2008

Finally, Blair exits the stage

Tony Blair will say farewell to Downing Street and domestic politics today, bringing to an end a remarkable decade in power which began with extraordinarily high hopes but ended with opinion divided over his legacy to the country After his last appearance at the dispatch box at Prime Minister's questions Mr Blair will return to Downing Street to make an emotional farewell to his staff, some of whom have been with him since he became Leader of the Opposition in the heady days of 1994 and the birth of New Labour.

Mr Blair, Labour's most successful leader after an unprecedented three election victories, making him - alongside Margaret Thatcher - one of the dominant political figures since the war, will drive up The Mall to Buckingham Palace with his wife Cherie to tender his resignation to the Queen. Mr Blair, in contrast to his arrival as Prime Minister in May 1997 when Downing Street was lined with handpicked Labour Party members cheering, and waving Union flags, will make a low-key exit. Today it will be photographers, not supporters, recording his reluctant departure.

Source text III used in Jakobsen and Jensen experiment 2008

Blair exits British politics as new era begins with a Tory defection

A new political order in Britain will take shape this afternoon when Tony Blair flies to his Sedgefield constituency to resign from parliament with immediate effect, and Gordon Brown enters No 10 to prepare a shakeup of government which will see at least six ministers quit the cabinet. Mr Brown's allies said the new ministerial line-up would be deliberately inclusive, and not settle scores with Mr Blair's supporters. Mr Blair had planned to keep the decision to quit as an MP secret until after his 318th and final prime minister's questions at noon today. But news leaked that his local party was being called to an extraordinary meeting to be addressed tonight by Mr Blair.
Two of his aides in No 10 are expected to join him in his new life as a Middle East envoy. If, as expected, the role is confirmed today, Mr Blair will resign as an MP, triggering a byelection which may take place as early as July. His departure from parliament means his earnings from the lecture circuit will be kept from the register of members' interests.

The subjects' eye movements were recorded by an eye-tracker. There were four different reading purposes to test. The first two texts were read with purposes (a) for comprehension and (b) with the intention of translating the text afterwards. Texts three and four were read while the participants simultaneously (c) translated orally and (d) translated in writing. The study aimed to compare professional translators and students

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in terms of task time, number of fixations, fixation length, and reading and translating modality. Jakobsen and Jensen (2008) controlled the test by giving the same tasks in the same order for all subjects, but changing the text used in each task. In other words, all the subjects performed all the tasks in the same sequence.

What the study found was that there was clear evidence that the reading purpose influenced eye movements and gaze time (Jakobsen and Jensen 2008: 120). Compared to reading for comprehension, a specific task demanded considerably more processing; therefore, task complexity was related to longer time and a higher number of fixations. Professionals read faster and more attentively than do students. For both groups, task time, fixation frequency, gaze time, and average fixation duration showed a consistent, linear or sequential progression from task to task. The study also found that students paid more visual attention to the source text, whereas professional translators prioritized visual attention to their own target text.

Alves et al. (2011: 179) did a replication experiment based on Jakobsen and Jensen's (2008) study. Replication experiments are not popular in Translation Studies, as specificities of the language pairs and translators' profiles are different, including language proficiency and professional experience (Alves 2003). Nevertheless, replication can either strengthen the previous research by presenting enough evidence to generalize the findings, or oppose the previous research findings by presenting different data. The test used by Alves et al. had twelve subjects: six Brazilian translation students and six Brazilian professional translators. Originally, they had 17 subjects, but only those who were able to show clear data on an eye-tracker (i.e. still head movement) were chosen for the test. The test used three reading purposes: i) answering reading comprehension questions, ii) producing an oral summary of a text, and iii) translating a text orally while reading it under two conditions.

Condition 1 was that subjects read three newspaper articles on the same content from different sources (different rhetorical structure), and Condition 2 was that subjects read three short science texts all found in an Ask the Expert column (similar rhetorical structure). All texts were in English, which is the second language of the participants. All output was made in their mother tongue, Brazilian Portuguese. To test Condition 1, they used the same text that Jakobsen and Jensen used. For Condition 2, three columns with an average word count of 105 were chosen.

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Source Text I used in reading comprehension in Condition 2 by Alves et al. (2010)

If the cells of our skin are replaced regularly; why do scars and tattoos persist indefinitely?

The public information office of the Dermatology Associates of Atlanta provides this brief reply:

"The answer is really quite simple. The cells in the superficial or upper layers of skin, known as the epidermis, are constantly replacing themselves. This process of renewal is basically exfoliation (shedding) of the epidermis. But the deeper layers of skin, called the dermis, do not go through this cellular turnover and so do not replace themselves. Thus, foreign bodies, such as tattoo dyes, implanted in the dermis will remain."

Source Text II used in oral summary in Condition 2 by Alves et al. (2010)

If a used needle can transmit HIV, why can't a mosquito?

Laurence Corash, chief medical officer of Cerus Corporation, provides the following explanation:

The AIDS virus (HIV) on used needles is infectious when injected into a human where the virus can bind to T cells and start to replicate. The human T cell is a very specific host cell for HIV. When a mosquito feeds on a person with HIV in his or her blood, the HIV enters the insect's gut, which does not contain human T cells. The virus thus has no host cell in which to replicate and it is broken down by the mosquito's digestive system.

Source Text III used in sight translation in Condition 2 by Alves et al. (2010)

If comets melt, why do they seem to last for long periods of time?

Greg Lyzenga, associate professor of physics at Harvey Mudd College, has the answer.

Comets do not melt in the strict sense of becoming liquid. However, since they are composed partly of ice and other volatile compounds, they vaporize (turn directly to gas) when warmed in the vacuum of space by passing near the sun. It is this escaping gas that forms the comet's luminous tail. "Near" in this context means closer than several astronomical units (AU) from the sun; one AU is about 93 million miles, the average radius of the earth's orbit.

Unlike Jakobsen and Jensen (2008), Alves et al. changed the task order but maintained the text for each task. For reading for comprehension and oral summary tasks, the subjects were allowed to read the ST as many times as they wanted before beginning the task. For the sight translation task, subjects were not allowed to read the text beforehand – they read the text as they performed the task. The time spent on each reading task was shorter in the professional group than in the student group. Table 2.2 compares the reading time of the two groups between Jakobsen and Jensen (2008) and Alves et al. (2010).

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Table 2.2. Mean task time (in seconds) for Condition 1 in comparison to Jakobsen and Jensen's findings (Alves et al. 2010)

TASK	PROFESSIONALS		STUDENTS	
	J and J (2008)	Condition 1	J and J (2008)	Condition 2
A: Reading for comprehension	40	95	61	139
B: Reading for oral summary	57	90	103	124
C: Reading for sight translation	154	225	204	334

All participants spent the most time in reading for translation, which is consistent with Jakobsen and Jensen's study. However both groups spent more time in reading for comprehension than in reading for oral summary, which is not consistent with the previous findings. The authors explain that the subject profiles could have affected the outcome. Even though the groups consisted of six professional translators and six students, just as in Jakobsen and Jensen, their subjects' language proficiency and skillsets were never examined. As the sample profiling is important in this type of test, the small sample size and different subject profiles might have been the reason for the difference. In particular, the participants' familiarity with sight translation could have impacted the task, as most of the participants talked about how unfamiliar they were with the sight translation task. Jakobsen and Jensen did not mention whether the subjects chosen for their study were equipped with the sight-translation skillsets. Another explanation is multiple readings before beginning the task. It is unknown whether Jakobsen and Jensen allowed multiple readings among the participants. If they did not, the differences in reading time might be well explained.

Fixation counts were also measured, and the results are summarized in Table 2.3. Professionals have slightly higher numbers of fixation counts for all the tasks. However, unlike Jakobsen and Jensen's (2008) findings, each group does not show clear differences across tasks, and the sight translation task showed the lowest fixation count.

Table 2.3. Mean total number of fixations in the professionals and students in Condition 1 in comparison to Jakobsen and Jensen's findings (Alves et al. 2010).

TASK	PROFESSIONALS		STUDENTS	
	J and J (2008)	Condition 1	J and J (2008)	Condition 1
A: Reading for comprehension	132	184	170	177
B: Reading for oral summary	373	194	643	181
C: Reading for sight translation	520	160	520	152

The overall increase from Task A1 (181) to Task B1 (188) is not significant (t=1.450; df=11; P=0.175), but the decrease from Task B1 (188) to Task C1 (156) is indeed

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significant (t=4.793; df=11; P<0.001) (Alves et al. 2010: 185). The large differences between Jakobsen and Jensen's data and Alves et al.'s data is explained by eye-tracking data filter configuration (Alves et al. 2010: 185). According to Alves (2009), the filter configuration can include or exclude fixation data in the analysis, so that unreliable data can be controlled. This underscores the importance of explaining each configuration, so that comparable data can be produced in similar studies.

Fixation length did not show significant differences across the tasks, although the sight translation task showed slightly longer fixation lengths in both groups, which is consistent with Jakobsen and Jensen (2008).

The test on Condition 2 showed similar results (Table 2.4). Professionals spent less time than students in doing all the reading tasks. Unlike Condition 1, Condition 2 shows a clear increase in time for tasks A2, B2, and C2.

Table 2.4. Mean task time (in seconds) for Condition1 and Condition 2 (Alves et al. 2011)

TASK	PROFESSIONALS		STUDENTS	
	Condition 1	Condition 2	Condition 1	Condition 2
A: Reading for comprehension	95	40	136	47
B: Reading for oral summary	90	63	157	70
C: Reading for sight translation	264	110	316	128

Fixation count showed different results in Condition 2 (Table 2.5). As opposed to Condition 1, where professionals showed higher numbers of fixation counts for all the tasks, Condition 2 shows that professionals had high fixation counts only in reading for sight translation.

Table 2.5. Mean total number of fixations in Condition 1 and Condition 2 (Alves et al. 2011)

TASK	PROFESSIONALS		STUDENTS	
	Condition 1	Condition 2	Condition 1	Condition 2
A: Reading for comprehension	184	120	177	134
B: Reading for oral summary	194	137	181	167
C: Reading for sight translation	160	148	152	138

Again, no group shows clear differences across tasks, and the sight translation task shows the lowest fixation count. The overall increase from Task A2 (127) to Task B2 (152) is not significant (t=- 0.084; df=11; p=0.934), but the decrease from Task B2 (152) to Task C2 (143) is indeed significant (t=4.229; df=11; p<0.001) (Alves et al. 2010: 185). It is worth mentioning that fixation counts are not much lower in Condition

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2 than in Condition 1, even though the text size was smaller and the subjects spent less time. Alves et al. (2010: 188) explain that this is because the subjects could have felt that they could read more attentively as the text size was smaller compared to Condition 1. Fixation lengths showed almost the same pattern as did Condition 1.

The study conducted by Alves et al. shows both similarities and differences from the preceding research by Jakobsen and Jensen (2008), proving how important it is to verify the subject profiles and standardize parameters for filter settings in process-oriented research.

2.4.2.4. *Dragsted's research*

Dragsted (2010: 58) attempted to find out how source language and target language are coordinated for translation, and how comprehension in one language is transformed into the text production processes in another language. The research included fourteen students in the translation and interpreting program at the Copenhagen Business School, and eight professional translators who had practiced in translation for over ten years. From each group, six participants whose eye-tracking data were of the highest quality and gaze-to-word mapping were precise were chosen for analysis. The participants were asked to read for the translation task, translate under time pressure, translate with no time pressure, and do the vocabulary test, called Dialang, which is a diagnostic test developed by the European Union for all the EU languages. I will selectively introduce parts in reading and comprehension task in this study, as the research talks a lot about writing and translation production. The participants had to answer the questions with respect to their language skills in their native language and in foreign language(s). The test also recorded the prompts when the participants showed fixation longer than normal, i.e., longer than 250 ms (Rayner 1998: 373).

In the first task, the participants were asked to read a 100-word English passage silently online.

Text used for reading and translation (Dragsted, 2010)

Although developing countries are understandably reluctant to compromise their chances of achieving better standards of living for the poor, action on climate change need not threaten economic development. Incentives must be offered to encourage developing countries to go the extra green mile and implement clean technologies, and could also help minimize emissions from deforestation. Some of the most vulnerable countries of the world have contributed the least to climate change, but are bearing

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the brunt of it. Developing countries, in particular, need to adapt to the effects of climate change. Adaptation and mitigation efforts must therefore go hand in hand.

As for the reading for translation task, the participants were informed that they would have to translate the English text into Danish after reading it. The second task was to read the same text once again and translate it, but without the help of dictionaries. Eye movement was measured by the Tobii 1750 eye-tracker and the writing part was logged in Translog.

The eye-tracking data was used to measure fixation time in reading for translation, silent reading, and reading for comprehension. Rayner (1988: 373) reports an average fixation duration of 225 ms in silent reading, Jakobsen and Jensen (2008: 114) report 205 ms in reading for comprehension. Dragsted (2010: 46) reports 231 ms among students and 245 ms among professional translators in reading for translation. Dragsted's results show that the students' mean fixation was close to the previous findings, whereas the professionals showed a higher mean fixation (Fig 2.9).

Fig 2.9. Reading for translation gaze plot (Dragsted 2010)
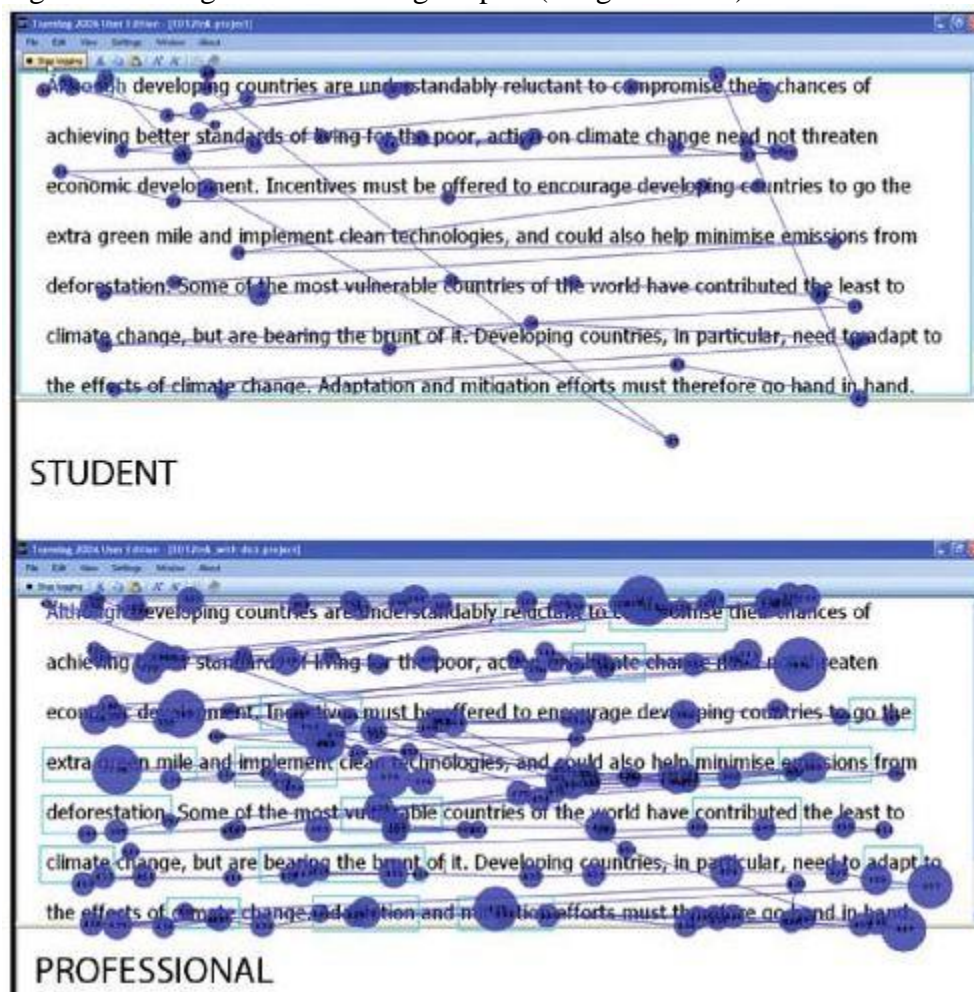
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Fig 2.9 shows that there are differences in reading patterns between the student group and the professional group. The bigger the size of the dot, the longer the duration the participants fixed their eyes for. The professional group shows more and longer fixations on the text, suggesting that the translation might begin in the reading stage. The result that the gaze data averages at 49 s in the student groups and 94 s in the professional group also suggests that consideration of how to translate, or more precisely how the meaning in ST can be transferred into TT, begins in this stage.

Moving on to the translation task, the study found that the student group spent a longer time on the task, and had longer total gaze time and fixation counts (Table 2.6).

Table 2.6. Mean task time and ST/TT visual attention for translation task (Dragsted 2010)

	Student		Professional	
Total task time (ms)	672000		427000	
Attention split	ST	TT	ST	TT
Total gaze time (ms)	119956	146559	82148	90903
Avg. fixation duration (ms)	200	233	253	276
Fixation count	572	540	318	366

All participants spent more time or visual attention on TT, as the total gaze time shows. The average fixation count did not show dramatic differences between ST and TT in both groups, however the difference between the two groups was obvious. Dragsted notes that the students' fixation patterns were characterized by many short fixations, whereas the professionals had fewer but longer fixations (Dragsted 2010: 48). The students' average fixation count of 572 is surprising as their average fixation count was only 129 when they only had to read. This suggests that fixations in the ST are not only related to reading and comprehension, but also show planning of TT production and the effort of transforming ST comprehension into TT production (Dragsted 2010: 48).

Dragsted's study also analyzed pauses and segmentation in text production. According to Jakobsen (1998) and Dragsted (2005), pauses of 1-2 seconds were shown to indicate that task-related cognitive processing is taking place. In Dragsted's research, the student group showed an average of 76 pauses longer than one second, and the professional group showed an average of thirty-six pauses. When these pauses are calculated as a percentage (Table 2.7), half of the production-related pauses took place when the participants shifted their attention from ST comprehension and TT production.

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Table 2.7. Distribution of pauses (Dragsted 2010: 57)

	Student	Professional
Production-related pauses	40%	36%
ST reading-related pauses	40%	31%
TT monitoring-related pauses	20%	33%

The student group frequently looked away from the screen in the course of reading ST or in the monitoring of their TT, for no specific reason. Other than that, the study was not able to find an obvious explanation for the pauses. Dragsted (2010: 57) cautiously interprets the tendency of pauses to be linked with difficulty in ST and the concentration level of the participants, suggesting that pauses may signal demanding cognitive processing. For example, pauses are used when the translators look away from the screen or close their eyes as a problem-solving technique. According to Schilperoord (1996: 47), pauses may signal a cognitive activity reflecting the process of retrieving the information required to continue text production from long-term memory and pauses in the process may involve searching long-term memory without the distraction of the ST.

Through this study, Dragsted (2010: 57) suggested two different modes of coordination in the translation process: integrated coordination and sequential coordination. Integrated coordination, commonly found in the professional translator group, is a continual shift between ST and TT attention, overlapping the comprehension and production processes. Sequential coordination, witnessed in the student group, is characterized as a higher number of fixations, and a longer sequence of comprehension and production processes. Sequential coordination prefers one task at a time, so not much overlapping takes place between the comprehension and the production processes.

2.4.2.5. Limitations of previous research

Most of the research described above suggests that reading for translation involves more processing than reading for comprehension or paraphrasing, based on mostly longer reading time. The main focus of research has been on the relation between ST and TT, and how the information in ST is transferred to TT. Most tests have used screen recording or keyboard logging programs, followed by survey or TAPs. The texts they used for reading tests were all static even though they were displayed online for recording purposes.

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As the number of people who use online material for their reading dramatically increases, there are valid reasons to investigate how people read online content. Investigating reading patterns on a dynamic web site with non-textual elements is an interesting area of research, as the previous tests minimized non-textual distractions on the computer so that readers could concentrate on the text. During the reading process, the subjects' activities were constrained to reading, except going back and forth between the sentences. Thanks to abundant information on the web, readers can not only move between sentences but between two windows that open completely different types of texts, i.e. one window with a scientific journal and another window with a science dictionary.

The use of TAPs also poses a question. As reading is an internal process that involves many cognitive processes, looking at keystrokes, analyzing eye-tracking data, and measuring the reading time simply does not give the entire picture. Retrospective TAPs can contain more logical explanation or justification of the subject's actions, so it can dilute the real process in action, not to mention the risk of memory failure. Using concurrent TAPs can and certainly will complicate by separating process between the reading and talking, but listening to what the subjects think and do while they are reading is critical in analyzing the screen recording, especially when the text is long. Measuring the reading time is not the only way of investigating reading cognition.

Subject selection also needs more careful consideration. Selecting translation students is convenient, as most researchers are also teachers, but depending on their leaning speed and duration, some students should not be considered as translators even at the novice level. The social and economic impact on reading may differ between trainees at school and professional novice translators in the industry. Intellectual ability and individual difference can also influence the research to a great extent, and more precise subject selection processes need to be designed and employed.

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3. Methodology

Chapter 3 explains the methodology of the main test. Section 3.1 explains the initial aims and plan of the test including the variables and translation error matrix. Section 3.2 describes the logistics and results of the pilot study, followed by discussion. Based on the pilot study, section 3.3 shows how the main test design was revised in detail.

3.1. Aims of the test

The test is designed with two things in mind: All readings are personal, and all readings are purposeful. All readings are personal as no two people read the same. Readers' background knowledge, experience, and personal culture affect how they read. All readings are purposeful, which means the reading purposes and reading patterns are closely linked. My research tries to study the reading patterns of a translated web page based on readers' occupations and reading purposes. In particular, the research aims at finding out three things:

> How do reading patterns differ between the heavy-reading group and the light-reading group?
> How do different reading purposes affect reading patterns on web pages?

Initial hypotheses, based on the findings of my minor dissertation, are as follows:

> H1. The heavy-reading group will detect more translation errors than the light-reading group.
> H2. The reading purpose will trigger changes in the reading patterns.
> H2.1 The number of translation errors detected will be highest in studying subject matter, followed by retrieving information, sharing information, and reading without a particular task, in descending order.

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To add clarity and quantitative analysis, critical translation errors based on the LISA QA grid will be designed and planted in the web page. By analyzing translation error detection and other information, I mainly aim to discover i) if certain types of errors are more detectable than others, ii) whether and how different reading purposes affect those detection rates, and iii) if there is a difference in error detection rates between the heavy-reading group and the light-reading group.

3.2. Testing logistics

3.2.1. Evaluation method

There are two different types of evaluation in usability testing: one is formative evaluation and the other is summative evaluation. Formative evaluation means performing a test run for products that are in the development stage. Scriven (1991: 168-169) states that "formative evaluation is typically conducted during the development or improvement of a program or product and it is conducted, often more than once, for in-house staff of the program with the intent to improve."

Summative evaluation tests the efficacy of the final product. According to Bhola (1990), summative evaluation is a method of judging the worth of a program at the end of the program activities and therefore the focus is on the outcome. In this study, summative evaluation is chosen since the purpose of the testing is to evaluate how translation errors in the final product affect reading patterns from a usability point of view. The testing platform should look complete and professional in order to give readers natural conditions that reflect their daily reading activities. This can be supported by Preece (1994: 103), who says the aim of summative evaluation is that a judgment can be made as to the overall usability and quality of the interface. Summative evaluation is also good to ensure that the final product is up to standard (Landauer 1995: 204). Formative evaluation during the design phase and summative evaluation at the prototype stage are both critically important if a product is usable and useful for its intended target population (Landauer 1995). My research uses a summative evaluation method on a finalized web page without considering design or development details.

The two most important issues in this reading test are what kind of task is given to the readers to reflect the purpose of reading, and what their reading levels are, both on paper and online. Nielsen (1989) conducted an analysis of 92 published comparisons

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of usability and found that four out of the ten largest effects were due to differences among individual subjects. Therefore knowing the users' background and classifying them into the correct categories can make a major difference in conducting the reading test.

3.2.2. Test object and platform

The test will include some degree of technical understanding, as the participants will have to browse a web page on computers. To minimize the technical glitches, the test will use the simplest form of a web page.

The testing application is the web page of Apple-Introducing iOS7 features, which is currently localized into many languages. Only this one page will be used for testing, which means the participants do not have to use the back button or navigate to different places to do the tasks. This is to eliminate the interaction between the technical savviness and the reading or doing a task. The main reason for choosing this specific web page is that the topic is very familiar to most Koreans, as over 80% of Koreans (99% in their 20s, 93% in their 30s, 92% in their 40s, 80% in their 30s, 33% in their 60s) subscribed to smartphone services as of July 2014 (Gallup 2014). In addition, since Apple is the main competitor of Korean-born Samsung in the mobile device market, Korean people are consciously and perhaps unconsciously aware that the web page they are looking at is a translation from English.

I used the current English version of the web page as an ST to create translation errors in different categories. I mostly left the currently published translation including translation errors as-is, and planted some errors purposefully throughout the Korean version of the iOS 7 web page.

Test platform does not matter in this test. The participants can use any computers and browsers they prefer, as we are not looking for comparability issues. As the web page is designed by Apple, it looks the best on Safari on Mac OX, but using different browsers and computers won't cause a serious problem. In fact, readers might bring up font or layout issues caused by other platforms, which will indicate what the readers focus on.

3.2.3. Implementing and examining different reading purposes

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Subjects were asked to do tasks designed to examine how reading patterns change depending on the purpose of reading: i) studying subject matter, ii) retrieving specific information, iii) sharing information, and iv) reading without specific tasks. There is an overlap between studying subject matter and retrieving specific information, but for the purpose of testing, studying subject matter is defined as an activity that requires readers to learn new information by reading the content, whereas finding specific information is defined as an activity that does not require an in-depth understanding of the content, but that asks readers to grab certain information quickly merely by looking at the content.

There are many ways to share information, but for the testing I chose SNS such as Facebook or Twitter as a means to share the information. When readers aim to share certain information, it was expected they would quickly skim the contents and find specific parts that are interesting for them. Reading without a specific task is done by asking the testing subjects to read the web page before the testing without informing them about any ideas on the testing itself. To minimize the impact from subjects' awareness that they are engaged in the testing, the subjects were instructed that the purpose of the first round of reading was just to find out about the overall content; they were encouraged to read in a causal way.

Setting a reading purpose were be done by giving subjects specific tasks that trigger specific purposes. However, examining the reading patterns for different purposes may not yield clear results, as the reading process is internal and eye movements do not accurately show the reading pattern, as described in previous chapter. To add clarity and quantitative analyses, critical translation errors based on LISA QA grid were designed and planted in the web page. This was to see if readers who were instructed to read the web page with certain purposes would be able to detect planted errors, or find something unintended.

For the specific questions and activities designed for the test (Appendix 3), readers were directed to read the entire web first before looking at the questions, in order to raise the level of subject knowledge, and more importantly, to implement the reading with no specific purpose.

After the first round of reading (general reading), three tasks and questions that are expected to show different reading purposes were asked. For studying subject matter, a question asking the new features of Camera and Photo with iOS7, "What are the overall new features in Camera and Photo with iOS7?" was asked. In order to answer the question, the readers were expected to read the relevant paragraph carefully

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and thoroughly and understand the content. The expectation was that the question would trigger thorough reading, increasing translation error detection rate.

For retrieving specific information, a non-descriptive information search question was asked: "Which devices are compatible with iOS7?".Attempting to answer this question was expected to change the reading patterns among readers in a way that the readers would scan the text until they spot the answers they want. After that, the reading patterns are expected to change.

For sharing information, the question was: "If we asked you to choose a certain part to post on the web on your SNS, i.e. FaceBook or Twitter, which part would that be?" This question does not fully incorporate the sharing aspect itself: it only addresses the aspect of finding the information that the readers intend to share, simulating the scenario that the readers would like to share some information on some new feature of iOS7 through their SNS, but do not know what they want to share. I expect the question to serve the testing purpose without a problem. I assumed that readers would have to either scan the entire text one more time to find what they want to share or try to jump to the place they remember interesting. Once they found something to share, readers were expected to read thoroughly until they acquired enough information to share. Reading for sharing information was expected to show different types of reading patterns among participants, and trigger most active involvement from the participants.

In case the participants did not formulate enough verbal activities, the survey asked if the web page looked professional, and if they had any comments.

3.2.4. Testing subjects

Needless to say, there should be enough participants in the research so that the results can be representative of the participants' groups. However it is difficult and redundant to gather many participants in usability testing. Nielsen and Tahir (2001) say three to five are generally sufficient to gain insight in qualitative research. He says that after the fifth participant, the issues already have been discovered and therefore, additional participants will just discover the same issues. Dumas and Redish (1993: 128) also support this by saying, "after you have seen several people make the same mistake, you don't need to see it a 10th or 20th or 30th time." This is very true in many cases, but gathering only three to five results can create an error of generalization, especially when I have many variables both in translation errors and purpose of reading. Given the

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qualitative nature of research, and number of variables and its complexity, thirty subjects were selected regardless of their age or gender, as these had previously been found not to be as influential factors in reading web pages as were profession, education or accessibility (Choi 2008). In this study, the main criteria for subject selection were education, reading experience, profession, and the subject's background knowledge.

The study exclusively chose native Korean subjects who had advanced web-reading skills. They all had completed higher-education and had professions that involve intensive reading on a regular basis. Selecting advanced web readers naturally eliminated the accessibility dimension. All of the subjects were familiar with the subject matter, and some of them were considered experts in the area.

Because of geographical limitations and the nature of the translation profession, many subjects I selected are currently living in the U.S. and are exposed to English and American culture. However, all the subjects who have been living in the U.S. were born and raised in Korea until they graduated from college, which means their higher education was conducted in Korean. Some subjects did not speak much English even though they have lived in the U.S. for many years.

As the test is designed to compare occupational differences, ten participants are divided into two groups: the heavy-reading group and the light-reading group. The heavy-reading group includes translators, editor, proofreaders who all have years of translation experiences. Since there is no single way to examine language competence in translation, and designing a system that measures language proficiency can be complicated, I chose the subjects who received at least MA degrees in translation from reputable institutions for the heavy-reading group. The light-reading group includes chefs, engineers, military personnel, and others who do not have to engage in intensive reading and also do not have to prove language proficiency. The detailed participant selection, at the initial stage, is listed in Table 3.1 and Table 3.2.

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Table 3.1. Participant profiles for the heavy-reading group at the initial planning stage

No	Gender	Education level	Topic familiarity	Age	Profession	Length in the profession (yrs)
1	F	MA	Familiar	34	Editor	7
2	F	MA	Familiar	27	Editor	4
3	M	BA	Very Familiar	35	Editor	7
4	M	MA	Familiar	33	Translator	9
5	F	MA	Familiar	36	Reviewer	6
6	M	MA	Familiar	49	Reviewer	4
7	F	MA	Familiar	37	Proofreader	7
8	F	MA	Very Familiar	30	Reviewer	4
9	M	MA	Familiar	35	Translator	9
10	F	PHD	Familiar	41	Translator	11

Table 3.2. Participant profiles for the light-reading group

No	Gender	Education level	Topic familiarity	Age	Profession	Length in the profession (yrs)
11	M	PHD	Familiar	45	Military Official	23
12	F	MA	Familiar	35	Financial Advisor	5
13	M	BA	Very Familiar	33	Businessman	3
14	M	PHD	Very Familiar	37	Engineer	9
15	F	MA	Familiar	26	Chef	4
16	M	BS	Familiar	30	Pharmacy student	2
17	F	BA	Familiar	26	Translation Student	1
18	M	MA	Familiar	37	Project Manager	5
19	F	BA	Familiar	30	Legal Assistant	2
20	M	BA	Familiar	44	Restaurant Owner	12

3.2.5. Translation errors matrix

Evaluating translation quality has spawned many debates in Translation Studies. Defining good, acceptable, poor translation is necessary in many occasions, but there is yet no universally accepted evaluation model in translation field (Secară 2005). For my research, I chose the LISA QA grid for translation error categories (mistranslation, accuracy, consistency, country standards, language, style, and terminology), as this is the widely used ISO – 9000 series format for web and software localization. The definition of each category is explained in Chapter 2 in great detail, so I will not explain the specific definitions here.

I designed two translation errors (E1, E2) as a set in each category. I planted E1 in places where subjects have to read intensively to perform specific tasks, and E2 in places where subjects do *not* have to read to perform a specific given task, so that I could investigate whether the tasks given for the purpose of reading were efficiently designed. If the error locations are proven efficient, or if the locations are found have no effect on the outcome, only one error will be planted in the main test.

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Each category can include many different types of translation errors. For example, a "style" error can vary from a simple formal/informal register issue to nonsense coming from a too-literal translation. Therefore, it is important to design similar types of translation errors of similar severity for each category, in order to eliminate multi-dimensional analysis of the translation errors and, consequently, different reading patterns.

The LISA QA grid suggests three severity levels for translation errors: critical, major, and minor. Even though major errors are considered failures to render the exact meaning of the ST, creating confusion related to meaning, or to use incorrect language (Secară: 2005), determining the severity of errors also poses a great challenge as there is no set of evaluation standards and there is not benchmarking standard. Severity is more likely to be a dependent variable in the testing, meaning it is discovered as a result of the subjects' actions, either because the reading subject goes off on the wrong track, or the error affects the interpretation of other terms (a structural definition), or because the error causes mistrust in the rest of the text (pragmatic definition). From this context, severity is not something that can be planted in the experiment, but rather something I discover as a result of the experiment.

For the test, I only implemented errors considered major to critical in order to ensure their impact and attempted to give similar levels of severity for all categories, as far as possible. The errors designed for the testing reflect probable translation errors in terms of syntax and discourse. For example, translating "you" is always problematic in Korean, as there are many different ways to say "you" in a social context. More importantly, when the subjects and/or objects are general groups of people or the speakers or writers themselves (i.e. you, we, I), they are often omitted. For the testing, I translated "you" as "당신", which is an individual, non-colloquial, and a little outdated translation. No arbitrary errors (i.e. translating "you" into "고양이(cat)") was planted, so that I could direct or manipulate the outcome in a certain way. The detailed translation error matrixes are shown in Table 3.3 through Table 3.9, followed by explanations.

3.2.5.1. Mistranslation errors

Mistranslation errors are designed to include wrong interpretations of the ST. Given the fact that the web page is written for the marketing purposes with no information that is

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critical from the readers' perspective, mistranslations might not interfere with readers' understanding. In other words, if the web page was about a surgery procedure and a mistranslation error was planted, readers might be able to detect the error with ease, as they would have trouble following the steps. As I attempted to implement probable errors, and given the non-reading patterns proved in other research, and the nature of the web page mentioned above, the mistranslation errors planted might be little subtle. I would not expect many readers to catch these errors even though they may cause incoherence in understanding. Still, some readers are expected to catch E1. Depending on the result of the pilot study, the severity of the errors will be reconsidered.

Table 3.3. Translation error matrix for mistranslation

Translation error category	English ST	Korean TT	Intended Error
Mistranslation E1 (in Camera)	Artistic license is all yours.	이제 예술적 자유가 느껴집니다. —> 카메라 기능으로 이제 사진 자격증을 따실 수도 있습니다.	"Artistic license" is translated as a physical "photographer license."
Mistranslation E2 (in Safari)	And with a swipe, you can go back or forward a page.	또한 스와이프 한 번으로 페이지 앞뒤로 이동할 수 있습니다. -> 또한 스와이프 한 번으로 뒤로가기를 하거나 페이지를 전달할 수 있습니다.	The word "forward" is translated as if email is "forwarded" instead of going back and forth a page.

As for E1, the ST said (Fig 3.1) "Artistic license is all yours" to describe the camera's artistic feature, but the Korean translation said (Fig 3.2) "카메라 기능으로 이제 사진 자격증을 따실 수도 있습니다 (Now you can acquire a photographer license using the camera feature). The error comes from misinterpreting the word "license" as an actual license. This is probable as Korean uses "license" as a transliterated form on many occasions in daily lives. The translation does not make sense, as acquiring a license has no relation to using an iPhone iOS 7.

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Fig 3.1. Mistranslation (E1) ST
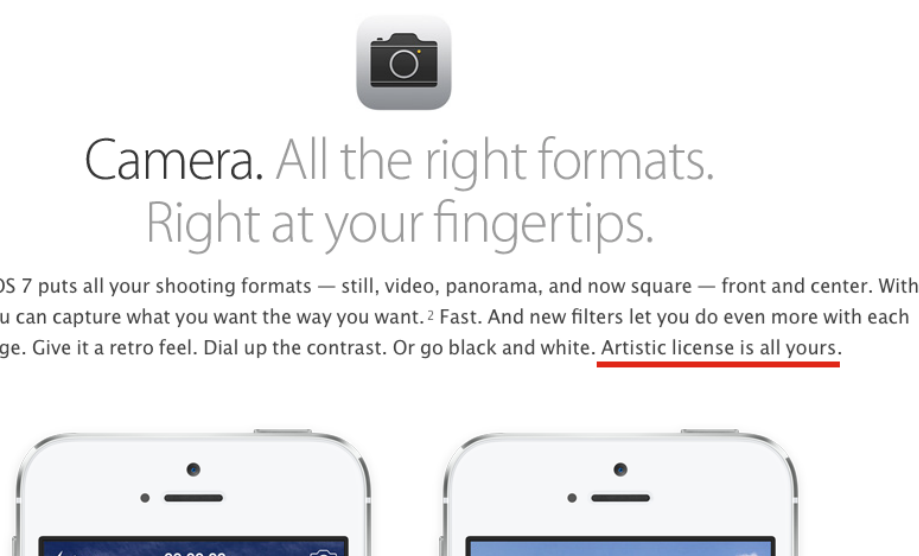
Fig 3.2. Mistranslation (E1) TT

As for E2, the ST said "And with a swipe, you can go back or forward a page" to describe how swipe works to move the web pages on the mobile devices (Fig 3.3) The Korean translation (Fig 3. 4.) says, "또한 스와이프 한 번으로 뒤로가기를 하거나 페이지를 전달할 수 있습니다. ("one swipe can make you go back or forward a page". Here the word "forward" is translated as if an email were "forwarded" instead of going back and forth a page, triggering logical incoherence, as "forwarding a web page" does not make sense. The error comes from a scenario where the word "forward" is

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translated in the most common usage without context considerations, which is quite likely in translation practice.

Fig 3.3. Mistranslation E2 ST

Safari. With things out of the way, there's way more web.

Browsing is bigger, better, and more beautiful with Safari in iOS 7. Buttons and bars — like the unified smart search field — stay hidden until you scroll to reveal them. [6] So you see more content than ever on your screen. And with a swipe, you can go back or forward a page. It's all designed so nothing gets in your way or slows you down.

Fig 3.4. Mistranslation E2 TT

Safari.
더 넓어진 웹 세상.

iOS 7과 함께 Safari에서의 브라우징이 더 큼직해 지고, 더 좋아지고, 더 아름다워졌습니다. 통합 스마트 검색 필드 같은 버튼과 막대들은 스크롤하기 전까지 보이지 않습니다. 그래서 화면에서 전보다 더 많은 콘텐츠를 볼 수 있는 거죠.[5]또한 스 와이프 한 번으로 뒤로가기를 하거나 페이지를 전달할 수 있습니다. 웹 서핑을 방해하거나 번거롭게 하는 요소가 없도록 모든 것이 디자인되어 있답니다.

3.2.5.2. Accuracy

There is no clear distinction between mistranslation and accuracy errors in terms of ST interpretation in the LISA descriptors (details are described in Chapter 2). Mistranslation is mostly about not interpreting ST as the author intended, whereas accuracy is more about omitting and adding words and/or slightly changing the meaning. Omission or addition is very unlikely to be detected as long as the translation makes sense in context, as readers only consider the TT without comparing it with ST. Therefore, I chose to change the ST meaning slightly in an isolated context for the testing purpose.

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Table 3.4 Translation error Matrix for Accuracy

Translation error category	English ST	Korean TT	Intended Error
Accuracy E1 (In Control Center)	Never has one swipe given you so much control.	스와이프 한 번으로 이렇게나 많은 컨트롤이 가능해졌습니다. -> 스와이프 한 번으로 이렇게나 많은 컨트롤이 가능했던 기기는 없었습니다.	"Never has" is translated as "no other device has."
Accuracy E2 (in Airdrop)	Enter AirDrop for iOS.	iOS 용 AirDrop 을 소개합니다. -> iOS 용 AirDrop 을 입력합니다.	"Enter" is translated as "type," instead of "use AirDrop."

For Accuracy E1 (Fig 3.5), the ST says "Never has one swipe given you so much control." This reverse structure is not used in Korean; therefore the syntax analysis can be tricky. For the testing, "Never has" was misinterpreted as "no other device has" (Fig 3.6), making the translation "스와이프 한 번으로 이렇게나 많은 컨트롤이 가능했던 기기는 없었습니다 (No other device has made it possible for one swipe to control so much). This error could be problematic as the translation claims that Apple device is the best device in swipe control, which was not what the ST said. As the accuracy is a scaled down version of mistranslation in the design, I do not expect the readers to catch the errors.

Fig 3.5 Accuracy E1 ST

Control Center. Some things should be only a swipe away. And now they are.

Control Center gives you quick access to the controls and apps you always seem to need right this second. Just swipe up from any screen — including the Lock screen — to do things like switch to Airplane mode, turn Wi-Fi on or off, or adjust the brightness of your display. You can even shine a light on things with a new flashlight. Never has one swipe given you so much control.

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Fig 3.6. Accuracy E1 TT

For Accuracy E2, "Enter AirDrop for iOS" means "Introduce AirDrop for iOS" as shown Fig 3.7. The Korean translation is done literally as "iOS 용 AirDrop 을 입력합니다 (Type AirDrop for iOS)" as if you entered the password in the log-in screen (Fig 3.8.). This creates nonsense but the error is confined to the local context. As this accuracy error is very confined to the local context and does not carry significant impact, I do not expect the readers to catch the errors.

Fig 3.7. Accuracy E2 ST
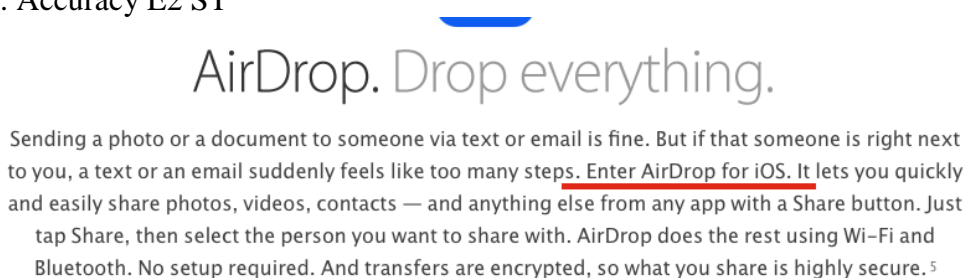
Fig 3.8. Accuracy E2 TT
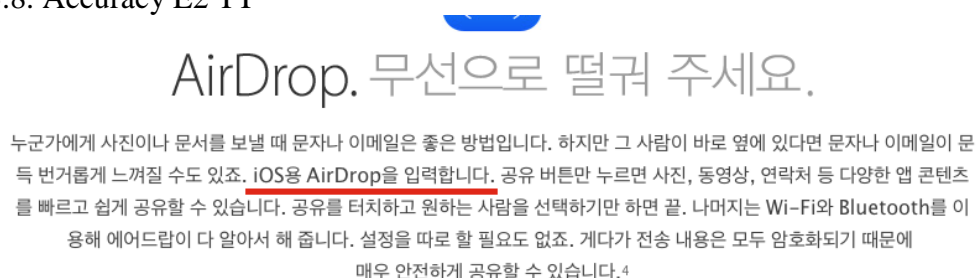
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3.2.5.3. Consistency

Consistency is considered critical in the translation and localization industry in order to avoid confusion and misunderstanding. However, I suspect consistency does not matter so much to ordinary readers, unless readers are experts in the field or have exceptional memories. Assuming these errors are not easily detectable, I attempted to maximize their visibility on the web page. Despite the effort, I do not expect readers to detect consistency errors, neither in E1 nor in E2.

Table 3.5. Translation Error Matrix for Consistency

Translation error category	English ST	Korean TT	Intended Error
Consistency E1 (in Photo)	Inside a Collection. Tap a Collection.	추억이 '모음' 안에 쌓입니다. -> '콜렉션' 안에 쌓입니다. '모음'을 터치해 봅니다. -> no change	The term "Collection" is translated differently when the two sentences are right next to each other.
Consistency E2 (iOS 7 and Business developers)	iOS 7	iOS 7 -> iOS 7	No space is given between "iOS" and "7" unlike other translations throughout.

Here in E1, the Collection (Fig 3.9) in Photo App is translated in two different ways. One is the Korean translation "모음" and the other is the transliteration "콜렉션". The difference was made very visible by placing the two right next to each other (Fig 3.10).

Fig 3.9. Consistency E1 ST

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Fig 3.10 Consistency E1 TT

E2 is about using inconsistent spacing rules. Spacing rules in Korean are extremely complicated due to many exceptions and frequent changes of grammar rules, which pose great challenges to writers and translators. Even experienced translators and writers spend some time to look for the correct spacing rules every time they write. Accommodating probable difficulties in real practice, I implemented two different spacing rules for the same word: one string says "iOS 7" and the other says "iOS7" (Fig 3.12), which also sit very close together.

Fig 3.11. Consistency E2 ST

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Fig 3.12. Consistency E2 TT

iOS 7과 비즈니스.

iOS7에는 회사 차원에서 직원들에게 iOS 기기를 배포하고 관리하는 것을 쉽게 해 주는 다양한 신기능들이 있습니다. 업무 및 개인 데이터 보호, 앱 라이선스 관리, 모바일 기기 관리에 간편한 등록, 무선 앱 구성, 기업용 Single Sign-On 지원, 서드 파티 앱의 기본 데이터 보호까지 가능합니다.

3.2.5.4 Country Standard

Apple's web pages and advertisements are said to sound very foreign to many Korean users as they contain a lot of transliteration. There have been debates in the company about how such alienation strategies are received among Korean readers. In particular, transliterating prepositions, hyphens, semicolons, articles and other units that do not exist in Korean is ungrammatical and poses readership issues.

From this context, I chose transliteration errors that already existed in the original translation for Country Standard category. As these errors should directly hinder comprehension and distract the readers on multiple occasions; I expected readers to catch them.

Table 3.6. Translation Error Matrix for Country Standard

Translation error category	English ST	Korean TT	Intended Error
Country Standards E1 (In CarPlay)	CarPlay seamlessly integrates your iOS device — and the iOS experience — with the in‑dash system on select new cars.	iOS 기기만이 제공하는 iOS 의 우수한 환경이 이제 CarPlay 를 통해 새롭게 출시되는 일부 모델의 인대시 시스템과 완벽하게 통합됩니다.	"in-dash system" is written phonetically in Korean without English or explanations.
Country Standards E2 (In Camera)	Swipe	스와이프	"Swipe" written phonetically in Korean without English or explanations.

For E1, the phrase "in-dash system" (Fig 3.13) is transliterated as "인대시 시스템" (Fig 3.14), which does not make sense to Korean readers as the preposition "in" is transliterated and a hyphen disappeared including its function. As a result, the transliteration of "in-dash" does not convey any meaning to those who do not understand the function and meaning of the preposition in English structure. The error is planted on the first line under the title to enhance its visibility.

Fig 3.13. Country Standard E1 ST
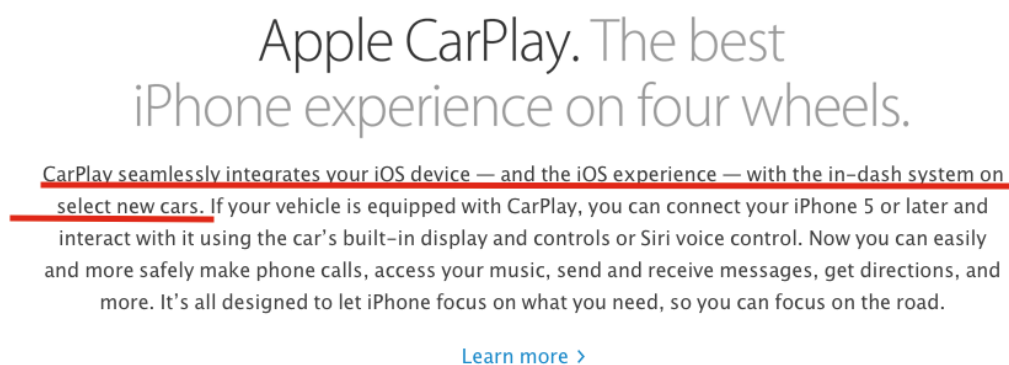
Fig 3.14. Country Standard E1 TT

For E2, I chose the transliteration of "swipe" (Fig 3.15., Fig 3.16.). This is a commonly used term and translation for Apple iOSes. Transliteration of "swipe" is not understandable for Koreans, but this term might have been "learned" over time among Apple users or those who have interest in Apple devices. As the transliteration of "swipe" does not convey much meaning, it should distract some readers. Catching E2 might be more difficult for those who are used to seeing the term on iOS devices, but it shows up in multiple places, which is expected to compensate for the disadvantages of the error.

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Fig 3.15. Country Standard E2 ST

Fig 3.16. Country Standard E2 TT

3.2.5.5. Language

Punctuation was chosen as the error type for the Language category, as this is one of the most common types of language issues in Korean translation. Although Korean is not as sensitive to punctuation as English is, I see many novice translators choose to follow English punctuation rules without considering the proper use of Korean punctuation, which can be completely ungrammatical. The Apple web page for iOS 7 already contained multiple serious punctuation errors, which were chosen for the Language category without changes.

Table 3.7. Translation Error Matric for Language

Translation error category	English ST	Korean TT	Intended Error
Language E1 (Everywhere)	. at the end of every sentence	. at the end of every sentence	A period shows up after every single sentence even though the sentence is a fragment.
Language E2 (Last section)	iOS 3 is compatible with :	iOS 3 호환 기기: -> no change	A colon is used after a title, which is not grammatically correct in Korean.

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E1 concerns an excessive use of periods (Fig 3.17). Incomplete sentences should not be followed by periods according to both English and Korean grammar rules, but both the ST and the TT used periods for every single sentence, whether the sentence was complete or not. In the Korean translation (Fig 3. 18), the second sentence is also translated as an incomplete sentence unlike ST, but still has a period at the end. Since this causes a major readability issue and happens in many places with high visibility, I expected readers to catch this error without much effort.

Fig 3.17. Language E1 ST

Fig 3.18. Language E1 TT

E2 is about the usage of the colon. The ST (Fig 3.19) used a colon to indicate the list will follow in a separate line next. TT (Fig 3.20) adopted exactly same usage as in the ST, which is grammatically problematic according to the Korean Grammar Rules announced in 1998 by the Ministry of Culture and Education. In Korean, colons can be used to indicate the list only when the list begins right next to the colon on the same line.

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Fig 3.19. Language E1 ST

Fig 3.20. Language E1 TT

3.2.5.6. Style

Style errors include anything that is not appropriate to the target language and culture, *including* translations that are too literal. As style can a very subjective evaluation category, there is always room for debate. I expected style errors to impact the users' overall impression on the web page.

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Table 3.8. Translation Error Matrix for Style

Translation error category	English ST	Korean TT	Intended Error
Style E1 (All)	You	당신	Translation is very dramatic and is mostly used in advertisement. This word rarely appears in usual Korean web pages of this type.
Style E2 (Intro)	And while many of the apps look different, the way you do things feels perfectly familiar.	많은 앱들이 낯설게 보여도, 사용하는 방식은 완전히 익숙합니다. —> 그리고 많은 앱들이 다르게 보이는반면, 사용하는 방식은 완전히 익숙하게 느껴집니다.	ST is translated very literally at the word-for-word level, which hinders flow and generates awkward expressions.

E1 involves translating a common subject "you". In Korean, subjects and objects that are clearly implied in the context are almost always omitted in correct grammar. In other words, subjects and/or objects like "I", "we" and "you" are almost always omitted. If they must be translated, the current translation prefers using comprehensive group terms like "users", "customers" or students". Apple's web page translates "you" as "당신", which is correct in meaning but not common in many aspects. The usage of "당신" is limited to very specific situations with multiple different implications. "당신" can be used to pay maximum respect to someone who is much higher than you in status, such as grandparents, teachers and elders (it was commonly used in the past) or to refer to a spouse in neutral tone, or to criticize someone in a demeaning way. Due to these complicated implications, the word is open to different interpretation and is not commonly used any more, neither in spoken nor written form, unless dramatic effect is sought.

Fig 3.21. Style E1 ST

Control Center. Some things should be only a swipe away. And now they are.

Control Center gives you quick access to the controls and apps you always seem to need right this second. Just swipe up from any screen — including the Lock screen — to do things like switch to Airplane mode, turn Wi-Fi on or off, or adjust the brightness of your display. You can even shine a light on things with a new flashlight. Never has one swipe given you so much control.

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Fig 3.22. Style E1 TT

For E2, literal translation was chosen for the error type. The translation of "And while many of the apps look different, the way you do things feels perfectly familiar" was already translated very literally "많은 앱들이 낯설게 보여도, 사용하는 방식은 완전히 익숙합니다". The translation is understandable but does not read smoothly. I made it even more literal in order to complicate the understanding of the context "그리고 많은 앱들이 다르게 보이는반면, 사용하는 방식은 완전히 익숙하게 느껴집니다." As the translation is still understandable, I do not expect many users to detect the error. Depending on the pilot testing, this error might need revision.

Fig 3.23. Style E2 ST

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Fig 3.24. Style E2 TT

iOS7에는 제어 센터, iOS용 AirDrop, 그리고 더 스마트한 멀티태스킹 같은 훌륭한 신기능이 도입되었습니다. 이제 매일매일의 일들이 더 편해지고, 더 빨라지고, 더 즐거워집니다. 그리고 많은 앱들이 다르게 보이는 반면, 사용하는 방식은 완전히 익숙하게 느껴집니다. 그래서 손에 들어온 첫날부터 쓰는 법을 마스터할 수 있는 친숙함은 그대로입니다. 세상에서 가장 앞선 모바일 OS가 몰라보게 발전했어도 말이죠.

3.2.5.7. Terminology

Terminology errors involve not choosing the subject or context-appropriate words as well as not following the existing terms in the glossary or terminology database. Terminology errors overlap with consistency by nature. The errors for terminology thus reused consistency errors. I kept the two errors (E1, E2) for the consistency of the testing and also for the result analysis. As first-time readers and those who have little exposure to the subject matter are very unlikely to pick up terminology errors, I do not expect the readers to catch the errors.

Table 3.9 Translation Error Matrix for Terminology

Translation error category	English ST	Korean TT	Intended Error
Terminology E1 (in Photo)	Inside a Collection. Tap a Collection.	콜렉션' 안에 쌓입니다. -> no change '모음'을 터치해 봅니다. -> no change	The first "Collection" is translated phonetically only in this location, therefore, did not follow the terminology used throughout the web page.
Terminology E2 (iOS 3 and business and developers)	…third-party app...	서드 파티 앱 (No changes)	"third-party app" is translated phonetically, which does not make any sense.

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E1 for Terminology is a duplicate of E2 for Consistency. As stated above, the Collection (Fig 3.25) in Photo App is translated in two different ways (Fig 3.26). One is a wholly Korean translation "모음" and the other is transliteration "콜렉션". The difference was made very visible by placing them right next to each other.

Fig 3.25. Terminology E1 ST

Fig 3.26 Terminology E1 TT
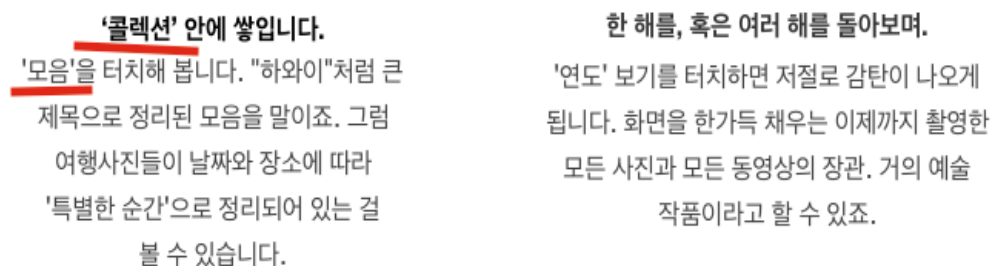
As for E2, "third-party app" (Fig 3. 27) was transliterated as "서드 파티 웹" (Fig 3.28). This is complete nonsense, as Korean already has multiple existing translations for "third-party" and the transliteration of "party" means a gathering for birthdays, weddings, etc. Since the translation error does not convey any meaning, if the readers pay attention, the error should be detected, especially if a task is involved.

Fig 3.27 Terminology E2 ST

Fig 3.28 Terminology E2 TT

3.3. Pilot study

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To prove the validity of the research design and examine the effectiveness of variables, methodology, and survey questions, a pilot study has been conducted among five participants who were not included in the suggested subject list. The most complicated variables with the test were error category matrixes. As I designed the matrix, I noticed that some error categories overlap by definition or by the purpose of the test, so I tried to avoid the overlap as much as possible. The test implemented errors that were expected to be caught in terms of visibility, severity, and location. The test also has a set of two errors (E1, E2), E1 for the places where a task is involved, and E2 for the places where a task is not involved. In sum, the test used 4 different reading purposes, 7 different error categories, and 2 different errors for each category. By conducting the pilot study, I plan to reduce the number of variables so that the results can be clearly interpreted.

Effectiveness of TAPs was also in question. As described in Chapter 2, it was proven that TAPs can hinder the reading performance among Asian readers. The test keenly examined the effectiveness of TAPs in terms of weakness and strength.

3.3.1 Testing Procedure

The pilot test design was implemented exactly as planned (see 3.2). All the participants were given explanations on the purpose and detailed process of the testing both verbally and by email before they signed the agreement (Appendix 1). It is important for the participants to understand why they are reading the given web page. However, the participants' full awareness of the test purpose is likely to distort the outcome, so the expectations were not discussed at all. The task sheet includes a brief explanation of the task and preparation in plain Korean (Appendix 2: translated into English), and was provided at the beginning of the test. In order to minimize the intervention, participants' activities were not monitored directly. Instead, participants' mouse movements, voices, and video were concurrently recorded.

When the participants were finished, they completed a survey form that asks about the usability aspect of the translation. Even though TAPs was the main tool to examine the results, given Koreans' tendency to depend on the internal thought-process, a written survey (Appendix 3) was created and provided as a backup. The main concern was whether the TAPs would be sufficient to draw meaningful results. As none of the participants was familiar with TAPs, getting them to talk was an important precondition

for the testing. The testing took place at their preferred places and their preferred time without my presence.

Indirect observation was chosen because it provides a more natural reading environment that can encourage talk-aloud activities. The readers who wished to do the test with their own computers downloaded the software and recorded their own sessions. I chose BB FlashBack, made by Blueberry Software for the recording on PCs. BB FlashBack is a screen-recording tool that records all the key strokes, video, and sound using a webcam in a single file. Some Mac users used QuickTime Player, which supports screen- and voice-recording just like BB FlashBack does.

Indirect observation also helped avoid the impact of having an observer present at the testing site, perhaps guiding users in a certain direction or making them feel like they had to complete the task in a certain timeframe, or hindering the readers' talk-aloud process.

3.3.2. Pilot testing subjects

The pilot study was conducted on six participants (Table 3.10), based on the settings and conditions above. The participant group included male and female, ages from 29 to 47, with medium familiarity to high familiarity with the subject matter. The main purpose of the pilot study was to confirm that the translation error matrix would give meaningful outcomes that the TAPs work as intended, and that the survey questions were effective. As the table shows, P01, P02, P03 belong to the heavy-reading group, and P04, P05, and P06 belong to the light-reading group.

Table 3.10. Participants' profile in the pilot study

Subject	Gender	Age	Profession	Highest Education	Yrs in the Profession	Topic familiarity
01	F	33	Translator	MA	3	Expert
02	F	44	Project Manager/Reviewer	MA	16	Expert
03	M	45	Translator/Editor	MA	12	Familiar
04	M	47	Stay-at-home dad	College	3	Familiar
05	F	31	Interpreter	MA	2	Familiar
06	M	29	Software Engineer	MA	2	Expert

All the subjects volunteered to participate in the test at no compensation. While recruiting the volunteers, I provided short verbal explanations in person about the

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testing purpose, and provided the participation agreement form (Appendix 1) for their review. They were given a maximum of seven days to sign the form. After receiving the signed forms, I emailed instructions on how to install and use the recording software (Appendix 2), so that the subjects could make their testing machine ready. After finalizing the detailed settings of recording software and computer specifications, I sent out the instructions and survey forms for the testing (Appendix 3).

3.3.3. Pilot test results

This section features participants' statements during the test, and analyzes the translation errors detected. As this was the pilot test that is designed to confirm the validity of the test procedures and translation errors, the results are analyzed in a simple way, and the discussion also focuses on the test logistics and shortcomings.

3.3.3.1. Participants observation

Although some participants talked more than others, most participants made minimal verbal activities. The observations made mostly were based on the screen and voice recording (sighs, breathing, and others) and how their cursor moved.

3.3.3.1.1. P01 analysis: P01 is a 33-year old female. She has been working as a translator and a Korean reviewer at a big IT company for 3 years. She holds an MA in conference interpretation. P01 made relatively more comments than other participants, and her comments were very straightforward and critical. She did not pay much attention to graphics. She had full awareness that the web page she was reading was a translated version. P01 read in a linear and thorough way from the beginning to the end, which represents the heavy-reading group. She read with no significant pauses and read and spoke fast. Her selected comments are as follows.

— This web site talks about Apple's iOS 7. OK, let's get started.
— Title has a period. Why did they put so many periods in all the sentences? Periods are placed consistently, so it is not even a mistake. Maybe the overuse of periods had something to do with marketing decision?
— So the Camera… it has new filters, 6 different filters.
— Siri responds to your commands, text or email for you, and….

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— The compatible devices are iPhone 4, iPhone 4s, iPhone 5…uh… let me look again. Oh here, iPhone 5s, iPad….

— "당신 (you)" is translated so strangely. I feel like I am time travelling to the 1970s.

— I don't know if it was necessary to transliterate all these important terms. They don't make sense if you consider readership. I don't understand all these technical terms like device management, sign-on support, and default data protection.

— CarPlay is nothing special. It sounds just like a navigation based on what is written here.

— Overall, I do not think the tone is appropriate to (conservative) Korean readers. It is too light and too casual.

Even though she showed the typical reading patterns of the heavy-reading group that I expected-linear, thorough, and critical, her error detection rate was not high, which was opposed to my initial hypothesis. She only caught Style, Language, and Country Standards errors.

3.3.3.1.2. P02 analysis: P02 is a 44-year-old female who has been working as a localization expert and Korean linguist in various major IT companies for over 16 years. She holds an MA in translation. She was very linear and thorough in her reading and she took her time in reading the task sheet and web page, and summarizing her understanding. She had many pauses while reading, but it was difficult to tell from the recording whether the pauses were for processing information or just for reading, as her verbal activities were very limited. Her selected comments are as follows:

— I will begin the test; I am not sure what I need to talk about really. I am also not very a verbal person, so I hope what I will do fits the purpose of the task.

— I like the style of the web page, as it is trendy and fun. However, I am not sure about all the transliterations as I don't understand terms such as "swipe," "turn-by-turn," and "in-dash system."

— I don't know what "정방형 (front and center)" means. (long pause) Oh, there are pictures of the filters.

— "당신 (you)" looks a little strange to me.

— I am sorry that I am too quiet. I cannot really think of anything to talk about. Thinking and talking at the same time is challenging.

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— The periods at the end of every sentence look strange to me. I don't think it is correct grammar.

— Where was the part about the car? I remember it was somewhere around here…

— There seem to be too many transliterated words like swipe, third-party app, app management and so on, in-dash system and so on.

— This web site does not seem to be proofread by professionals, but overall style and tone was fun and interesting to read. Some of the word-paying was interesting.

— (at the end of the testing) I am sorry about the lack of verbal activities. I tried, but I was unable to think about things to say. I hope it still helps and you can use this.

P02 was under a lot of pressure as she felt obligated to talk while doing the tasks. Even so, her verbal activities were minimal, and she was not able to talk and read simultaneously. It looked like TAPs interfered with her thought process to a great extent, as she expressed her regret in many places during the recording. She gave me the impression that she was not able to concentrate, as she was aware that she was not making a lot of verbal activities. In spite of her linear and thorough reading, her error detection rates were not as high as I hoped. She only caught Style, Language, and Country Standards errors.

3.3.3.1.3. P03 analysis: P03 is 45-year-old freelance translator and editor. He holds an MA in translation. He showed a strictly linear and thorough reading pattern with high speed. He was not as critical as I was expecting, presumably because of the length of reading. He showed high dependence on text and low dependence on non-textual elements, and no significant pauses. He said the web page was too long to read all at once. He read about 1/3 of the web page for the general reading and then moved on the tasks. He did not make a lot of verbal activities either, but he made some meaningful comments. His selected comments are as follows.

— I will take a look at the web page now. The instructions say that I have to read (looking at the task sheet) the entire web page. (Scrolling up and down multiple times) Well, this is a very long web page. Who reads all this? It is not even easy to scroll. This is badly-designed web page.

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— Anyway, I will begin.

— (reading quietly about three sections) Okay, there is nothing much to digest. It is all about marketing without core content. I will just move to the task on the instruction sheet.

— First, new features of Camera… by the way, there are a lot of periods.

— Some words are too foreign to understand. I would have to look them up if I wanted to really understand.

— The compatible devices? I remember. (scrolling up and down fast). Here! iPhone 4, iPhone 4s, iPhone 5, iPhone 5s, iPad….

— The overall style is too casual. I don't think it is appropriate for older generation.

P03's linear and thorough reading pattern coincide with other heavy-reading group participants. He was critical on the purpose of the content, rather than the content itself. Consequently, his error detection rate was less than I expected. He only caught Style, Language, and Country Standards errors.

3.3.3.1.4. P04 analysis: P04 is a 47-year-old male who has been a housemaker and dad for three years. Before becoming a housemaker, he had worked as a cook for over 10 years. P04 showed very random and non-thorough reading patterns with extremely quick speed. He did not say a single word while he read, so whether he had meaningful pauses was not clear. Given the speed of his scroll movement, P04 did not read the entire text regardless the reading purposes, although reading for studying subject matter was read most thoroughly. Even on the survey sheet, he wrote down just key words. Even though there were no significant comments in the recording, some comments are described here.

— Hello. My name is… I will begin the reading.

— I will do the task now. Qustion 1. (pause) filters.

— Question 2. The compatible devices? I don't remember if there was something like that. (scrolling up and down fast multiple times). Ah! iPhone 4, iPhone 4s, iPhone 5, iPhone 5s, iPad….

— Question 3. I don't do SNS.

— Question 4. I don't know. It looks fine.

— Thank you.

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He showed a non-linear, non-thorough or extremely scatter, and sporadic reading pattern which is expected to be observed in the light-reading group, but in an extreme scale. As proven in the comments above, he read No.4 task incorrectly: The task asked "*If we ask you to choose a certain part to post on the web on your SNS, i.e. FaceBook or Twitter, which part would that be? Please copy and paste the area, and rewrite the content as you would post in the real world.*" But he took it as "*where would you want to post the section?*" It looked that P04 almost did not want to participate in the test, but his reading attitude might not be so extreme in the light-reading group.

3.3.3.1.5. P05 analysis: P05 is a 31-year-old interpreter who has been working as an in-house interpreter in a large IT company. She holds an MA in conference interpretation. She read randomly, looking for interesting sections. Her cursor went all over the place without concentrating on one section. She complained about the length of the web page and did not show any intention to read it all. P05 barely read for general reading (reading without a specific purpose) as she was discouraged by the length of the web page. Instead, she consulted on pictures, graphics, and other visual elements of the web page. She read in a linear and thorough way when reading for studying subject matter. She had no pauses while reading, and depended on non-linguistic elements for many parts of reading. Her selected comments are as follows.

— I am not sure what to talk about. I hope what I say will help you. Let me begin.

— (Scrolling up and down) This is very long. (scrolling up and down again) I don't know who is going to read all these. I hope I don't have to read this whole thing!

— Again, it is too much to read. I don't know who is going to read all these. Shorter reading will be much more effective.

— Okay, so the web page is talking about new things on iOS7. That is good enough to know. Let me move on.

— New feature on Camera? That, I will need to read to find the answer.

— The new feature of Camera is…

— "당신 (you)" sounds little strange.

— I don't know all these words and I don't know what this section means.

— Overall style is really good. I like how witty and fun it is. But once again, it was too much reading.

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P05 showed clearly different reading patterns for different reading purposes, which suggests H2 is correct. She was critical about the length of the web page, but she was not critical of the content of the web page. This could be because she did not read much as she was overwhelmed by the length of the web page.

3.2.3.1.6. P06 analysis: P06 is 29-year-old male. He has been working as a localization software engineer and project manager for 2 years for a major IT company. He holds a BA in computer engineering. He read sporadically, not-thoroughly, quickly, and not critically. He did not make any significant verbal activities, therefore, it was difficult to determine if his pauses were for reading or processing information or for both. He did not move his cursor very much either, so it was not clear where on the web page he was reading. He only said a few words to answer the questions such as filters, Carplay, and so on. His comments are as follows:

— I will read.

— (reading quietly) It looks like this is going to be a long page. I will begin the tasks.

— Q1….the answer is new filters.

— Q2… (searching for the correct reading section for a long time by scrolling up and down) They are iPhone 4, iPhone 4s, iPhone 5, iPhone 5S, iPad....

— Q 3… Navigation? (sounds unsure)

— Q4. I think it looks good.

— Done. Thank you.

He showed the reading patterns of the light-reading group with zero error detection rate. He did not read the entire page on general reading as he moved on the tasks quickly, and had to look for where the information was, in order to do "reading for retrieving information" task.

The reading patterns of the two groups in terms of linearity, thoroughness, pauses, dependence on non-textual elements, and critical attitude are summarized in Table 3.11 and Table 3.12. Reading speed was not mentioned in the comparison, as lack of verbal activities made it difficult to measure the exact reading time. It was unclear if the readers were thinking or reading from the recording as the participants did not talk

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about what was happening in their heads. In addition, many participants stopped reading to talk in some instances, and did not stop reading in other instances. The cognitive comprehension process and the reading process seemed to interfere with each other, and obtaining an exact reading time seemed misleading in this design.

Table 3.11. Summary of reading patterns of the heavy-reading group

No	Content coverage	Long pauses (more than 5 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
01	Thorough	No	Top to Bottom	High	None
02	Thorough	Yes	Top to Bottom Text to graphics	High	High
03	Through	No	Top to Bottom	High	None

Table 3.12. Summary of general reading patterns of the light-reading group

No	Content coverage	Long pauses (more than 5 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
04	Extremely low	No	Sporadic	Low	Low
05	Selectively Thorough	Yes	Sporadic	Low	High
06	Not-Thorough	No	Top to Bottom Sporadic	Low	Low

3.3.3.2. Error detection

Out of seven error categories, Language, Style, and Country Standards errors were the issues the participants pointed out. The heavy-reading group detected more translation errors than the light-reading group. The individual participants' error detection rates are summarized in Table 3.13 through Table 3.16, depending on the reading purposes.

Table 3.13. Number of error detection per participant for reading without a specific purpose.

Heavy-reading Group	Errors detected	Light-reading Group	Errors detected
P01	3	P04	0
P02	3	P05	1
P03	3	P06	0
Total	9	Total	1

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Table 3.14. Number of error detection per participant for reading for studying subject matter.

Heavy-reading Group	Errors detected	Light-reading Group	Errors detected
P01	3	P03	0
P02	2	P04	2
P03	3	P05	0
Total	8	Total	2

Table 3.15. Number of error detection per participant for retrieving information

Heavy-reading Group	Errors detected	Light-reading Group	Errors detected
P01	1	P04	0
P02	1	P05	0
P03	1	P06	0
Total	3	Total	0

Table 3.16. Number of error detection per participant for sharing information.

Heavy-reading Group	Errors detected	Light-reading Group	Errors detected
P01	0	P03	0
P02	0	P04	0
P03	0	P05	0
Total	0	Total	0

As there were only three participants in each group, and it consistently shows that the heavy-reading group detected more translation errors than the light-reading group in this pilot study, calculating median and showing the comparison in graphs do not carry significance, and therefore, were skipped. A full comparison will be made after the main test.

Detailed translation error-detection rates by error types are shown below, organized by purpose of reading. Two translation errors (E1, E2) compose one set in each category as explained before. We planted E1 in places where subjects have to read to perform specific tasks, and planted E2 in places where subjects do *not* have to read for specific subject matters and retrieving information. As expected, the error detection rate was definitely higher with E1. The detection rate with E2 was close to zero, so the results will not consider E2 as a separate section. Summary of error detection rates by two different reading groups are summarized in Fig 3.29 through 3.31. Since no one detected any error for reading for sharing information, no chart was drawn.

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Fig 3.29. Translation error detection rates by category while reading without a specific purpose
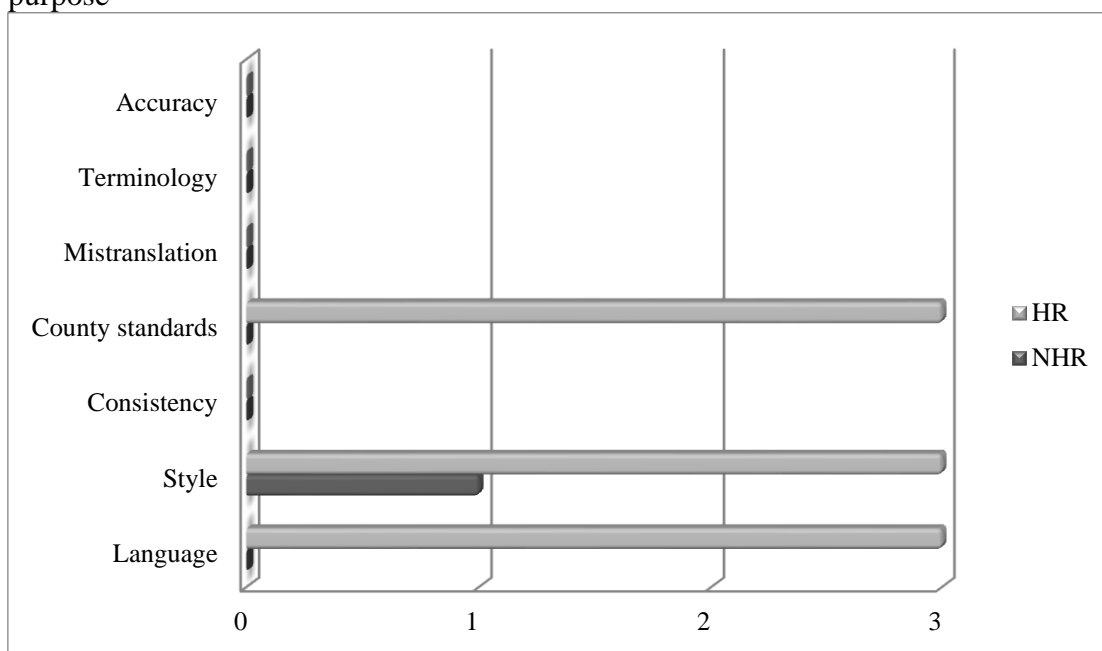
Fig 3.30. Translation error detection rates by category while reading for studying subject matter

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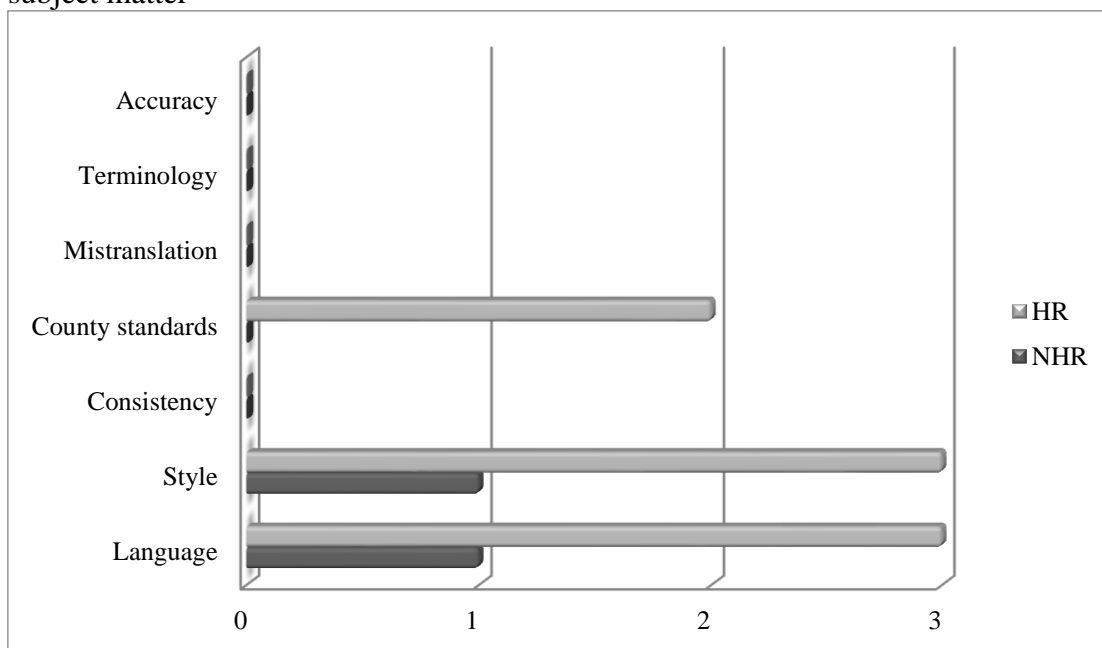
Fig 3.31. Translation error detection rates by category while reading for retrieving information
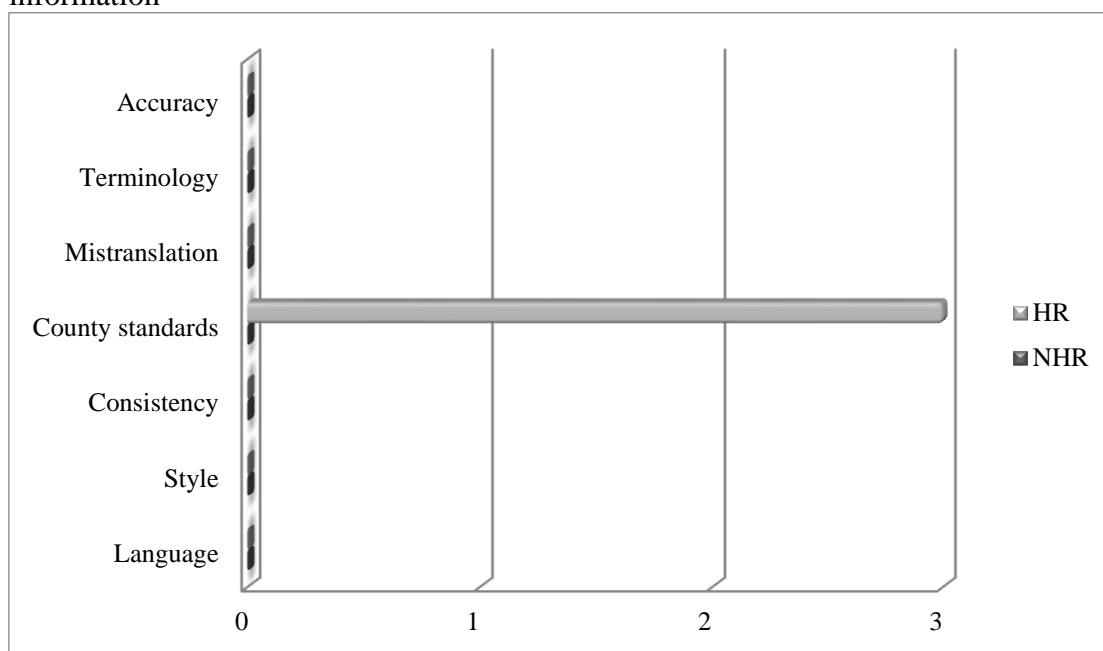
3.3.4. Discussions on the findings from the pilot study

The pilot study yielded clear results and insights into many aspects of the main test, including logistics and the translation error matrix. This section summarizes the discussions of the findings from the pilot test.

3.3.4.1. Results of the pilot test

The heavy-reading group and the light-reading group showed clearly different reading patterns. The heavy-reading group showed mostly linear and thorough reading patterns with low dependence on pauses and non-textual elements. The light-reading group showed mostly circular or sporadic reading patterns with high dependence on pauses and textual-elements.

There was not as clear a difference as I expected among the different reading purposes in terms of linearity, thoroughness, and so forth, but there were differences in the error detection rates, but that seems to be due to the cognitive process of the individual readers, rather than task formulation.

The participants read the content of the web page more carefully and thoroughly when they tried to understand the content, i.e. studying subject matter and retrieving information, than when they attempted to share information. Reading without a task,

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unlike my initial expectation, triggered reading patterns as seen in the reading for studying subject matter. The number of errors the participants detected was consistent with the thoroughness of reading.

When reading without a specific purpose, all the participants in the heavy-reading group talked mainly about the overall style and register. Two participants (P02, P05) liked the "casual" style of the translation, saying it was "fun," "witty," and "attractive," while another two participants (P01, P03) did not consider the style "appropriate to (conservative) Korean readers." Three participants (P01, P02, P03) talked about the awkward use of punctuation marks, the word choice for "you", and too many translated words.

The most striking finding is that no participant in either group detected Mistranslation, Terminology, Consistency or Accuracy errors in any of the activities. Even when the error was planted at the beginning of a sentence that they had to read to understand the context for subject- matter studying, no one detected the error. This was inconsistent with my hypothesis. Several factors could have contributed to this outcome. First, the participants did not read the entire sentence thoroughly, but rather jumped to the place, even within one sentence, that grabbed their attention or they expected to be meaningful in syntax structure, as described in the previous chapter. Second, the participants were so goal-oriented that they focused too much on the survey paper to complete the task. Third, the translation errors were not critical enough to call their attention. Given that all the participants in the heavy-reading group showed through reading patterns, the severity of errors seems to be increased to the errors that were not detected.

As for sharing information, the recording revealed that readers grasped the main point of the segment they wanted to share, instead of reading all the information thoroughly. P01 said, "Where was the part about the compatible devices?" or "I remember it was somewhere around here" and placed her cursor at the beginning of the sentence she was attracted to, not the beginning of the paragraph. After reading the text quickly, the participants focused on reconstructing the message to write down on the survey paper.

3.3.5 Shortcomings

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Based on the following shortcomings, some adjustments were made to increase the efficiency and validity of the test.

3.3.5.1. Length of the web page

The length of reading seemed to affect the overall reading performance and the quality of the TAPs. Participants had a hard time recalling what they read and did not show a willingness to go back and find the information required. Two of the participants (P03 and P05) voiced that the length of reading was problematic. P05 repeatedly said, "It is too much to read. I don't know who is going to read all these. Shorter reading will be much more effective." As long as the content of web page includes all the errors planted, the content does not have to be long. In order to prevent the frustration of the participants, the web page was shortened for the main test. Each reading section for each task is between 80-130 words, as less word count encourages more reading (Weinreich 2008; Nielsen 2008) as Fig 2.5 shows.

3.3.5.2. Writing on survey

The screen recording showed the participants spent much time editing their own writing instead of reading, which was not intended. The written survey paper was originally prepared to compensate for the shortcomings of TAPs, but it did not serve the intended purpose. Those who did not talk while performing the task did not write down anything meaningful in the survey either. It seemed that the survey was just duplicate work, as most participants wrote down what they had already said. For this reason, the exclusive use of TAPs without the written survey seemed more effective. With strengthened TAPs performance and clean screen recording, the results should be meaningful and valid enough. For the main test, the written part will be converted to an oral part, so that the participants do not have to concentrate on how to write.

3.3.5.3. TAPs and screen recording

As expected, the TAPs were problematic in most cases; prompting the test participants to talk for the entire testing time was problematic. Some participants were more verbal and critical than others: Out of six participants, only two female participants (P01 and P05) spoke enough to draw meaningful results; the other two female participants spoke a little at the beginning but stopped talking after 1-2 minutes, and two male participants (P04 and P06) did not say or write anything meaningful during the entire testing. All

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they said was "none," "don't know," and "good" without discussing any issues. It is unclear if gender affects the effectiveness of TAPs among Korean readers, however selecting female subjects might increase the validity of the test results, as gender difference is not a concern for the testing. P02 was overwhelmed by the instruction that she had to talk while performing the tasks, which interrupted the process.

Screen recording was very effective in understanding where the readers are reading and going to read, what they are doing, and where the participants' verbal activities belong to. Screen recording combined with TAPs, if implemented properly, can be a strong tool in examining the reading patterns.

TAPs need improvement in the main test. The main test will choose more females than males, and will consider the participants' verbal preference, if possible. What is more important, though, is how to ease the participants with talking. According to further research, showing a short demo clip at the beginning of the test can be greatly beneficial with some added verbal communication (Nielsen 2014).

Nielsen (2014) suggests, "a great way to do so is by showing the test user a short video of somebody else thinking aloud. Demonstrating something by a concrete example gets the point across better than most abstract explanations." Before beginning the actual testing session, a one-minute TAPs demo video (http://goo.gl/t2WynQ) linked from Nielsen (2014) was provided for the participants to become familiarized with the unnatural thinking process and to activate the external thought process. Along with the clip, verbal explanations were given when required.

3.3.5.4. Translation Error Design

The pilot study raised the question of the severity of some translation errors, and showed some redundancy in design. The suggested adjustments should streamline the reading process and reduce the data to analyze, and most importantly raise the reading efficiency among participants.

3.3.5.4.1 Severity: The test shows somewhat predictable results, but the comparison was not as dynamic as I expected. The categories that the translation and localization industry deems most important, namely Mistranslation, Accuracy, and Consistency, were not detected at all under any of the four reading purposes. A few factors could have had an impact on the results. First, the severity of the errors was too low. As the content is somewhat technical with numerous new or foreign words, especially for those

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who are not familiar with the subject matter, the errors seemed to be overlooked by the participants. Second, the number of errors planted was too low. While language and style errors showed repeatedly, mistranslation, accuracy, and consistency errors showed only once. Third, as one participant explained, the entire content might be too long, complicating the methodology. Fourth, the survey questions seem too generic, and the participants seemed to have a hard time recalling and re-finding translation errors at the end.

Adjustment in the length of reading is expected to eliminate the third and fourth factors. For the first and second factors, the matrix could be adjusted in a way that the severity and frequency of those errors increase in Mistranslation, Accuracy, and Consistency.

3.3.5.4.2. Error Categories: The grouping of error categories also will enhance the validity of testing results. Mistranslation and accuracy, and consistency and terminology overlap by nature. The pilot study also showed the tendency that readers who did not detect mistranslation also did not detect accuracy issues. The same goes for consistency and terminology as well. As a result, the current seven categories can be reduced into five categories of Mistranslation, Consistency, Style, Country Standards and Language.

3.3.5.4.3 Number of Errors: Planting two errors as a set gave exactly the results expected. E1s that were planted as a part of task had much higher detection rate than E2s that were planted in a place that no task was involved. This is consistent with many previous findings on reading patterns, described in Chapter 2, and it is not directly related with the current testing, so the testing removed E2s in all categories. As a result, only one error for each of the five categories was planted and the testing result was expected to show if the readers caught the specific error or not.

3.4. Main Test Design

3.4.1. Aims of the test

The test is designed to examine how different reading purposes affect reading patterns. In order to examine reading patterns in a more accurate way, five different types of

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translation errors were planted at different points in the web page, which were expected to show up different reading patterns and reading tactics when readers meet the errors. The main research questions are as follows:

> How will different reading purposes affect reading patterns on web sites?
> How will reading patterns differ between the heavy reading group and the non-heavy reading group?
> How will different types of errors affect reading tactics?

In order to answer the questions above, two main hypotheses have been formulated. Under each main hypothesis, a few sub-hypotheses have been determined. The sub-hypotheses differentiated the participants into two groups: the heavy reading group and the non-heavy reading group.

H1. The heavy-reading group will detect more translation errors than the light-reading group.

H2. The number of translation errors detected will be highest in studying subject matter, then retrieving information, sharing information, and reading without a particular task, in descending order.

3.4.2. Methodological framework

Based on the literature review and the outcome of the pilot study, the test design has been finalized as follows. This chapter explains additions and changes in details. Components previously explained in 3.2 are not explained again.

3.4.2.1. Web page

The web site I used for the pilot testing, Apple's official iOS7 introduction page, was found valid in the pilot testing. The web site explains new features of iOS 7 from the users' perspective without describing too many technical aspects. The web site was created for marketing purposes and was translated contextually and creatively in the original Apple version. It has a unique style, with a light and casual tone, and contains many punctuation errors and maximum level of transliterations. Such a large number of

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transliterations give a very alienated, foreign atmosphere in translation, which contributes to its casual and "hip" style but also generates difficulties in understanding the content. A similar imbalance is also found in the degree of literal translation. When a sentence contains a technical concept, the translation is extremely literal, which creates discrepancies in the overall casual and contextual translation style. These existing translation errors, combined with the errors designed for the main testing, provided enough errors for each translation error category to test each reading pattern.

The reasons for choosing the web page are: i) it is not content-heavy, even though it talks about features of a new product, ii) each section is composed of approximately 100 words, which is the average maximum number of words that are read in one visit to a web site (Nielsen 2008, Weinreich 2008), and iii) the web site already contains numerous errors, which reflects real-world translation practice.

For the purpose of testing, the entire web site was cut shorter than the original. The testing web site had an introduction, four different features of iOS 7, one section about types of iOS 7, and the fine print. Each section has a word count between 80 and 160, with many non-textual elements such as graphics and pictures. The web site delivers 50% of its content in text and 50% in graphics. This combination is also optimal to investigate how people navigate and acquire information for the different reading purposes.

3.4.2.2. TAPs and screen recording

To rectify the lack of verbalization found in the pilot testing, the main testing made a few improvements. I verbally explained the methodology and importance of verbal activities to the participants, and they were reminded to watch the demo video included in the task sheet. The main test used more female participants than male participants, as the pilot study showed very low verbal activities among male participants. This difference is attributed to the combination of individual differences and culturally low tolerance of "talkative" male members of Korean society.

For the screen recording software, Blueberry's screen recording tool and QuickTime were used. A step-by-step instruction with screenshots on screen and a voice recording was given as a separate file for those who previously had not used the software. The screen recording with voice explanation provided sufficient data to analyze.

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3.4.2.3. Main test participants

A total of 20 people participated in the main test. Since I assumed that those who read heavily for their professional careers (i.e. writers, translators, and reviewers) might read differently than others, the group was composed of both heavy-reading professionals and light-reading professionals. Their ages were between 21 and 51, and 15 participants were female and five were male. They were all college graduates and had some knowledge and interest in smartphone OS systems. Eighteen out of the 20 participants were using Apple smartphones. Detailed participant information is shown in Table 3.17. Participants 1 to 10 were professional translators, editors, or students who were in intensive training. Participants 11 to 20 worked in relatively light reading professions such as realtors, soldiers, or developers.

Table 3.17. Participant profiles

Subject No	Gender	Age	Profession	Highest Education	Topic familiarity
1	F	22	Translation student	MA in progress	Above average
2	F	26	Project Manager	MA	Above average
3	F	32	Translation student	MA in progress	Above average
4	M	34	Diplomat (translation major)	MA	Above average
5	F	33	Editor/Project manager	MA	Familiar
6	F	25	Editor/Project manager	MA	Above average
7	F	39	Project Manager	MA	Familiar
8	F	43	Translator	MA	Expert
9	F	32	Translation student	MA in progress	Above average
10	F	30	Apple content reviewer	MA	Expert
11	F	44	Cashier	MA	Familiar
12	M	46	Chef	College	Familiar
13	M	32	Business Owner	College	Above average
14	M	33	Software developer	MA	Above average
15	F	51	Stay-at-home mom	College	Above average
16	F	41	Engineer	MA	Expert
17	M	44	Military official	PHD	Familiar
18	M	38	Diplomat	PHD	Expert
19	F	24	Pharmacy student	MA	Above average
20	F	21	College student	College	Above average

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3.4.2.4. Reading purpose and task

As described in the pilot study section, the subjects were asked to do tasks designed to examine how reading patterns change depending on the purpose of reading: i) studying subject matter, ii) retrieving specific information, iii) sharing information, and iv) reading without a specific task. Studying subject matter is defined as an activity that requires readers to learn new information by reading the web site, whereas finding specific information is defined as an activity that does not require an in-depth understanding of the content, but that asks readers to grab certain information quickly merely by looking at the content. For sharing information, participants were asked to look for information they would like to share through SNS media. It was expected they would quickly skim the contents and find specific parts that were interesting for them. Reading without a specific task is done by asking the test subjects to read the web site at the very beginning of the test without any specific task. The instruction merely says, "to familiarize the content." The issue with this is that the "familiarization" itself becomes a reading purpose or task, so there is no real "reading without task," as all readings are purposeful. However, that format served its purpose for the main testing. I expected there might be some overlap between reading without a specific task and reading for studying subject matter, insofar as the primary function of reading is to make sense out of what is written and to understand the meaning coherently.

Setting a reading purpose can be done by giving subjects specific tasks that trigger specific purposes. However, examining the reading patterns for different purposes may not yield clear results, as the reading process is internal and eye movements do not accurately show the reading pattern, as described in the previous chapter. To add clarity and quantitative analyses, critical translation errors based on LISA QA grid were designed and planted in the web site. This was to see if readers who were instructed to read the web site with certain purposes would be able to detect planted errors, or would find something unintended. By analyzing the translation error detection and other information, I mainly aimed to discover i) whether certain types of errors are more detectable than others, and ii) whether and how different reading purposes affect those detection rates.

For the specific questions and activities designed for the testing (Appendix 4), the readers were directed to read the entire site first before looking at the questions, in order to measure how they read when no specific task is involved. The specific wording for the activity is "Please read through the web site in a casual way from the beginning

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to the end just to familiarize yourself with the idea. Please verbalize whatever comes to your mind." As this was the first round of reading, without any specific task, readers talked about all kinds of findings, which shed light on what people actually pay attention to in casual reading.

After the first round of reading, three questions were asked in an attempt to examine different reading purposes. For studying subject matter, there was a question about the new features of Camera with iOS7: "What are the overall new features in Camera with iOS7? Please verbalize your answer." In order to answer the question, the readers were expected to read the relevant paragraph carefully and thoroughly, and understand the content. The expectation was that the question would trigger thorough reading with reference to the pictures, thus increasing the translation-error detection rate.

For retrieving specific information, a non-descriptive information search question was asked: "How does iOS7 help business and developers? Please verbalize your answer." Attempting to answer this question was expected to change the reading patterns among readers in a way that the readers would scan the text until they spotted the answers they wanted. After that, thorough reading might or might not begin.

For sharing information, the question asked was: "If we asked you to choose a certain part to post on the web on your SNS, i.e. Facebook or Twitter, which part would that be? Please explain verbally." This question does not fully incorporate the sharing aspect itself: it only addresses the aspect of finding the information that the readers intend to share, simulating the scenario that the readers would like to share some information on a new feature of iOS7 through their SNS but do not know what to share. I expected the question to serve the testing purpose without a problem. I assumed that readers would have to either scan the entire text one more time to find what they want to share or try to jump to the place they remember as being interesting. Once they found something to share, readers were expected to read thoroughly. Reading for sharing information was expected to include different types of reading patterns and have the most active involvement of the readers.

The final question was about linguistic quality, asking, "Did you find that the web site looks linguistically professional? If not, please explain." This was to investigate the overall impression of the style and language. These errors are rather subtle and dispersed throughout the entire web site, which means readers could become

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accustomed to the overall style while performing the tasks. The question was meant to remind the readers of first and overall impression of the web site.

3.4.2.5. Translation error tolerance

Mistranslation and consistency errors have been reconsidered, since the pilot study showed no detection rate. As the pilot test result raised the question of readers' threshold level for incoherence and inconsistency, the main test added a set of errors that were more critical in their severity and visibility. Mistranslation errors are designed to include wrong interpretations of the ST at the word or phrase level, which can be extended to misinterpreting the entire sentence meaning. In the main test I implemented two different levels (ML1, ML2) of mistranslation: ML1 is complete nonsense and ML2 is probable mistranslation that is still considered major but is not as obvious as ML1. To raise the detectability, ML1 is placed at the very beginning of the paragraph, as the common reading patterns (see Chapter 2) revealed that first lines are usually read carefully.

For ML1, "Camera in iOS 7 puts all your shooting formats" in ST is translated as "iOS 7 카메라는 사격을 위한 모든 포맷을 제공합니다". The back-translation of the planted sentence is "iOS 7 Camera offers all the formats you need for firing a firearm." In this context, "shooting" is translated as "firing a gun." The word "사격" that was chosen for "shooting" is used only in the context of shooting firearms. The word "put" is translated as "offer" to make sense out of "format" in the syntax. If the readers understand English and know the word "shooting," they are likely to guess that "shooting" was mistranslated, resulting in complete nonsense in the sentence.

For ML2, the same error that I used for the pilot study was used. The ST said "Artistic license is all yours" to describe the camera's artistic feature, but the Korean translation said,"카메라 기능으로 이제 사진 자격증을 따실 수도 있습니다," which means "Now you can acquire a photographer license using the camera feature." The error comes from misinterpreting the word "license" as a physical license document. This is probable, as Koreans use "license" as a transliterated form on many occasions in daily life. The translation nevertheless does not make sense, as acquiring a license has no relation to using iPhone iOS 7, but the word "license" still has a relation to cameras in general, which lowers the overall impact of the mistranslation error. This error is planted at the end of the paragraph, which gives a visibility disadvantage. As ML1 is

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highly visible and does not make any sense contextually, I expect many readers to detect the error. As for ML2, due to its relatively low impact and visibility disadvantage, and given the results of the pilot study, I expect a lower detection rate for it.

Consistency errors involve not choosing the same translation for a subject or context-sensitive words, as well as not following the existing terms in the glossary or terminology database. For the testing, the main keyword "iOS 7" is chosen for the consistency error. In order to add a tolerance component, I implemented various kinds of typo-looking inconsistency issues in various locations. The translation used "iOS 7" (correct name), "iOS7" (without a space), "OSi 7", "iSO 7", "SOi" (reversed letters or number omission). The locations of error are also in the title, beginning of sentence, last sentence, etc. Maximum visibility of the errors on the web site was made by implementing three different versions of translation for "iOS 7" in one small segment, right next to each other, where subjects have to read to complete the task. Making consistency error in an English word in a Korean translation should also raise the visibility, just because they look different.

3.4.3. Translation errors by reading task section

As the pilot study showed an area of overlap, instead of all seven LISA categories, the testing examined only five categories: mistranslation (previously mistranslation and accuracy), consistency (previously consistency and terminology), country standard, language, and style. To add the reader's tolerance level component for mistranslation and consistency which no participant was able to detect in the pilot study, some of the sections contain multiple vigorous errors with maximum visibility.

The entire web site has errors but only three parts were chosen for the testing. The selected sections are all about new features of iOS 7 with some information. The word count, level of language use, tone and style is fairly consistent for all these three sections. The following describes three sections in detail and shows the errors planted.

3.4.3.1. Camera

Camera section (Fig 3.32) is used to examine the reading for studying subject matter task. As it explains new features of Camera in iOS 7 and camera is one of the most popular apps people use, this section resembles the natural motivation for people to study the subject matter. The section has many pictures that show new formats and

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filters, which also is typical for introducing a new feature. The space allotted for Camera section is approximately 30% text and 70% pictures.

Fig 3.32. First section of Camera in iOS 7 (ST)
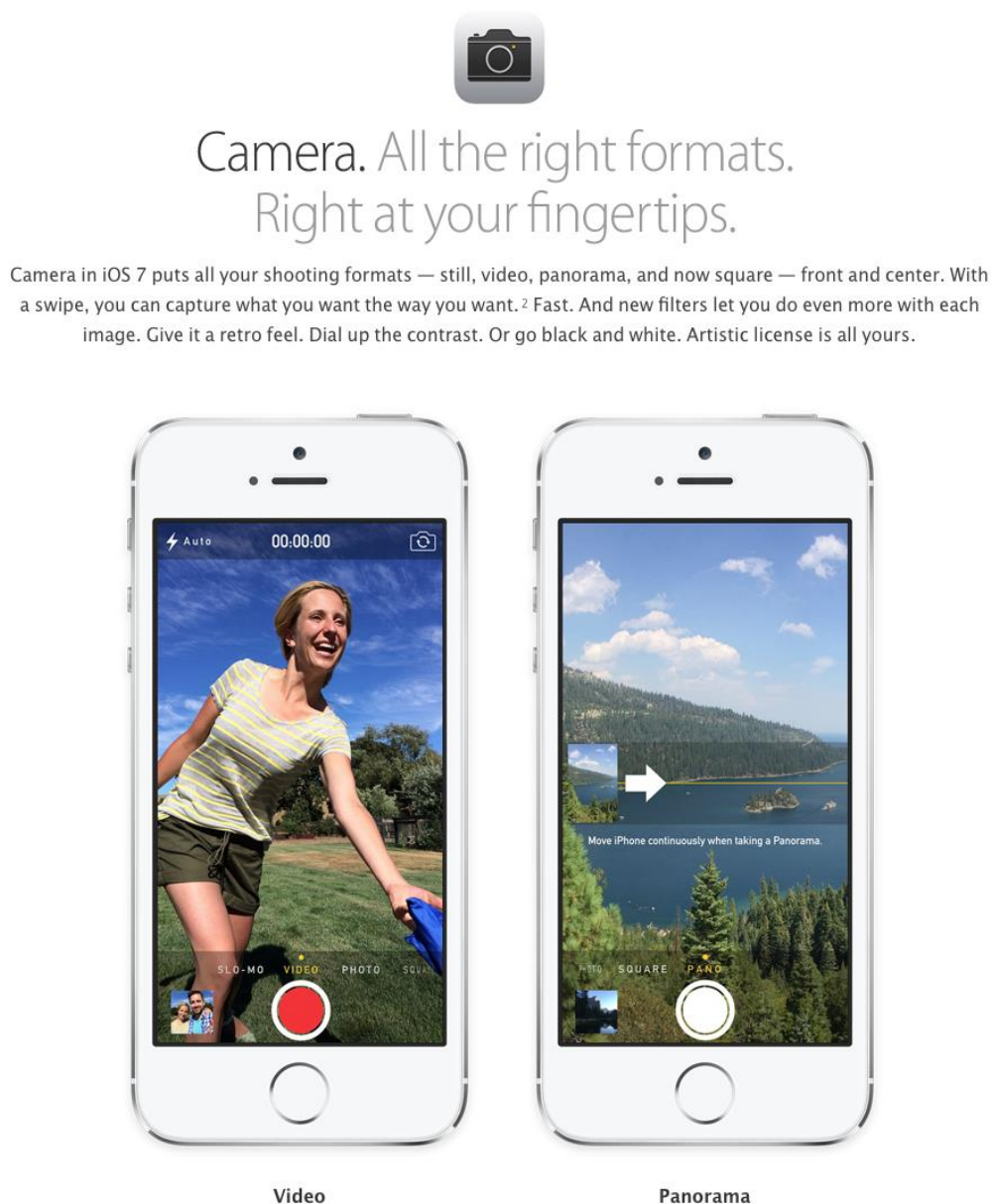
The translated section for Camera includes at least one translation error for each category. A mistranslation error has been planted in two different severity levels and locations. A complete look at the translated section can be found in Fig 3.33 and the details of the errors are listed in Table 3.18. As readers must carefully read this section to do the task, I assume that most errors will be detected except ML2, as it is located at the end of the sentence and the severity is lower. Consistency is another error that readers might overlook as the pilot study showed.

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Fig 3.33. First section of Camera in iOS 7 with errors (TT)

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Table 3.18. Error details in Camera

Translation error category	English ST	Korean TT	Intended or existing Error
Mistranslation ML1	Camera in iOS 7 puts all your shooting formats.	Planted: iOS 7 카메라는 사격을 위한 모든 포맷을 제공합니다.	The word "shooting" is translated as "firing a firearm" and "puts" is translated as "offers." The translation means "iOS 7 Camera offers all the formats for firing forearms"
Mistranslation ML2 (in Camera)	Artistic license is all yours.	Planted: 카메라 기능으로 이제 사진 자격증을 따실 수도 있습니다.	"Artistic license" is translated as a physical "photographer license." There is no license for taking a photograph. The translation means "Now you can acquire a photographer license with the Camera feature"
Consistency	iOS 7	Planted: OSi7	"iOS 7" has been translated as "OSi7" to make it inconsistent with others.
Country Standard	Contrast	No changes: 콘트라스트	"contrast" is transliterated when there is a Korean translation.
Language	Camera.	No changes: 카메라.	A single word "Camera" is used with a period for the title, which is ungrammatical in Korean.
Style	Front and center	No changes: 정방형	A picture format "front and center" is literally translated using a very formal and Chinese-based word, which is not intuitive. The word choice goes against of the overall style of using English-based words.

3.4.3.2. iOS 7 for Enterprise and Developer

This section (Fig 3.34) has two short sub-sections explaining how enterprises and developers can benefit from iOS 7. The section is vertically divided, each section with approximately 70 words. In ST, what iOS 7 can do for business and developers is written clearly in general.

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Fig 3.34. iOS 7 and business and developers (ST)

The Korean translation of this section also contains at least one error for each category. For mistranslation, I chose literal translations which use the ST grammatical units and formats in the TT. In Korean, translating "make" or "enable" the way English does triggers a very convoluted and complicated sentence structure. As Korean often omits subjects in full sentences, the confusion becomes a serious issue in understanding. Nevertheless, this type of translation is found very often as practicing translators feel "safer" when they follow the formats in the ST. The original Apple translation complied with the English sentence structure already, so the main testing used those as meaning errors for this section.

For consistency, iOS 7 is used as "iOS7", "OiS", "OiS 7" very close together in the beginning of paragraphs for maximum exposure. Style, language, and country standard errors are all similar kinds as explained in Camera. The complete Korean translation with errors is shown in Fig 3.35 and a detailed explanation of the errors is in Table 3.19. As readers are directed to find the key concept for the task and the content is not easily understandable, mistranslation errors are expected to be mentioned in a form such as "difficult to understand," "don't know the answer," or "have to read again." Due to maximum exposure, consistency errors are also expected to be detected. Country standard errors are also expected to be detected as there are too many. As this section contains too many errors, other errors might be overlooked.

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Fig 3.35. iOS 7 and business and developers (TT)

Table 3.19. Error details in iOS 7 and Business and Developer
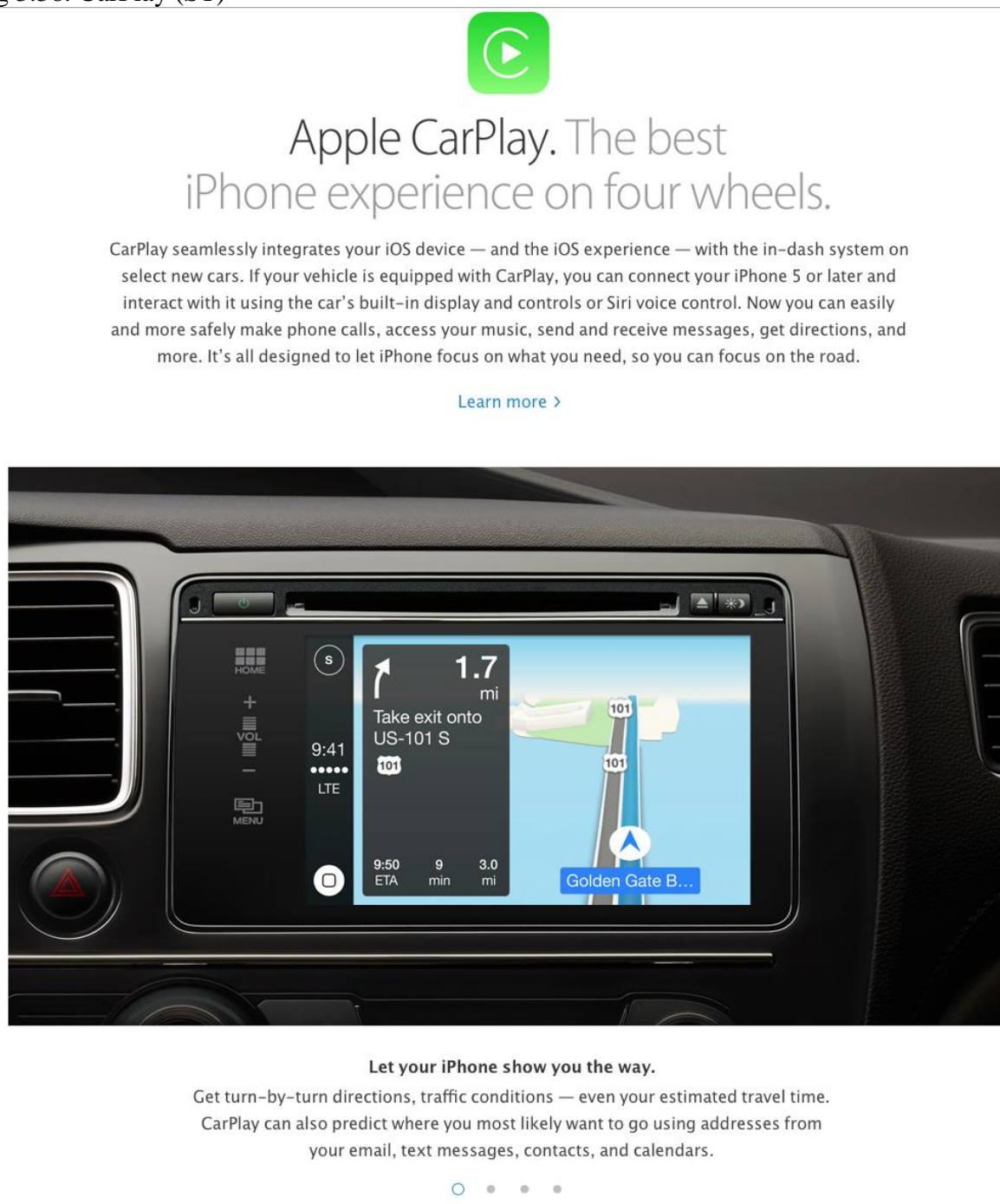
Translation error category	English ST	Korean TT	Intended or existing Error
Mistranslation ML1	iOS 7 includes many new features designed to make it easier for business to put iOS devices in the hands of employees.	No changes: iOS7 에는 회사 차원에서 직원들에게 iOS 기기를 배포하고 관리하는 것을 쉽게 해주는 다양한 신기능들이 있습니다.	"make it easier for" is translated based on English structure. In Korean, "차원에서 ...에게 ... 것을 쉽게 해주는" structure is very convoluted as it is unclear "who did what to whom."
Mistranslation ML2	With the IOS 7 SDK, developers can enable their apps to take advantage of all that iOS 7 offers.	No changes: OiS 7 SDK 로 개발자들은 앱이 iOS 7 의 모든 기능을 활용하도록 할 수 있습니다.	"enable their apps to" is translated based on English structure. In Korean, " …이 ...을 ...하도록 할 수" structure is very convoluted as it is unclear "who did what to whom"
Consistency	iOS 7 and Business. iOS and Developes.	From: iOS 7 To: iOS7, OiS, OiS 7	"iOS 7" has been translated in many different ways to make it inconsistent with others.
Country Standard	App licenses	No changes: 앱 라이선스	"app-licenses" is transliterated when there is a Korean translation. The transliteration sounds awkward to ordinary readers.
Language	iOS 7 and Business. iOS 7 and Developers.	No changes: iOS 7 과 비즈니스. iOS 7 과 개발자.	Incomplete sentences are used with a period for the title, which is ungrammatical.
Style	Single Sign-On, API, UI Dynamics, SDK, Airdrop	No changes: Single Sign-On, API, UI Dynamics, SDK, Airdrop	There are too many unlocalized words with no explanations. Those are specific terminologies, but too many English words without explanation can cause style issues.

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3.4.3.3. CarPlay

The CarPlay section was chosen to examine the reading for sharing information, as it was one of the main features with iOS 7 that anyone who drives cars might feel interested enough to want to share some information with someone they know (Fig 3.36.) The section begins with approximately 80 words, followed by a large graphic in English and a small graphic in Korean. There are approximately 40 words after the graphic.

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Fig 3.36. CarPlay (ST)

The Korean translation contains at least one error for each category. A meaning error is planted in a way that the dashes in the English structure is mistranslated, in-dash system is not transliterated, and "select new cars" is translated as "select new models of devices." The sentence does not mention anything about cars, which should make it difficult to understand what an "in-dash system" is and how the system is related to cars. The first sentence "CarPlay seamlessly integrates your iOS devices – and the OS

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experience -- with in-dash system on select new cars" has been translated as "iOS 기기만이 제공하는 iOS 의 우수한 환경이 이제 CarPlay 를 통해 새롭게 출시되는 일부 기기 모델의 인대시 시스템과 완벽하게 통합됩니다," meaning "the superior iOS environment that only iOS devices provide integrates perfectly through CarPlay with in-dash system of select models of new devices."

This section also contains many transliterations. The phrase "in-dash system" is transliterated as "인대시 시스템," which does not make any sense to Korean readers as the preposition "in" is transliterated and the hyphen has disappeared, including its function. As a result, the transliteration of "in-dash" does not convey any meaning to those who do not understand the function and meaning of the preposition in the English structure. The error is found on the first line under the title to enhance its visibility. Exactly the same kind of error is also found with "turn-by-turn."

The style error concerns an inappropriate word choice whose influence extends to the overall impression of the web site. As English requires a subject and at least one object or complement to make a complete sentence, Korean often omits subjects when it is a general group of people like we, you, the public, etc. On the English web site, "you" is a common word choice to refer to the readers, as it is more direct and interactive. The Korean web site has translated "you" as-is, without considering syntactic differences in language structure. In addition, the connotation of the word "you" can be controversial as it can deliver a too-dramatic tone (a more detailed explanation of this problem can be found in section 3.1). Other errors are self-explanatory and consistent with previous sections. The final translation is shown in Fig 3.37., and the detailed errors are listed in Table 3.20. I expect mistranslation and country standard errors to be detected as they hinder the understanding of the key concept of the feature. However, I do not expect other errors to be detected as reading for sharing information does not require in-depth reading of the entire passage.

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Fig 3.37. CarPlay (TT)

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Table 3.20. Error details in CarsPlay

Translation error category	English ST	Korean TT	Intended or existing errors
Mistranslation ML1	CarPlay seamlessly integrates your iOS device — and the iOS experience — with the in-dash system on select new cars.	Planted: iOS 기기만이 제공하는 iOS 의 우수한 환경이 이제 CarPlay 를 통해 새롭게 출시되는 일부 기기 모델의 인대시 시스템과 완벽하게 통합됩니다.	The dashes in the English structure are mistranslated and "select new cars" is translated as "select new models of devices."
Consistency	iOS 7	Planted: OSi	"iOS 7" has been translated as "OSi."
Country Standard	In-dash system turn-by-turn	No changes: 인대시 시스템, 턴바이턴	"in-dash system" and "turn-by-turn" are written phonetically in Korean without English or explanations.
Language	Carplay.	No changes: Apple Carplay.	Incomplete sentences are used with a period for the title, which is ungrammatical.
Style	You	당신	Translation is very dramatic and marketing-oriented. This word rarely appears in typical Korean web sites of this type.

3.4.3.4. Other sections

Besides all the specific errors described above, similar types of errors are also planted in other areas of the web site where a specific task is not involved. This is to add more errors for the entire web site so that the testing can investigate the reading pattern without a task more accurately. As no tasks are involved, I do not expect readers to detect any of the errors.

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4. Main Test Results

The main test was conducted based on the logistics described in 3.3 and it yielded meaningful results in terms of reading patterns for different reading purposes. Section 4.1 summarizes the expectations of the main test, and Section 4.2 describes the subject details in age, gender, education level, profession and so on. As my experiment had only 20 participants and used multiple variables of reading purposes and translation errors, the results will first be presented in a qualitative way. Sections 4.3 and 4.4 will describe each participant's actions and their statements revealed by the screen recording and TAPs. Particular emphasis is placed on the participants' reading direction, content coverage, cognitive process with pauses, and dependence on textual and non-textual elements. Then I present quantitative comparisons of translation errors detected by the heavy-reading group and the light-reading group.

4.1. Expectations

The test is designed to examine how different reading purposes affect reading patterns. In order to examine reading patterns in a more accurate way, five different types of translation errors were planted at different points in the web page, which I expected would show different reading patterns and reading tactics when readers meet the errors. The main research is expected to provide answers to the following questions.

> How do different reading purposes affect reading patterns on web pages?
> How do reading patterns differ between the heavy-reading group and the light-reading group?
> How do different types of errors affect reading tactics?

As the hypotheses in 3.3.1 describe, the heavy-reading group is expected to read more thoroughly and critically than the light-reading group. That is, the translation error detection rates are expected to be higher in the heavy-reading group than in the light-

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reading group. The test is also expected to show the reading sequence and dependence on textual and non-textual elements.

4.2. Subject Profiles

The subjects for the main test were divided into two groups: the heavy-reading group and the light-reading group. The heavy-reading group included ten participants who have been working in the translation, editing, and reviewing industry full time or freelance-based for more than three years. The light-reading group included ten participants whose professions involve light reading, such as chef, military officer, businessman, or engineer. According to my previous research (Choi 2008), gender and age do not affect Internet literacy significantly. Given that education level, accessibility, and profession had been found to be the main determinants on web site literacy, the main test set the minimum education level to college, and internet accessibility to high. The only difference was profession. The detailed participant profiles are listed in Table 4.1 and Table 4.2.

Table 4.1. Final participant profiles for the heavy-reading group

No	Gender	Education level	Topic familiarity	Age	Profession	Length in the profession (yrs)
1	F	MA	Familiar	34	Editor	7
2	F	MA	Familiar	27	Editor	4
3	M	BA	Very Familiar	35	Editor	7
4	M	MA	Familiar	33	Translator	9
5	F	MA	Familiar	36	Reviewer	6
6	F	MA	Familiar	27	Reviewer	4
7	F	MA	Familiar	37	Proofreader	7
8	F	MA	Very Familiar	30	Reviewer	4
9	M	MA	Familiar	35	Translator	9
10	F	PHD	Familiar	41	Translator	11

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Table 4.2. Final participant profiles for the light-reading group

No	Gender	Education level	Topic familiarity	Age	Profession	Length in the profession (yrs)
11	M	PHD	Familiar	45	Military Official	23
12	F	MA	Familiar	35	Financial Advisor	5
13	M	BA	Very Familiar	33	Businessman	3
14	M	PHD	Very Familiar	37	Engineer	9
15	F	MA	Familiar	26	Chef	4
16	M	BS	Familiar	30	Pharmacy student	2
17	F	BA	Familiar	26	Translation Student	1
18	F	MA	Familiar	39	Project Manager	5
19	F	BA	Familiar	30	Legal Assistant	2
20	M	BA	Familiar	44	Restaurant Owner	12

4.3. Observations of the participants in the heavy-reading group

Each participant was observed through TAPs and screen recordings. Each participant's comments are analyzed here for all reading purposes. The first round of reading, which was designed to gauge reading without a specific purpose, served as a good tool for investigating general reading patterns. All the participants' meaningful comments and actions that show a general reading pattern, or reading without a specific purpose, are given here (all comments made in Korean have been translated into English by myself).

4.3.1. P01 analysis

P01 is a 34-year-old female. She has been working as an editor for 7 years, mainly on marketing and financial materials for a major wholesale company. She holds an MA in Translation and Interpretation. P01 began the task by looking at (not reading) the text, scrolling up and down once, and clicked the buttons on the very top of the page. When the buttons did not direct her to the pages she expected, she looked at the URL window and figured out that the web page is not an official Apple web site. She criticized the overall layout, font, design, and length of the web page before her actual reading. Once reading began, she stayed on the text until she finished reading the last word, catching numerous errors. After that, she looked at the graphics. When an entire reading passage

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made sense, she moved on to the next reading block. Similar reading actions took place for the rest of the texts. She took her time reading, and there was no moment of haste. Reading was at a consistent pace, thoroughly and critically, until the very end of the text. P01 showed a high concentration span, as she was never distracted or made any personal comments. She showed the same reading pattern for studying subject matter, and also a similar pattern for retrieving information, except that P01 ended reading as soon as she figured out the answers. For sharing information, P01 just read or looked at the relevant information, with heavy dependence on graphics. P01's selected comments are as follows:

— Let me begin with the buttons at the top. So this is Apple's web page talking about iOS 8, oh 7. 7? It is not the most updated page…

— Anyway… (click all the buttons on top). These Buttons are not leading to the correct pages. Why? (look at the url) Oh, this is not the official Apple web site-it does not start with "apple.co.kr".

— There are too many words to read in one page. (scrolls up and down a few times) Well… it is not really technical any way.

— The font is so old-fashioned. What is this font? I have not even seen this kind of font before.

— Word-wrapping is incorrect in so many places.

— "Shooting?" I don't think this is right. The translation - it is translated, correct?-seems incorrect. (reads the content) What is "front and center?" I've never heard of the term before.

— The style of the text is too casual, sounding too rudimentary with short sentences and simple structure.

— "당신 (You)?" That sounds funny.

— There is a footnote with this sentence. Where is it in the page?

— The graphics are not completely localized. I am not sure if this is intentional, but it looks strange that only the contents have been fully localized.

— Whatever they left in English grabs more attention. Siri is hard to miss.

— "In-dash system?" What is that? Let me google it (search the word, click one of the results and recite the page). Ok so in-dash system means you embed the……

— The verbs are so repetitive that it is kind of boring to read to the end.

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— I have no idea what this section is about. I can visually see that iOS 7 has optimized functions for Business and Developers, but I just don't understand what is written. However, it might be just because I am not knowledgeable on this subject.

— There is a typo, maybe two.

— About the Carplay, I cannot really see the difference between CarPlay and navigation system. Nothing really grabs my attention enough.

P01's actions and comments showed exactly what I was expecting from the heavy-reading group. As soon as the task began, P01 become an error finder, looking for problems both in textual and contextual elements of the web page, without being distracted. Most of the comments she made were negative rather than positive, and her thorough and linear reading suggested that all the hypotheses were correct.

4.3.2. P02 analysis

P02 is a 27-year-old female. She has been working as an editor for four years for a translation company on various subjects and in various different roles. She holds an MA in Translation. P02 read very thoroughly from the beginning to the end of the web page. As soon as the task began, P02 started reading the text from the title, concentrating on understanding the text. She did not look at the menus or buttons at the top or bottom. The only instance where P02 consulted the graphics was when she was unable to comprehend the meaning with the textual element only. While reading, she enunciated all the keywords loudly and clearly. When P02 encountered an error, she paused for a considerable amount of time to use various strategies to help her comprehension process, such as re-reading, consulting non-textual information, and/or connecting her background knowledge. P02 never skipped a single word without understanding, even though she never used a search engine. P02 was critical of the errors, but also indicated positive aspects of the translation. P02 showed very similar reading patterns for reading for studying subject matter and for retrieving information. However, P02 looked at some key words and graphics, and used her own personal background knowledge, instead of reading thoroughly for sharing purpose. P02's selected comments are as follows:

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— The title is "iOS 7." The web page should be about the overview of iOS 7. Let's get started.

— "Shooting?" That sounds a little strange.

— "Front and center"… Looks like it is a kind of filter, but I am not sure what it means. (long pause) Maybe there is a picture. Oh here! (short pause) Oh this! I never knew this was called "front and center." The name is not intuitive enough for me.

— What is "air drop?" No translation?

— Um…. I have no idea what this means. (long pause) No matter how many times I read this, I won't get this. So I will pass.

— Overall, this translation sounds sophisticated, but some expressions like "OS 가 몰라보게 발전했어도 말이죠 (colloquial expression of "even with great improvement of OS")" sound a little awkward.

— "iOS 7" has been written differently here.

P02's actions and comments showed what I was expecting from the heavy-reading group. Her focus was on understanding the text rather than on finding errors, but she found many errors, especially in the area where the errors can trouble understanding. P02 had high concentration even when she was frustrated by the nonsense of the text. She used the information within the text and made many pauses to solve the problems. Most of the comments she made were neutral. P02's thorough linear reading and types of error detection suggested that the hypotheses were correct. However, her use of long pauses for comprehension was not commonly witnessed in the heavy-reading group.

4.3.3. P03 analysis

P03 is a 35-year-old male. He has been a freelance translator and editor for different companies for five years. He holds BA in English Literature. The texts P03 usually translates or edits are mostly in a paper format, and he does not have any localization experience. P03 was very goal-oriented during the reading process. He overlooked the main title at the top and did not look at the entire page. He read from top to bottom quickly, mentioning a few key concepts. P03 summarized what he read in short run-on

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sentences and hardly mentioned the pictures or graphics. P03 did not pay attention to the fonts, word wrapping, layout, or anything non-textual. He read halfway through the text and stopped reading for the task that involved studying subject matter, grabbed some key concepts for the information-retrieval task, and did not read the text at all for the information- sharing task. P03's answers came from what he already knew. P03's selected comments are as follows (P03 did not talk very much during the task other than key words and summaries):

— I will begin the task now. The first paragraph is about the introduction of iOS7, how it is different. (reads quietly)

— The second paragraph is about Alarm Center. (reads quietly) "짠하고 나타납니다 (Ta-da!)" sounds too colloquial.

— Camera, (pause) format, (pause) new filter…

— Shooting…. Shooting? Must be a mistake.

— In-dash system? It is hard to understand what it is.

— Siri (pause) responds faster now, helps do everyday works.

— I read it all, so let's go back to the questions.

— It is hard to understand the part about iOS 7 and Business and Developers. It has many words, but not a concrete explanation.

P03's actions and comments were not what I was expecting from the heavy-reading group. P03 read linearly from the top to bottom but not very thoroughly. P03 only caught mistranslation and country standard errors, which is lowest among the heavy-reading group. His extremely low dependence on non-textual elements and low error detection rates were counter to my expectations.

4.3.4. P04 analysis

P04 is a 33-year-old male. He has a mixed background as a translator and public worker. His work involves extensive writing and reviewing public documents in paper format. P04 holds a BA in Public Administration, and an MA in Translation and Interpretation. P04 read the text from the main title and scrolled up and down once to look at the overall structure and length of the web page. He focused on the textual elements much

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more than on the non-textual elements to understand what was written. After reading one paragraph, he summarized the content, as he understood it. P04 had a high level of concentration, reading at a consistent pace to the end. P04 paused a few times mainly to formulate his thoughts, but each pause was 2-3 seconds long. P04 kept a neutral tone over the overall quality of the web page. P04's selected comments are as follows:

— The title is "iOS 7," so this must be about introducing iOS 7. Let's see. The first part talks about how it is different (reads quietly)

— Notification Center sends you notifications when…

— Okay, so Camera's new features are …

— "Shooting?" Maybe it means camera shooting, not firearm shooting in English.

— Siri's new feature is that it can respond faster, and follows many commands accurately.

— I don't understand iOS 7 and Business and Developer section. Let me read it again. I think iOS 7 does provide different features exclusively for enterprises and developers by providing all these things like device management, single sign-on. But, it is just my guess.

— Typo in iOS 7. Oh typos!

— "In-dash system" sounds too English, which is difficult to understand. (reads more) "turn by turn" as well. There are too many transliterations and strange word choices. I don't know if they had to be so foreign.

— I like how the text is written with a spoken language. It is fun and witty. I feel close to the text.

P04's actions and comments were what was expected from the heavy-reading group. He showed linear and thorough reading patterns. P04's reading focus was on comprehension, so the errors that hindered his understanding were caught easily: mistranslation, country standard, and consistency. Such actions suggest that the hypotheses were correct. P04 showed almost no dependence on non-textual information.

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4.3.5. P05 analysis

P05 is a 36-year-old female. She has been a reviewer for a major publishing company for six years after earning her MA in Translation. She was extremely thorough in covering non-textual elements on the web site by clicking every single button, image, and link, and searched online multiple times when encountering transliterations. For textual information, P05 read the content line by line and summarized what she understood. P05 used information from outside the text instead of re-reading or connecting her background information to comprehend the web page. She detected most of translation errors, but mentioned the error type and moved on quickly without negative comments. Her reading involved multiple processes at the same time, but P05 did not pause in any part of the reading. P05 read very thoroughly to study subject matter, to retrieve information, and even to share information. P05's selected comments are as follows:

— I will begin the test now. At the top of the page, there are grey buttons. I will begin reading by clicking all the buttons. Oh! they are not buttons. What a strage graphic!

— The fonts are ugly. Very ugly.

— These buttons lead me to somewhere else. What about the other buttons? (click all the buttons) I don't know what is going on here, but none of the buttons work. Maybe I am not supposed to read other pages?

— The graphic is cut at the end. Or is it by design? Still, it looks very strange.

— Camera's new features are filters with new contrast. The pictures show the difference clearly!

— "Ois?" Typo is here. Again. Oh my goodness, there are so many typos here!

— What are "Single Sign-On, device management, API, UI Dynamics"? Too many transliterations!!! Well, I will need to look them up. (search some of the terms on Google)

— "In-dash system?" Let me Google it really quick.

— I would like to learn more. (Clicked the link and read the related page for approximately 3 minutes)

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— Overall, this translation has too many colloquial expressions. Examples are "몰라보게 발전했어도 말이죠 (using a colloquial ending word)" or "짠하고 나타납니다 (Ta-da!)".

P05 showed mixed results. Her linear and thorough reading was what I expected from the heavy-reading group. However, the fact that P05 did not catch mistranslation and language contradicted my expectation. The relations between reading thoroughness and types of error detected will be discussed in Chapter 5.

4.3.6. P06 analysis

P06 is a 27-year-old female. She has been working as a reviewer for a translation and printing company for four years. P06 began reading from the title, without examining the web page, and continued reading from top to bottom thoroughly, including all the fine print. She made sure she understood what was written by summarizing as she read. P06 also investigated the non-textual elements thoroughly. She frequently made short pauses to connect the information to her background information. She made a lot of personal comments, and read the web page from a consumer's point of view. She made a lot of exclamations without verbalizing what she was thinking. She showed similar reading patterns when reading for subject matter and retrieving information, but read less intensively for sharing information. Her answers for sharing information also involved many personal opinions rather than what was written on the web page. P06's selected comments are as follows:

— This is about "iOS 7." I am using iOS 7, so this should be interesting. But the latest version is iOS 8.4, so this web page much be old. Oh I want a new phone.
— "Even with all the improvement"… strange style
— "Camera license?" That sounds wrong.
— Panorama, filters, (looks at all the pictures). I like this filter. It makes all the pictures pretty! Oh this is nice too. I have never used it before though. I did not even know I had one. I will check after this task.

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— "Front and center?" Not sure what that is. (continues to read) Hmmm…I still son't know what it is.

— (looking at graphics) "Sung-ouk?" My classmate? Really? (3 second pause) No way. It couldn't be him. (try to examine the picture). Oh it is not him!

— Siri, my favorite toy! Siri is fun to play with.

— How is the Carplay different from Bluetooth? Oh… navigation… and Siri support. That sounds convenient.

— iOS 7 and Business… (Reading aloud)…(making confused sound). I will read again.

— OiS? Typo?

— iOS 7 and Developer…(Reading quietly) I don't know much about this, so it is hard to understand.

— "In-dash…. License… DSK…" well… (sounds confused)

— Well, overall, the writing was fun and had a good style. I wish I saw more style consistency though.

— Oh iPad, iPad, iPad! I want the new iPad…. Where is it? (reads the end section) Oh this information is a little outdated.

P06's actions and comments were what I expected from the heavy-reading group. She read both the textual information and the non-textual information thoroughly, catching systematic errors including mistranslation, country standard, and consistency. However, P06's frequent disruptions of thought to connect the information to her personal background while reading was a unique process within the heavy-reading group. This will be discussed in Chapter 5.

4.3.7. P07 analysis

P07 is a 37-year-old female. She has been working as a senior proofreader for a localization company for seven years. P07 holds an MA in translation. Upon beginning the task, P07 scrolled up and down a few times and talked about her general impression of the length, style, layout, and flow of the translation. After she gave her impression of the textual elements, P07 began reading from the very top to the bottom thoroughly. She read the web page at a consistent speed without pauses. P07's comments are exclusively

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on the textual elements of the web page, the non-textual elements being completely overlooked. P07's selected comments are as follows:

— It is too long, making it difficult to read.

— Line breaks are incorrect all over the place, which makes it very difficult to read.

— What's up with all these periods?

— "Swipe?" What is "swipe?"

— "Front and center?" I have no idea what that is.

— The tone of the translation is too old-fashioned.

— "Photo license?" What license? You do not need a license to take a photo.

— "In-dash?" How am I supposed to understand this terminology?

— "OSi?" Typos.

— "Turn-by-turn?" There are way too many transliterations.

P07's comments and actions showed exactly what I was expecting from the heavy-reading group. Her reading was thorough, linear, and critical. As soon as the task began, she became an error-finder just like P01, showing a very critical attitude toward the translation. P07 caught all the intended errors, and more.

4.3.8. P08 analysis

P08 is a 30-year-old female. She has been working as a translator and reviewer for a major IT company for four years. P08 holds an MA in Translation and Conference Interpretation. She began reading the web page from the textual elements, but did not verbally indicate her level of understanding. She read thoroughly and in detail, catching all the punctuation and consistency errors. She made comments on the tone and style of the translation. P08's dependence on non-textual elements was very low. She did not pause for more than a few seconds in any of the reading durations. P08's selected comments are as follows:

— The periods are not correctly used. There should be no periods at the end of run-on sentences.

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— The commas here are not necessary.

— Expressions such as […] do not sound right.

— "Shooting?" (kept reading and came back to the error) Oh! Shooting with a camera, probably. This translation is incorrect.

— "Contrast?" Does this have to be transliterated?

— Words such as […] do not sound intuitive.

— […] is too literal. It reads strangely.

— "In-dash system, turn-by-turn, […]" are all so foreign.

— "OSi?" iOS and no space before 7? Typos are everywhere. Has this been reviewed?

P08's actions and comments were what I was expecting for the heavy-reading group. Her thorough reading and detail-oriented approach, as well as her high error-detection rate, suggest that the hypotheses are correct. The only difference compared with similar participants such as P01 and P07 was that she did not verbalize her understanding or enunciate keywords. She showed more of detail-oriented attitude than a critical attitude.

4.3.9. P09 analysis

P09 is a 35-year-old male. He has been working as a national security specialist, writer, translator, and reviewer for a public institution for nine years. He has a BS in Computer Engineering and an MA in Translation. P09 read the web site thoroughly and critically. He used both textual and non-textual information to gather information on the text. He began reading from the title and went down to the bottom, except the fine print. He clicked all the links and conducted many web searches when the written text included the transliterated terms. P09 concentrated on understanding the text with all the information presented and beyond. He spent a little more time reading when he encountered issues, but the overall speed was at a consistent level. His concentration span was long, showing no distractions. He read thoroughly and critically for studying subject matter and for retrieving information. But the sharing-information task triggered non-linear reading within the reading block. P09's select comments are as follows:

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— "Shooting" sounds funny. (short pause). Oh, shooting the film! This is a mistranslation.

— "Front and center?" Why suddenly use such an awkward expression?

— Phone license? Well.... this is not true.

— "OiS, SOi, iOS," lots of typos.

— This button does not lead me where it is supposed to.

— What is "in-dash system?" (does online search) OK, so in-dash system means [...]

— There are too may transliterations, which hinders the overall flow.

— Expressions like "말이죠, 해요 (colloquial honorific additions on general verbs)" are so awkward.

— The overall style is light and positive.

— I wonder if you planted all these errors for the testing purposes. I am pretty sure you did!

P09's actions and comments showed exactly what I expected from the heavy-reading group. His reading was thorough and critical. The focus of his reading was to understand the content. He caught all the planted errors and even indicated that the purpose of the reading was to catch the errors.

4.3.10. P10 analysis

P10 is a 43-year-old female. She has been working as a translator and reviewer for multiple IT companies for 16 years. She received an MA and a PhD in Translation and Applied Linguistics. Before her actual reading, P10 scanned the title and scrolled the web page down slowly, checking the overall subject and layout of the information. After that, she began reading the web site from top to bottom thoroughly, but also quickly. Her thoroughness is indicated by the way she pointed out every single grammar mistake while summarizing the content. P10 gave a balanced view of the quality of the web site. She also investigated non-textual elements in detail and commented on the look and content. Her comments included not only the errors, but also the remedies. When incoherence was found, P10 tried to use textual information to understand the text, rather than referring to graphics or trying online searches. She showed the same reading pattern for studying subject matter, but read only the first sentence for retrieving

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information. For sharing information, P10 just found a keyword in the text, and built her sentence around it. P10's selected comments as follows:

— This is a little too long… texts are on the left and graphs are on the right.

— "iOS 7" is the title? Nothing else? Interesting. It would have been nicer to have more specific information.

— (looking at graphic) Where is the rest of the iPad? Oh it is by design?

— Word-wrapping is incorrect in so many places.

— "Shooting?" Ah… it must mean "film shooting"?

— Why all of a sudden a Chinese-based word like "front and center"? The translation should use more Korean-based word such as […]

— All these periods are making it really difficult to read. What's up with all these periods? They are there on purpose?

— Siri does not work in Korean very well… so I will just take a quick look.

— iOS 7 and Business…uh… what is it trying to say? I will read it again from the beginning. (reads quietly). Oh. I see. Why did they make the sentence so complicated? So this means […]

— "iOS7?" No space? "SOi?" There are too many typos.

— "In-dash system?... turn-by-turn?" Way too many transliterations.

— […] is a brilliant translation! It is witty, fun and dramatic!

— This graphic is not fully localized… and boring.

— Fine print… I will skip that, as no one reads it.

P10's actions and comments were exactly what I expected from the heavy-reading group. She was thorough and critical, catching all the errors in both textual and non-textual elements, which suggests the hypotheses were correct. One difference was that P10 did not read things that she considered unimportant, and focused more on key concepts and key words, which was found more often in the light-reading group.

4.3.11. Summary of participants' response in the heavy-reading group

Based on the participants' actions and statements, the general reading patterns are categorized in terms of four variables: Content coverage, Long pause, Reading direction (linearity), Dependence on text, and Dependence on non-text. Reading time is not

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measured as a variable, as the entire recordings showed frequent interruptions in reading while the participants wanted to verbalize their findings. Some participants were able to read and talk at the same time, and some were not. Adding such segmented reading time was not a good indicator of anything, as that involves the cognitive process in shifting between reading and talking. Therefore, reading time was not meaningful enough to this test. The results are shown in in Table 4.3.

Table 4.3. Summary of general reading patterns of the heavy-reading group

No	Content coverage	Long pauses (more than 5 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
01	Thorough	No	Top to Bottom Text to graphics	High	High
02	Thorough	Yes	Top to Bottom Text to graphics	High	High
03	Selectively Thorough	No	Top to Bottom Text to graphics	High	Low
04	Thorough	No	Top to Bottom Text to graphics	High	Low
05	Thorough	No	Top to Bottom Text to graphics	High	Low
06	Thorough	Yes	Top to Bottom Text to graphics	High	High
07	Thorough	No	Top to Bottom Text Only	High	None
08	Thorough	No	Top to Bottom Text to graphics	High	Low
09	Thorough	No	Top to Bottom Text to graphics	High	High
10	Selectively Thorough	No	Top to Bottom Text to graphics	High	Low

As Table 4.3 shows, all participants in the heavy-reading group read the web page thoroughly, with short or no pauses. Only two out of ten participants used long pauses. This group consistently showed a linear reading pattern, from top to bottom and left to right. Their dependence on textual elements was consistently high, and dependence on non-textual elements was relatively low, as only four out of ten participants showed

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high dependence on non-textual elements. Reading patterns for other purposes also are summarized in the following tables (Table 4.4 to Table 4.6).

Table 4.4. Summary of reading patterns of the heavy-reading group for studying subject matters

No	Content coverage	Long pauses (more than 5 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
01	Thorough	No	Top to Bottom Text to graphics	High	High
02	Thorough	Yes	Top to Bottom Text to graphics	High	High
03	Selectively Thorough	No	Top to Bottom Text to graphics	High	Low
04	Thorough	No	Top to Bottom Text to graphics	High	Low
05	Thorough	No	Top to Bottom Text to graphics	High	High
06	Thorough	Yes	Top to Bottom Text to graphics	High	High
07	Thorough	No	Top to Bottom Text Only	High	None
08	Thorough	No	Top to Bottom Text to graphics	High	Low
09	Thorough	No	Top to Bottom Text to graphics	High	High
10	Selectively Thorough	No	Top to Bottom Text to graphics	High	High

The reading pattern for studying subject matter shows a pattern very similar to that of general reading, except the increased dependency on non-text for some participants.

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Table 4.5. Summary of reading patterns of the heavy-reading group for retrieving information

No	Content coverage	Long pauses (more than 5 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
01	Thorough	No	Top to Bottom Text to graphics	High	None
02	Thorough	Yes	Top to Bottom Text to graphics	High	None
03	Selectively Thorough	No	Top to Bottom Text to graphics	High	None
04	Thorough	No	Top to Bottom Text to graphics	High	None
05	Thorough	No	Top to Bottom Text to graphics	High	None
06	Thorough	Yes	Top to Bottom Text to graphics	High	None
07	Thorough	No	Top to Bottom Text Only	High	None
08	Thorough	No	Top to Bottom Text to graphics	High	None
09	Thorough	No	Top to Bottom Text to graphics	High	None
10	Selectively Thorough	No	Top to Bottom Text to graphics	High	High

Reading for retrieving information also looks similar, except that it shows no dependency on non-textual elements, as the graphics in this specific section were not meaningful to the readers.

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Table 4.6. Summary of reading patterns of the heavy-reading group for sharing information

No	Content coverage	Long pauses (more than 5 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
01	Thorough	No	Top to Bottom Text to graphics	High	High
02	Not Thorough	No	Sporadic	Low	High
03	Selectively Thorough	No	Sporadic	High	Low
04	Not Thorough	No	Sporadic	Low	Low
05	Not Thorough	No	Sporadic	Low	High
06	Not Thorough	No	Sporadic	Low	High
07	Not Thorough	No	Sporadic	Low	None
08	Not Thorough	No	Sporadic	Low	Low
09	Not Thorough	No	Sporadic	Low	High
10	Selectively Thorough	No	Top to Bottom Text to graphics	High	High

Reading for sharing information triggered less-thorough reading and less dependence on textual information for the heavy-reading group, which was in line with the light-reading group.

4.4. Observations of the participants in the light-reading group

This section describes the actions and comments of the ten participants in the light-reading group, and summarizes the findings. Overall, the light-reading group produced much fewer verbal activities, mainly due to much less reading coverage and more non-critical attitudes.

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4.4.1. P11 analysis

P11 is a 45-year-old male. He has been working as a military officer for over 20 years. He has an MA and a PhD in National Security. He read the web site very quickly from the top to the first section of the web page and then stopped reading. His reading became very random and sporadic. He read the title and picked up a few keywords and glanced at the associated graphics in a few places. P11 did not show any indication that he actually understood what was written. He showed no interest in the layout or look of the web page. His verbal activities were also very limited. P11 read the web page and answered the questions extremely briefly for all the reading tasks. The same pattern persisted for all the different reading purposes. P11's selected comments are as follows:

— This is about iOS 7. Let me begin the task.
— Camera, filter, effect…
— "Shooting?" This does not sound right here.
— What are the new features of Camera? Filters.
— iOS 7 and Business? (reading the first sentence of the web page)
— Overall style seems to be okay. I see no problem linguistically.

P11's actions and comments were what I expected from the light-reading group, on a somewhat extreme level. His reading actions and comments were short and simple. P11 read in a linear way for only ten lines and then went sporadic all over. He caught only the mistranslation error in "shooting." As it was impossible to gauge his level of understanding, it was also difficult to determine his level of dependence on textual elements and non-textual elements. However, his cursor movement showed he used both textual and non-textual elements.

4.4.2. P12 analysis

P12 is a 35-year-old female. She has been working as a financial advisor for 5 years for a mainstream financial institution. She began reading in a linear way, but soon changed her reading from the center of the passage, centering on keywords. She concentrated on textual information to understand what was written, but referred to non-textual elements

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when she had trouble understanding. P12 made frequent pauses for more than 5 seconds to digest all the information and she summarized what she read after the pauses. The focus of her reading was on text comprehension and showed a high concentration span. She showed similar reading patterns for studying subject matter and retrieving information. P12's selected comments are as follows:

— Let me begin from the title.

— "Center and front?" I am not sure what it is, so let me see…. (looking at graphic)

— I don't quite understand about the filters. Let's look at the pictures.

— The section talks about […]

— Overall, this reads smoothly, but some expressions were quite dramatic in my opinion.

— Let me answer the questions. For Camera, the new features are (quietly reading the web page) …

P12's actions and comments showed mixed results between the two groups. Her linear reading changed to a circular pattern after a while, and she read the content more thoroughly than others in this group. She also caught a few errors concerning country standards and mistranslations. She was highly focused on reading and showed a long concentration span. P12 is somewhat in between the heavy-reading group and light-reading group.

4.4.3. P13 analysis

P13 is a 32-year-old male. He has been running his IT business for three years. He began reading from the title to the bottom at a machine-like constant speed. While reading, he pointed out keywords in many places but did not summarize what he understood. He showed no dependence on non-textual elements and showed no interest in the look of the web site either. His verbal activities were limited to keywords and the overall impression only. The same applied when reading for studying subject matters, retrieving information, and sharing information. P13's selected comments are as follows:

— Camera, (pause), filter, (pause), panorama (pause)...

— iOS and Business, (pause), for convenience, (pause)...

— There are unnecessary periods all over.

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— I like the casual tone.

P13's actions and comments were confusing from an analytic point of view. He read thoroughly and linearly, unlike other participants in the light-reading group, but his verbal activity does not show whether he read the text to understand or just to complete the task. His keywords are often from the syntax, rather than context, and he showed no emotions while reading. The only error he caught was the overuse of periods, which is a language error.

4.4.4. P14 analysis

P14 is a 37-year-old male. He has been working as a software engineer for 5 years. P14 holds an MA and a PhD in Computer Engineering. P14 admitted from the beginning that he rarely reads the text on web pages, so he was going to read the web page as he usually reads them. He read the title first and moved to graphics. He looked at the overall layout of the web page, making comments on the margin, space, color, button, and links. The only part he tried to read was Camera as he was interested in the Camera feature. However, he only read one sentence and moved on. P14 summarized the content only by looking at non-textual information. P14 set the trust level high from the beginning as he assumed that the web page was by Apple. Reading for studying subject matter triggered a relatively thorough reading, but he did not read the content word by word. For retrieving information he picked up a few words, and for sharing information he only read one word that was written below the graphic. P14 made a few pauses when he tried to process non-textual information, especially for studying the subject matter. P14's selected comments are as follows:

— This web site is about iOS 7, which was made by Apple.

— I never read the text so I will not read the text this time either.

— I think the text usually is just blah, and graphics and pictures can say much more than text.

— Here are some empty spaces and a big margin, which I like very much.

— It gives me room to breathe. Oh Camera. I love Camera, so maybe I will read this part (read one sentence). Or not.

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— As this web site is made by Apple, and Apple is a trusted company, they do not have to explain all the features scientifically. If it were an unknown start-up company, I would look for more scientific information such as resolution, pixels, etc.

— From the graphic, I can see Siri now does…

— I only read the titles, but some titles are complete and some are not.

P14's actions and comments showed exactly what I expected from the light-reading group, except that he was very detail-oriented in layout and format of the non-textual elements. He barely read the textual information, but was able to summarize the content from non-textual elements. The only error he caught concerned inconsistency. P14 assumed the web page was made by Apple, and showed a high level of trust in Apple. His attitude toward the textual element of the web page was positive.

4.4.5. P15 analysis

P15 is a 26-year-old female. She has been working as a chef for four years. She holds a BA in Sociology. Upon beginning, she skimmed the web page very quickly by scrolling up and down a few times, and just read the titles before moving on to the first task. For studying the subject matter, P15 read the first sentence and moved to graphics, showing heavy dependence on the graphics. Her dependence on textual information was even lower in reading for retrieving information and sharing information. However, when there were no graphics to explain the content, P15 read the content. There were no pauses throughout the reading. P15's selected comments are as follows:

— I will begin the reading. (scrolling up and down a few times)

— It sounds difficult overall. Let's just begin the tasks.

— Camera's new features are… filters. (looking at graphics). So the new filters are …

— Photo license? There is no license for taking a photo!

— I have no idea what this section is talking about. "Third-party app," "single sign-on"… do not make much sense to me. There are no other explanations.

— Ugh…. I just don't get it. Let's move on.

— Oh my gosh, this is so frustrating. I give up. I can't find an answer for your question.

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— Carplay? (without reading the text) Is it like navigation? What's the difference? (looking at graphics). I don't find this very attractive any way.

— I think there are too many transliterations without explanations.

P15's extremely low reading coverage for all purposes was exactly what I expected from the light-reading group. She caught some mistranslation errors. One error was located very close to the Camera graphic, and the other was the too-literal translation, which frustrated her a great deal. Her low tolerance on frustration made her stop reading. This will be discussed in Chapter 5.

4.4.6. P16 analysis

P16 is a 30-year-old male. He is a Master-PhD student in Pharmacy. He began reading the web page by looking at the title. Then, he directly moved his cursor to the graphic. He only looked at the title and subtitles to see what the web page was about, without reading any content. He also mentioned that he usually does not read the text on the web page. When he did the tasks, he began reading the texts with high dependence on non-textual elements. He read relatively thoroughly when he had to study the subject matter, read the first sentence when he had to retrieve the information, and read nothing for sharing information. P16 also showed a high level of trust in Apple, which made him overlook a few errors. P16 made a few pauses when reading for studying subject matter. P16's selected comments are as follows:

— This is about iOS 7, which is Apple's iOS. So this web page must be about Apple's introduction of iOS 7.

— I never read the text on web sites for something like this. So I will skip all this text.

— So Camera's new features are (looking at graphic) filters.

— OK. I am done, so let's move on to the next question.

— (looking at graphic) Front and center? (looking at graphic again) I think it is …

— I don't know what iOS 7 and Developer are all about. Maybe just because I do not know much about them.

— OSi? What is this? (pause) Is it a new name for a different OS?

— I would share how Carplay helps the driving, but I don't really want to share such information already available to the public.

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— I really do not read text on the web because it usually is just meaningless words after words. I am reading this just because I am asked to.

P16's actions and comments were exactly what I was expecting from the light-reading group. He did not read any textual information except the titles and subtitles, and only read when he had to, as he admitted. He caught mistranslation and country standard errors only while reading for subject matter. P16 clearly showed different reading patterns for different reading purposes, which also was expected of the light-reading group.

4.4.7. P17 analysis

P17 is a 26-year old female. She is a first-year MA student in Localization. She read thoroughly from the top to bottom, showing a linear pattern, and pronouncing keywords. Her keywords were based on the syntax, not the context. It was unclear whether P17 concentrated on comprehension of text or not. She had a high dependence on textual information only. She did not look at non-textual information. Various keywords and answers to the questions were the only verbal activities. She frequently made long pauses. She read thoroughly for studying subject matter and retrieving information as well. P17's selected comments are as follows:

— iOS 7… new feature…

— Camera, new filters,

— Car play, in-dash system, navigation, Siri…

— I think overall the web page looks professional. It is Apple's web page after all.

P17 showed mixed results. She showed the expected reading pattern of the heavy-reading group with the detection rate of the light-reading group. P17 did not provide much verbalization of her thoughts. However, the cursor movement and pronounced keywords showed that the reading was thorough and linear. P17 was a passive recipient, not criticizing anything on the web page, and she briefly mentioned that the web site looked professional. Her high trust in Apple contributed to her passive attitude as well. P17 did not detect any errors.

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4.4.8. P18 analysis

P18 is a 39-year old female. She has been working as a project manager for a medium sized company for 5 years. P18 skimmed the web page quickly when the task began. She read one or two sentences thoroughly and stopped reading. She pronounced a few keywords when she read those few sentences. There were no verbal activities other than the key words and answers to the questions. However, when she had to read for studying subject matter, P18 read the applicable section very thoroughly and provided well-organized answers. When she read to retrieve information, P18 simply copied the text as she was not able to understand the content (she did not verbalize the difficulties in comprehension). For sharing information, she misunderstood the question and provided an irrelevant answer. She had long pauses in a few places. P18's selected comments are as follows:

— I will begin the task by reading from the top.

— Camera's new futures are new filters…contrast

— iOS 7 and Business and Developers. (long pauses) iOS provides device management, single sign-on, third-party app features.. (read the content on the section without rephrasing)

— Carplay has the in-dash system, which works like navigation.

— Camera's new features are new filters with contrast and other effects.

— I don't use SNS so I do not want to share anything.

— Overall, the web page looks professional.

P18 showed what I expected from the light-reading group. She showed non-thorough reading patterns with no error detection. P18 was also a passive recipient without criticizing anything on the web page, and she briefly mentioned the web site looked professional. Because of the insufficient verbalization of her thoughts and long pauses, it was not absolutely clear how to analyze her reading in terms of linearity. Her cursor movement and keywords suggest her reading is linear for the first two sentences.

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P18 was the only participant who overlooked or misunderstood the task. She read the No. 4 task incorrectly: The task asked *"If we ask you to choose a certain part to post on the web on your SNS, i.e. FaceBook or Twitter, which part would that be?"* But she took it as "where would you want to post the section?"

4.4.9. P19 analysis

P19 is a 30-year-old female. She has been working as an assistant in a law firm for two years. P19 began by looking at pictures and layout. Based on the overall look, she made a prediction of what the content would be about. She only read the first sentence of all the segments on the web page, and moved on to the pictures. When the reading was not intuitive enough, she read the next sentence. She showed a high level of frustration when she was unable to understand. P19 did not understand many parts of the web page with which no other participants had trouble. P19 did not show very different reading patterns for different purposes, as she was too frustrated to answer the questions for different reading purposes. P19's selected comments are as follows:

— Based on the pictures and titles, this web page is about …

— Camera…

— Shooting? Shooting … swipe… It is hard to understand.

— iOS 7 and Business…I don't understand.

— Carplay.. All so foreign. (sounds frustrated) I just don't get it.

— Let's just move to the questions.

— First question, (read the question), I don't know. It was too difficult to understand. (re-read the text for the first two sentences). I still don't know.

— Second question, (read the question). This part…. I had no idea what it talked about. I am not going to reread the part, as I already know that I won't be able to understand.

— Third question, (read the question). Car play. I am not interested, and there are too many words I don't know. I don't want to answer.

— The web site was too difficult to understand. There are too many foreign words. It just was not worth reading.

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P19 did not read thoroughly and she showed heavy dependence on graphics, which is what was expected from the light-reading group. However, P19's actions and comments need further analysis as her frustration level was too high. After reading only two sections, P19 lost interest in reading due to her impression of the translation. Most of her comments are about how she did not understand, not about why. She caught one mistranslation and the country standard errors.

4.4.10. P20 analysis

P20 is a 44-year-old male. He has been running his restaurant for 12 years. P20 holds a BA in Business and Finance Management. Upon beginning the task, he skimmed the web page quickly by scrolling down and up a few times. After that, he just read the title, and moved to the graphics. P20 read or looked at the textual elements only when the section talked about things that caught his personal interest (in this case Siri). While he read the text, he did not read from the first sentence. His reading began more in the middle of the section or closer to the graphics, which was observed from his cursor movements and verbal activities. He only read one third of the web page and began answering the questions. He made a few long pauses to understand what he is reading or looking at. When he had to study the subject matter, P20 read the first two sentences quickly, but soon his attention went to the non-textual elements. For retrieving information, he recited what was written on the web page without trying to process the information. For sharing information, P20 used one keyword to extend his idea. P20's selected comments are as follows:

— Let me see what this is about. (scrolling down) This is about iOS 7 and its new features, but who reads all these? I would never read the text in this type of web page.

— Camera is (reading out loud the first sentence). Boring… (looking at the graphic). So there are new features such as filter, and there are different types of filter…

— Siri! I've always thought Siri was fun! (reading out loud the first two sentences quickly and moving on to the graphic).

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— Well, this entire web page is about how to sell iOS 7, so I am just going to answer the questions.

— New features of Camera is (long pause) that it uses new filters….

— iOS 7 and Business is (reciting the web page). I have no idea what it says. (long pause) Well, I don't know. I just don't get it. I will just do the next task.

— Sharing information? (looking at graphics with long pauses) I liked how Carplay makes driving convenient…..

— I think overall it looked professional. It should be, as this is Apple's web site.

P20's actions and comments showed what I expected from the light-reading group.

His reading was not linear or thorough. He read only a fraction of the web page, with no critical attitude. P20 only caught one mistranslation error, which was close to the graphics. P20 indicated a positive attitude with respect to the look and content of the web page, as he had a high level of trust in the content provider.

4.4.11. Summary of participants' responses in the light-reading group

Based on the participants' actions and statements, the general reading patterns are categorized in terms of four variables: Content coverage, Long pauses, Reading direction (linearity), Dependence on text, Dependence on non-text. The results are shown in in Table 4.7.

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Table 4.7. Summary of general reading patterns of the light-reading group

No	Content coverage	Long pauses (more than 3 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
11	Not thorough	No	Sporadic Circular	Medium	Medium
12	Thorough	Yes	Circular	High	High
13	Thorough	No	Linear	High	No
14	Not thorough	Yes	Still at graphics	None	High
15	Not thorough	No	Sporadic	None	Low
16	Not thorough	Yes	Still at graphics	None	Low
17	Thorough	Yes	Partially linear Text Only	High	None
18	Not thorough	Yes	Partially linear Text Only	Low	Low
19	Not thorough	No	Partially linear Text to graphics	Low	High
20	Not thorough	No	Sporadic	Low	Medium

As Table 4.7. shows, seven of the ten participants in the light group did read the web page thoroughly. Only one out of ten read the web page in a linear way as was observed in the heavy-reading group, and three showed partially linear patterns. Six out of ten participants in the group showed circular or/and sporadic reading patterns all over the web page. In the light-reading group, the dependence on textual elements was extremely low, and dependence on non-textual elements varied from none to high. Reading patterns for different reading purposes are summarized in Table 4.8, Table 4.9, and Table 4.10.

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Table 4.8. Summary of reading patterns of the heavy-reading group for studying subject matter

No	Content coverage	Long pauses (more than 3 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
11	Not thorough	No	Sporadic Circular	Medium	Medium
12	Thorough	Yes	Partially linear Circular	High	High
13	Thorough	No	Linear	High	No
14	Not thorough	Yes	Sporadic	Low	High
15	Not thorough	No	Sporadic	None	High
16	Not thorough	Yes	Still at graphics	None	High
17	Thorough	Yes	Partially linear Text Only	High	None
18	Not thorough	Yes	Partially linear Text Only	High	Low
19	Not thorough	No	Partially linear Text to graphics	Low	High
20	Not thorough	No	Sporadic	Low	Medium

Reading for studying subject matter exhibited a reading pattern similar to that of general reading, but triggered a partially linear reading and higher dependence on non-textual elements in the light-reading group.

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Table 4.9. Summary of reading patterns of the heavy-reading group for retrieving information

No	Content coverage	Long pauses (more than 3 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
11	Not thorough	No	Sporadic Circular	Medium	None
12	Thorough	Yes	Circular	High	None
13	Thorough	No	Linear	High	None
14	Not thorough	Yes	Sporadic	Low	None
15	Not thorough	No	Sporadic	None	None
16	Not thorough	Yes	Circular	None	None
17	Thorough	Yes	Circular	High	None
18	Not thorough	Yes	Circular	High	None
19	Not thorough	No	Circular	Low	None
20	Not thorough	No	Sporadic	Low	None

Reading for retrieving information triggered more sporadic or circular reading in the light-reading group. The reason for less dependence on non-textual elements is because this particular reading section did not include any meaningful graphics.

Table 4.10. Summary of reading patterns of the heavy-reading group for sharing information

No	Content coverage	Long pauses (more than 3 seconds)	Reading direction (Linearity)	Dependence on text	Dependence on non-text
11	Not thorough	No	Sporadic Circular	Medium	High
12	Not thorough	Yes	Circular	High	High
13	Thorough	No	Linear	High	Low
14	Not thorough	Yes	Sporadic	Low	High
15	Not thorough	No	Sporadic	None	High
16	Not thorough	Yes	Circular	None	High
17	Not thorough	Yes	Circular	High	High
18	Not thorough	Yes	Circular	High	High
19	Not thorough	No	Circular	Low	High
20	Not thorough	No	Sporadic	Low	High

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Reading for sharing information triggered the most less-thorough reading and the highest dependence on non-textual information in this group.

4.5. Quantitative Comparisons

This section will look at the differences between the heavy-reading group and the light-reading group in terms of translation error detection rates and error type comparisons. The results for both groups will be broken down by reading purpose.

4.5.1 Reading without a specific purpose (General Reading)

4.5.1.1. Translation error detection rates by participants

As expected, the heavy-reading group showed much higher error detection rates than the light-reading group in all categories. Each participant's error detection is summarized in Table 4.11.

Table 4.11. Number of error detection per participant

Heavy-reading Group	Errors detected	Light-reading Group	Errors detected
P01	5	P11	1
P02	4	P12	1
P03	2	P13	1
P04	3	P14	1
P05	3	P15	1
P06	4	P16	0
P07	5	P17	0
P08	5	P18	0
P09	5	P19	2
P10	2	P20	1

The mean for the heavy-reading group is 3.8, as opposed to 0.8 for the light-reading group, showing a highly significant difference ($p<0.0001$ for a two-tailed t-test). The box plot (Fig. 4.1) shows the very clear difference between the two groups.

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Fig 4.1. The total number of detected translation error of the two groups while reading without specific purposes
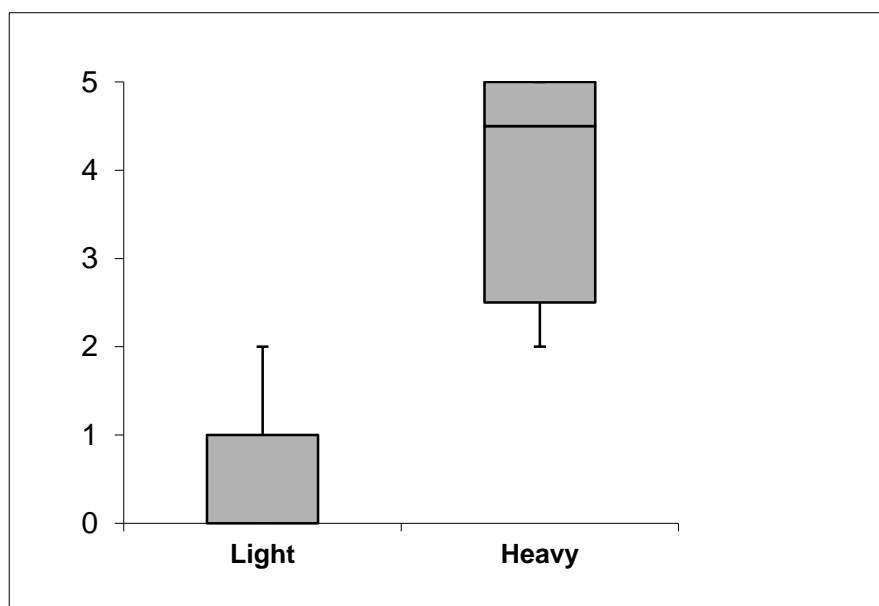
4.5.1.2. Translation error detection rates by error categories

As opposed to the initial hypothesis that the light-reading group would focus more on the intuitive errors than on the systematic ones, that group actually pointed to incoherence and incomprehensiveness as being the most problematic features of the text. The individual error detection rates for the heavy-reading group and the light-reading group are summarized in Table 4.12 and Table 4.13 respectively.

Table 4.12. Error detection for reading without purpose in the heavy-reading group

	Mistranslation	Country Standard	Consistency	Style	Language
1	√	√	√	√	√
2	√	√	√	√	
3	√	√			
4	√	√	√		
5		√	√	√	
6	√	√	√	√	
7	√	√	√	√	√
8	√	√	√	√	√
9	√	√	√	√	√
10	√	√			
Total	9	10	7	7	4

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Table 4.13. Error detection for reading without purpose in the light-reading group

	Mistranslation	Country Standard	Consistency	Style	Language
11	√				
12	√				
13					√
14			√		
15	√				
16					
17					
18					
19	√	√			
20	√				
Total	5	1	1	0	1

The error detection rates for all categories between the two groups is compared in Fig 4.2.

Fig 4.2. Translation error detection rates by category while reading without specific purposes
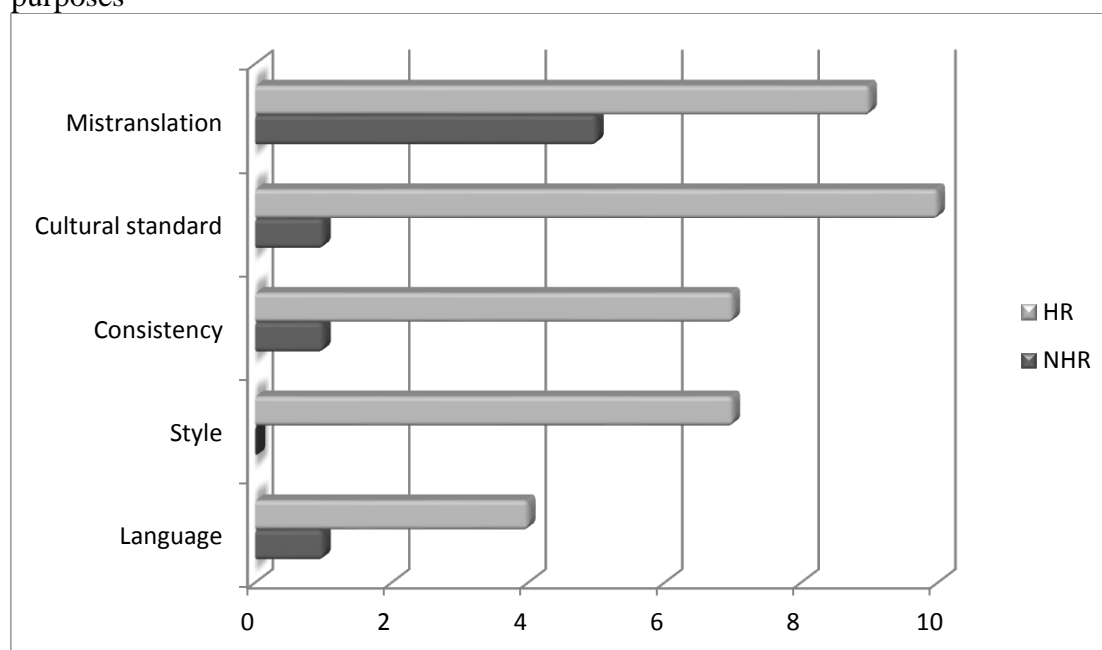
4.5.2 Reading for studying subject matter

4.5.2.1. Translation error detection rates by participants

As expected, the heavy-reading group showed much higher error detection rates than the light-reading group in all categories. Three participants (P08, P09, and P10) in the heavy-reading group caught all the errors, whereas seven participants (P12, P13, P14,

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P16, P17, P18, and P20) in the light-reading group caught no errors. Each participant's error detection is summarized in Table 4.14.

Table 4.14. Number of error detection per participant in reading for studying subject matter

Heavy-reading group	Errors detected	Light-reading group	Errors detected
P01	4	P11	1
P02	3	P12	0
P03	2	P13	0
P04	2	P14	0
P05	2	P15	1
P06	3	P16	0
P07	4	P17	0
P08	5	P18	0
P09	5	P19	3
P10	5	P20	0

The mean for the heavy-reading group is 3.5, as opposed to 0.5 for the light-reading group, showing a highly significant difference ($p<0.0001$ for a two-tailed t-test). The box plot (Fig. 4.3) shows a very clear difference between the two groups.

Fig 4.3. Total number of detected translation errors of the two groups while reading for studying subject matter

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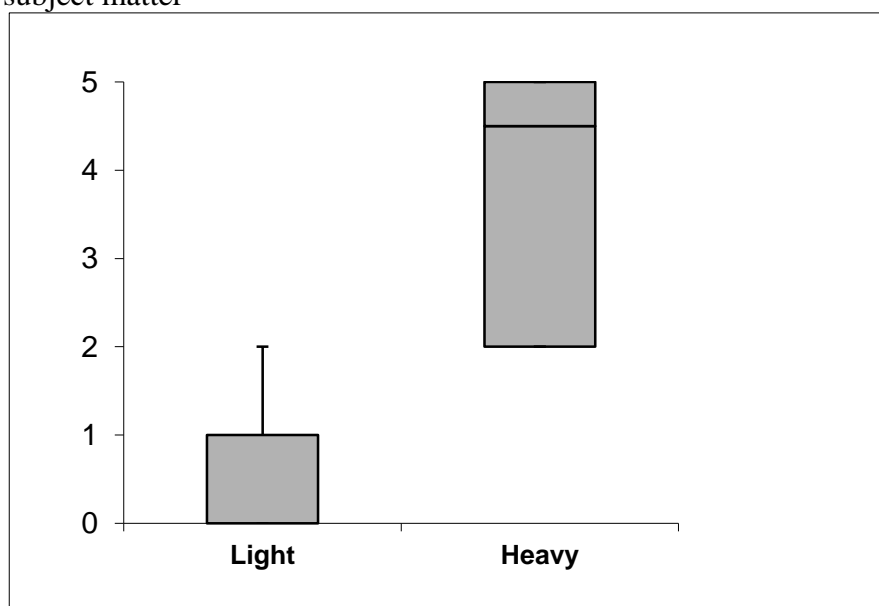
4.5.2.2. Translation error detection rates by error categories

The participants in the heavy-reading group confirmed and elaborated on their previous error detections from general reading. The individual error detection rates in reading for studying subject matter for the heavy-reading group and the light-reading group are summarized in Tables 4.15 and 4.16 respectively.

Table 4.15. Error detection for reading to study subject matter in the heavy-reading group

	Mistranslation	Country Standard	Consistency	Style	Language
1	√	√		√	√
2	√	√		√	
3		√		√	
4	√	√			
5		√		√	
6	√	√		√	
7	√	√		√	√
8	√	√	√	√	√
9	√	√	√	√	√
10	√	√	√	√	√
Total	8	10	3	9	5

Table 4.16. Error detection for reading to study subject matter in the light-reading group

	Mistranslation	Country Standard	Consistency	Style	Language
11	√				
12					
13					
14					
15	√				
16					
17					
18					
19	√	√		√	
20					
Total	3	1	0	1	0

The error detection rates for each category between the two groups is compared in Fig 4.4.

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Fig 4.4. Translation error detection rates by category while reading for studying subject matter
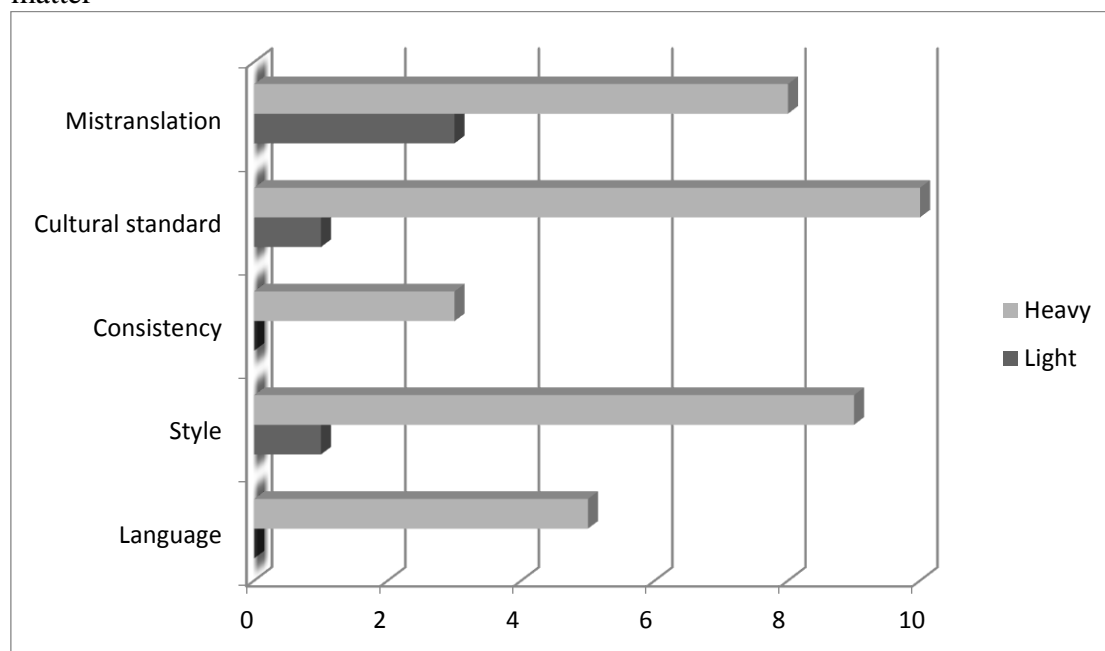
4.5.3 Reading for retrieving information

4.5.3.1. Translation error detection rates by participants

As expected, the heavy-reading group showed much higher error detection rates than the light-reading group in all categories. Three participants (P08, P09, and P10) in the heavy-reading group caught all the errors whereas six participants (P11, P14, P16, P17, P18, and P20) in the light-reading group caught no errors. Each participant's error detection is summarized in Table 4.17.

Table 4.17. Number of error detections per participant in reading for retrieving information

Heavy-reading group	Errors detected	Light-reading group	Errors detected
P01	4	P11	0
P02	2	P12	1
P03	2	P13	2
P04	2	P14	0
P05	3	P15	2
P06	3	P16	0
P07	4	P17	0
P08	5	P18	0
P09	5	P19	2
P10	5	P20	0

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The mean for the heavy-reading group is 3.5, as opposed to 0.7 for the light-reading group, showing a highly significant difference ($p<0.0001$ for a two-tailed t-test). The box plot (Fig. 4.5) shows a very clear difference between the two groups.

Fig 4.5. The total number of detected translation errors of the two groups while reading for studying subject matter
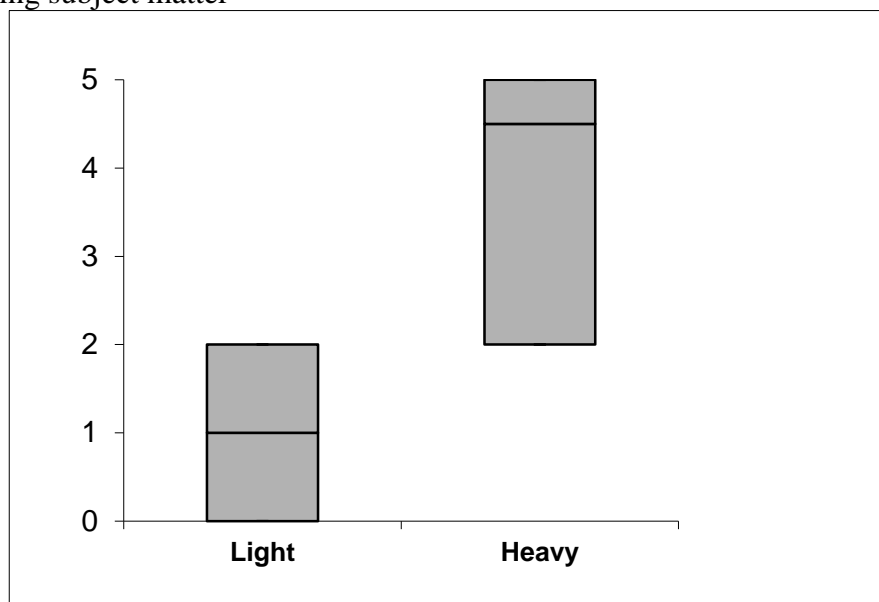
4.5.3.2. Translation error detection rates by error categories

The participants in both groups confirmed their previous error detections from general reading and also found new errors. The individual error detections in reading for retrieving information for the heavy-reading group and the light-reading group are summarized in Tables 4.18 and 4.19 respectively.

Table 4.18. Error detection for reading to retrieve information in the heavy-reading group

	Mistranslation	Country Standard	Consistency	Style	Language
1	√	√	√	√	
2	√		√		
3	√		√		
4	√		√		
5	√	√	√		
6	√		√	√	
7	√		√	√	√
8	√	√	√	√	√
9	√	√	√	√	√
10	√	√	√	√	√
Total	10	5	10	6	4

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Table 4.19. Error detection for reading to retrieve information in the light-reading group

	Mistranslation	Country Standard	Consistency	Style	Language
11					
12	√				
13	√		√		
14					
15	√		√		
16					
17					
18					
19	√	√			
20					
Total	4	1	2	0	0

The error detection rates for each category in the two groups are compared in Fig 4.6.

Fig 4.6. Translation error detection rates by category while retrieving information
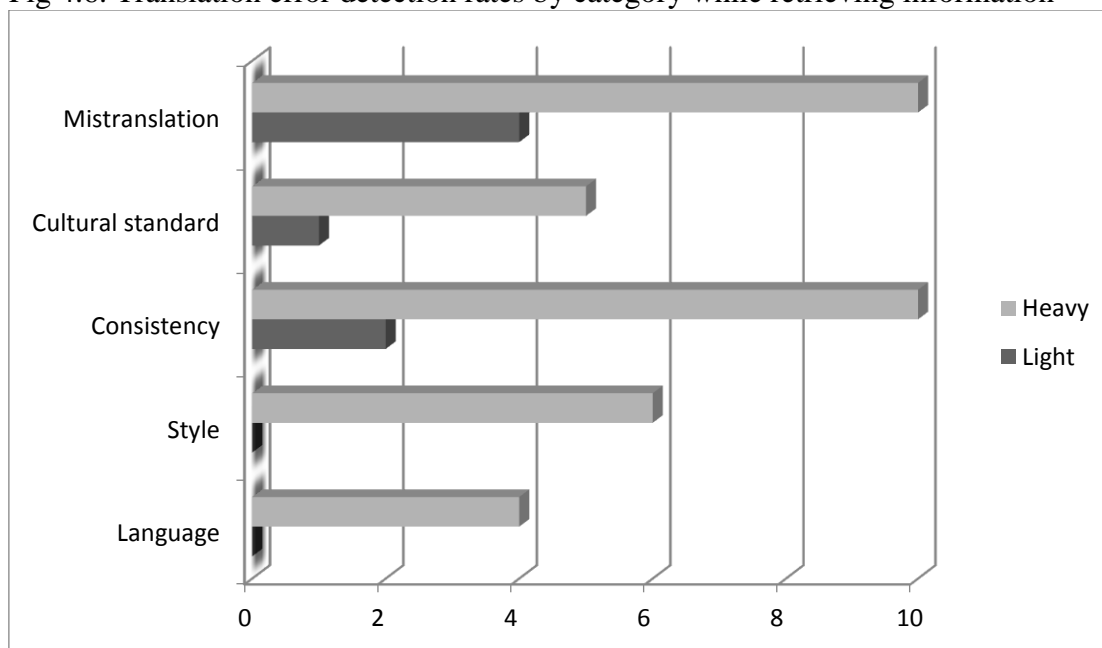
4.5.4 Reading for sharing information

4.5.4.1. Translation error detection rates by participants

As expected, the heavy-reading group showed higher error detection rates than the light-reading group in all categories, but the difference was smaller compared to other reading purposes. Each participant's error detection is summarized in Table 4.20.

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Table 4.20. Number of error detections per participant

Heavy-reading group	Errors detected	Light-reading group	Errors detected
P01	2	P11	0
P02	2	P12	0
P03	1	P13	0
P04	1	P14	0
P05	1	P15	0
P06	2	P16	0
P07	2	P17	1
P08	2	P18	0
P09	2	P19	1
P10	1	P20	0

The mean for the heavy-reading group is 1.6, as opposed to 0.2 for the light-reading group, showing a highly significant difference ($p < 0.0001$ for a two-tailed t-test). The box plot (Fig. 4.7) shows a very clear difference between the two groups.

Fig 4.7. Total number of detected translation errors of the two groups while reading for sharing information
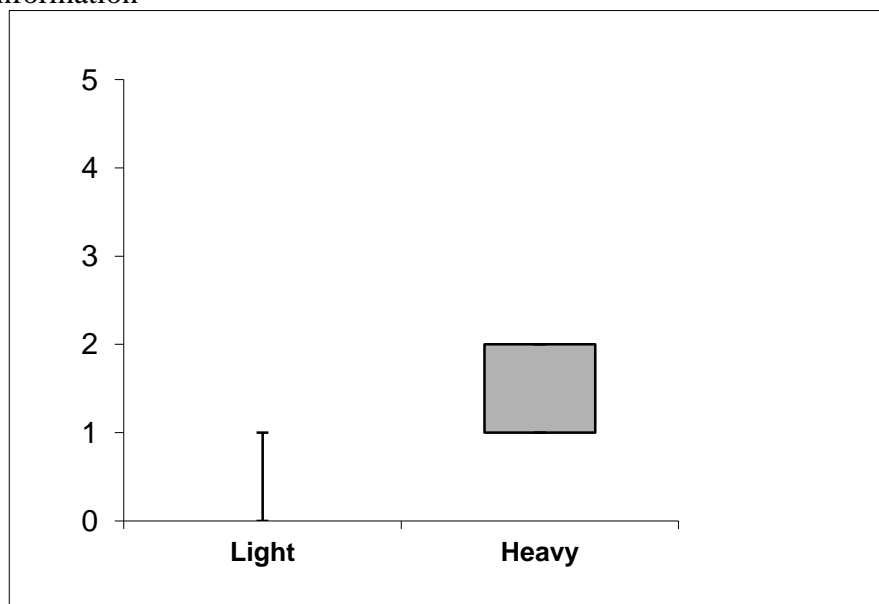
4.5.4.2. Translation error detection rates by error categories

The individual error detections in reading for sharing information for the heavy-reading group and the light-reading group are summarized in Tables 4.21 and 4.22 respectively. The error detection rates in the heavy-reading group are much lower compared to other reading purposes.

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Table 4.21. Error detection for sharing information in the heavy reading group

	Mistranslation	Country Standard	Consistency	Style	Language
1		√		√	
2		√		√	
3		√			
4		√			
5		√			
6		√		√	
7		√		√	
8		√		√	
9		√		√	
10		√			
Total	0	10	0	6	0

Table 4.22. Error detection for reading for sharing information in the light reading group

	Mistranslation	Country Standard	Consistency	Style	Language
11					
12					
13					
14					
15					
16					
17		√			
18					
19		√			
20					
Total	0	2	0	0	0

The error detection rates for each category between the two groups are compared in Fig 4.8.

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Fig 4.8. Translation error detection rates while sharing information
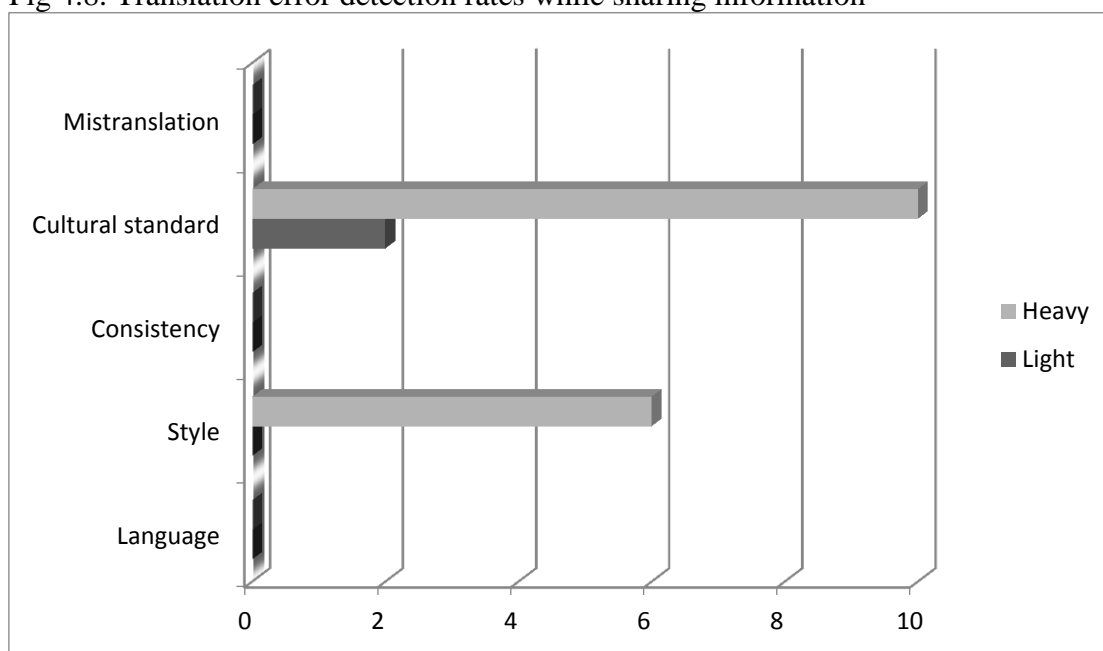
5. Discussion

Based on the test results and analyses in Chapter 4, this chapter discusses different reading patterns, reading tactics, and error detection rates in the heavy-reading group and the light-reading group. The discussion is summarized by each reading purpose, followed by discussions on hypotheses and other unexpected findings such as the severity and reception of translation errors. Section 5.1 discusses different reading behaviors by different reading purposes in terms of linearity, content coverage, dependence on textual elements and non-textual elements, pauses and cognitive processes, and criticality. Section 5.2 closely examines why the error detection rates varied between the two groups, and how those errors impacted the reading, including the frustration thresholds by reading purposes. Section 5.3 examines whether the hypotheses were correct, and Section 5.4 presents unexpected findings such as readers' trust level with the web page, and how trust levels affected the reading patterns.

5.1. Reading behaviors per reading purposes

The test showed that different reading purposes trigger different reading patterns among participants, but not as obviously as I expected. However, within one reading purpose, reading patterns such as linearity, dependence on textual and/or non-textual elements, reading coverage, and critical attitude differed greatly between the two groups.

Such differences contributed to the different error detection rates, which are summarized in 5.2. Interestingly, despite the large difference in error-detection rates, the quality of the answers did not differ much. For example, the question that asked the new features of camera in iOS 7, the answers that explained the new features showed similar accuracy between the heavy-reading group and the light-reading group. This means the critical and thorough reading witnessed in the heavy-reading group is not necessarily more effective in understanding the content than the casual and relaxed reading witnessed in the light-reading group. Examining what factors compensate for casual and relaxed reading to produce quality answers is another discussion point.

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5.1.1. Reading without a specific purpose

The reading patterns of the two groups are analyzed from five different perspectives in this section. All five sections show there are many differences between the two groups.

5.1.1.1. Linearity

The term "linearity" is defined here as reading direction or sequence, looked at without considering pauses or coverage. All participants in the heavy-reading group exhibited a strictly linear reading pattern. The reading took place from top to bottom, left to right, texts (positioned on the left) to graphics and non-textual elements (positioned on the right), which is typically found in paper-based reading. The general reading direction for the heavy-reading group is marked in Fig 5.1. In some cases, step 1 or step 4 was skipped, but steps 2 and 3 were integral parts of the reading in the heavy-reading group.

Fig 5.1. Reading direction for the heavy-reading group

For the light-reading group, most participants consistently showed a non-linear reading pattern. It looked as though the participants were searching for "something worth reading," in a way that was not observed in the heavy-reading group. Even when

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they found something to read, they only read one or two sentences and moved on. This could be because of the non-reading habits of the participants and/or their lack of interest in reading activities. Only one participant (P13) showed a linear reading pattern, and two participants (P17 and P18) showed partially linear patterns: they began reading linearly, but changed to circular within 30 seconds of reading. Given that it sounded much more natural and comfortable when they read in a circular and sporadic way than when they read linearly, the first linear pattern might have been triggered simply because the reading task asked the participants to "read" in the instructions. The light-reading group's reading direction is marked in Fig 5.2. In many cases, step 5 was skipped.

Fig 5.2. Reading direction for the light-reading group

5.1.1.2. Content coverage

Contrary to initial expectations, even when no task was involved, many participants read the content very carefully and thoroughly, especially at the beginning, and especially among the heavy-reading group.

All participants in the heavy-reading group read the text thoroughly. The consequence of such thorough reading appeared when the participants answered all the

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questions based on their memories, with only quick references to the text and graphics. In this vein, reading without a specific task resembled reading for studying subject matter for the heavy-reading group. The participants' awareness that they were participating in a test and that their verbal activities were being recorded might have contributed to such thorough reading. Given that reviewing web sites or documents was their profession, they might have felt compelled to do the task well, or were even excited to do it. In fact, three participants in the heavy-reading group described the test as "fun" and "exciting," and asked if I had more tests they could participant in.

In the light-reading group, only three participants (P12, P13, and P17) showed thorough reading. Other participants read random spots after reading the title and, in some cases, the first sentence; their scroll bars went up and down many times and their cursors moved sporadically all over the place. Even those who started reading thoroughly loosened up a bit and read a lot more casually and roughly after 20-30 seconds. Most of them just picked and talked about one or a few parts that were interesting to them. Most participants in the light-reading group stopped reading when they grasped the very general concepts of the entire web page, or when they found the web page uninteresting.

This suggests that all the participants in the heavy-reading group considered reading as an integral part of the task, while most participants in the light-reading group considered reading as a guideline in performing the task. Two participants (P15 and P18) said that they "never read the contents unless they were required to," and they just read the title and skipped all the texts.

5.1.1.3. Dependence on textual elements and non-textual elements

The heavy-reading group relied on the textual elements rather than on the non-textual elements to understand what was written, as all ten participants focused on textual elements to draw meaning out of the web page. However, four (P01, P02, P05, P06, and P09) out of ten participants in this group also investigated non-textual elements thoroughly and critically. They focused on the layout and format of both textual and non-textual elements, examining all the links and buttons. Different participants exhibited different foci on non-textual parts of the web site: the functions of all the buttons and links (P01, P02, P05, P06, and P09), positions of text and graphics (P10, P05, P09, and P10), word-wrapping (P01, P07, and P10), and font type and size (P01

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and P05). Two out of ten participants (P01 and P05) in the heavy-reading group said that they were unable to concentrate on the content because of "ugly and old font" and "constant word-wrapping issues." One participant (P02) spent 40% of her reading time checking the links and investigating why the top bar in grey is not showing anything. Their dependencies on the textual elements were extremely high, but there was mixed dependence on the non-textual elements. When encountering unfamiliar concepts, the participants showed increased dependence on the textual elements and search engines, rather than the non-textual information, which was the complete opposite of the light-reading group.

However, in the light-reading group, only three out of ten participants (P12, P13, and P17) paid attention to textual elements, and again only three out of ten (P12, P14, and P19) paid attention to non-textual elements. Interestingly, contrary to my expectation, lower dependence on textual elements did not lead to higher dependence on non-textual elements, or vice versa. Some of the heavy-reading group participants showed higher dependence on both textual and non-textual elements, whereas some of the light-reading group participants showed lower dependence on both textual and non-textual elements. This implies that dependence on textual elements and/or non-textual elements is linked with individual reading thoroughness.

It is interesting that those who paid attention to the non-textual elements also made many more comments on the look of the web site than did those who did not pay attention. For those participants, the aesthetic appearance predominantly determined the impression and credibility of the web page, if those values had not already been predetermined by the brand name Apple. The relation between the authority of the web page and the various reading patterns is further described in Section 5.4.

5.1.1.4. Cognitive processing

Another difference between the heavy-reading group and the light-reading group is the duration and frequency of pauses during the reading. Many participants paused during and/or after the reading, which is a critical cognitive process in digesting, retrieving, processing, and anticipating information. However the patterns, lengths, and frequency of pauses differed between the two groups.

Most participants in the heavy-reading group showed infrequent pauses. This group paused after they read the entire text bloc but before consulting the graphics, or in some cases after looking at graphics, which seemed to be influenced by the

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concentration level or saturation point. Most participants in the heavy-reading group paused before reading the text or when they encountered incoherence. Some participants (P01 and P05) stopped reading to go online for further research, which should be differentiated from pauses for information processing. Only two participants (P02 and P06) used long pauses for internal processing. P02 showed a very thorough reading process for comprehension, which seemed to trigger frequent long pauses. P06 exhibited a thorough reading pattern, but associated much personal background and history to her understanding, which disrupted her thought process. She made pauses when she tried to come back from her personal stories or when she had a hard time understanding the text. In this vein, P02 and P06 used pauses to process information, and P06 used pauses to return to her reading mode from various distractions.

On the other hand, in the light-reading group, pauses for anticipation and for putting together the clues were more common. In detail, the light-reading group showed frequently intermittent pauses that lasted longer than five seconds. This group paused after reading the title, and after and while looking at graphics, and reading the content. Their reading stopped for many reasons: anticipating the content, incorporating background knowledge, encountering incoherence, processing input information, and putting together the clues to comprehend. Such intermittent pauses seem to help the comprehension of the text in this group, contributing to the quality of the answers. The lack of critical attitudes and thoroughness in the reading process in this group seem to be compensated by pauses and the following cognitive process.

Five (P12, P14, P16, P17, and P18) out of ten participants in this group read the title and then paused for 5 to 30 seconds to anticipate the content or connect the dots among subject matter and their background knowledge, which was a major difference with respect to the heavy-reading group. Given that the number of participants who used pauses is greater when they were studying subject matter, the number of participants who paused during the general reading (reading without a specific purpose) seemed to be affected by the low reading coverage among the participants. Attempting to anticipate content was a large part of their reading and understanding process. When the participants in the light-reading group had trouble understanding the text, or the text went against their expectations, they stopped and tried to resolve the issue by asking a question of themselves or by looking at the references again. If they were still unable to understand the text, they gave up and moved on to the next reading block quickly. No

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participants read more than twice for general reading. After the pause, most of them moved to the next reading block and the same pattern persisted throughout the entire reading.

This difference can be explained in a few cognitive ways. First, the anticipation and putting together of the clues do not require pauses, but rather happen simultaneously with reading activities in the heavy-reading group. On the other hand, they happen more consecutively in the light-reading group. Second, the reading process in the heavy-reading group is more automated and goal-oriented than in the light-reading group. The focus among the heavy-reading group participants is mostly on finding errors rather than on understanding the text. Third, the heavy-reading group has a higher saturation point with respect to the amount of reading than the light-reading group, which means they can read and digest a lot more information at once.

5.1.1.5. Critical analysis

The attitudes of the heavy-reading group and the light-reading group differed. Whereas the heavy-reading group had serious, goal-driven, and critical attitudes, the light-reading group showed casual, fun, and relaxed attitudes. The test showed that the heavy-reading group was more critical of the format and look as well as the content of the web site than was the light-reading group. Six (P01, P02, P07, P08, P09, and P10) out of ten participants showed highly critical attitudes, whereas none of the light-reading group showed a critical attitude.

One interesting finding is that a critical attitude does not always lead to higher error detection rates. For example, P02 caught the average number of errors despite her highly critical attitude. It looked as though P02 paid more attention to the look of the web site on the basis of her personal preferences rather than with respect to any absolute standard.

5.1.2. Reading for studying subject matter

Overall the reading patterns for studying subject matter were very similar to the ones for reading without a specific purposes. The similarities will be described, but the differences will be analyzed more precisely in the following sections.

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5.1.2.1. Linearity

All participants in the heavy-reading group exhibited a strictly linear reading pattern, just as they did for reading without a specific purpose. The reading took place from top to bottom, left to right, texts (positioned at the top) to graphics and non-textual elements (positioned at the bottom). Fig 5.3 shows the linear reading pattern of the heavy-reading group.

Fig 5.3. Reading direction for the heavy-reading group for studying subject matter

For the light-reading group, most participants consistently showed a non-linear reading, just as they did for general reading. However, reading for studying subject matter triggered the largest number of linear reading patterns within the light-reading group, as four participants (P12, P13, P17, and P18) *attempted to* read from left to right, and top to bottom. However, only one participant (P13) showed a linear reading pattern all the way to the end, and three participants (P12, P17, and P18) changed the reading from linear to circular within 30 seconds of reading. Most participants (P11, P14, P15, P16, P19, and P20) looked at the graphics after reading the title and, in rare cases, the
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first sentence. After looking at graphics, the participants' cursors moved from the end of the text toward the beginning. The light-reading group's reading direction is marked in Fig 5.4. In some cases, steps 3 and 4 are skipped. In many cases, step 4 is circular or sporadic.

Fig 5.4. Reading direction for the light-reading group for studying subject matter

5.1.2.2. Content coverage

All participants in the heavy-reading group read the text thoroughly to the end, even after they found the answers they were looking for. Those who answered the question while they read the web page reconfirmed or corrected their answers after reading the entire web page section. It seemed important to those in the heavy-reading group not to miss any information. This contributed to maximum coverage in the heavy-reading group.

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In the light-reading group, only three participants (P12, P13, and P17) showed thorough reading, and two participants (P15 and P18) only interpreted graphics and pictures, and did not read at all, just like the reading without a specific purpose. Other participants looked at the graphics after reading the title. After looking at graphics, the participants read some portion of the content. Most participants in the light-reading group stopped reading when they found the answers.

In sum, the heavy-reading group reads the entire textual information, sometimes even more than once, to acquire and verify information on the web page. On the other hand, the light-reading group reads only until they find the information they search for, and do not confirm whether their finding is correct. Some participants in the light-reading group depend solely on the non-textual information, and do not read at all, but still acquire new information.

5.1.2.3. Dependence on textual elements and non-textual elements

Both reading groups showed the highest dependence on textual and non-textual elements for this reading purpose. The heavy-reading group relied on the textual elements rather than the non-textual elements to study subject matter, as all ten participants focused on textual elements to draw meaning out of the web page. Dependence on non-textual information was also the highest among all reading purposes, as six (P01, P02, P05, P06, P09, and P10) out of ten participants investigated non-textual elements thoroughly and critically. When encountering unfamiliar concepts, the participants showed increased dependence on the textual elements and search engines, rather than the non-textual information, which was the complete opposite of the light-reading group.

Most participants in the light-reading group referred to both textual and non-textual elements for studying the subject matter. However, only four out of ten participants (P12, P13, P17, and P18) paid close attention to textual elements and the rest of them (P11, P14, P15, P16, P19, and P20) paid attention to non-textual elements almost exclusively. It is noteworthy that reading for studying for subject matter triggered the largest number of non-textual elements dependence in the light-reading group as well.

Even though both groups showed the highest dependence on the non-textual elements, the reasons were different: high dependence on the non-textual information

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among the heavy-reading group seems to come from the tendency to read and cover everything on the web page to provide correct and complete answers, rather than using the non-textual elements as a way to understand the content as the light-reading group did.

5.1.2.4. Cognitive processing

The duration and frequency of pauses in the heavy-reading group were the same as when reading without a specific purpose, as most participants in the group paused after they read the entire text bloc but before consulting the graphics, or in some cases after looking at the graphics. Most participants in the heavy-reading group paused when they detected the translation errors, but only for long enough to verbalize their findings. As soon as they verbalized the errors, they moved on. If the participants did not have to verbalize the findings, I presume the pauses would have been much shorter and less frequent. Having said that, only two participants (P02 and P06) used significant pauses for internal processing. P02 showed a very thorough reading process for comprehension, which triggered frequent long pauses. P06 exhibited a thorough reading pattern, but associated much personal background and history with her understandings, as she did for general reading.

On the other hand, the light-reading group used the most frequent pauses in this reading purpose. Most participants paused after the title for anticipation and/or for putting together the clues. In detail, the light-reading group showed frequently intermittent pauses that lasted longer than five seconds. This group paused after reading the title, as well as after and while looking at graphics, and reading the content. Their reading stopped for many reasons: anticipating the content, incorporating background knowledge, encountering incoherence, processing input information, and putting together the clues to comprehend. Such intermittent pauses seem to help the comprehension of the web page in this group, contributing to the quality of the answers. The lack of critical attitudes and the thoroughness in the reading process in this group seem to be compensated by pauses and the cognitive process associated with the pauses.

Five (P12, P14, P16, P17, and P18) out of the ten participants in this group read the title and then paused for 5 to 15 seconds to anticipate the content or connect the dots among the subject matter and their background knowledge, which was a major difference with respect to the heavy-reading group.

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The participants in the light-reading group chose to ask a question of themselves or to look at the non-textual elements when they had trouble understanding the text. If they were still unable to understand the text, they gave up and moved on to the next reading block quickly. After the pause, most of them moved to the next reading block and the same pattern persisted throughout the entire reading.

The explanation offered in Section 5.1.1.4 also explains the cognitive differences in processing information between the two groups.

5.1.2.5. Critical analysis

The attitudes of the heavy-reading group and the light-reading group differed for this reading purpose as well. Even though the task asked the participants to describe the new features of Camera, the light-reading group kept casual, fun, and relaxed attitudes. Rather than trying to find the correct answers, the participants in this group had fun learning about Camera. In some cases, they lost track of their task, and just talked about whatever came to their minds. No one showed critical attitudes toward textual or non-textual elements.

On the other hand, the heavy-reading group was focused on looking for answers. Not a single participant got distracted while performing the task. However their goal-driven reading seemed to take the critical attitudes off from the readers. Six participants (P01, P02, P07, P08, P09, and P10) who showed highly critical attitudes while general reading showed much lower levels of criticism or even no criticism. In other words, the critical attitudes seem to be replaced with goal achievement to some degree, if not entirely.

5.1.3. Reading for retrieving information

Reading for retrieving information exhibited some interesting findings in regards to comprehension. Compared to other reading sections, this particular section did not include meaningful non-textual elements, the reading sections were divided vertically, and the severity of mistranslation errors was high. Such variations yielded new findings, including high frustration levels among the participants in the light-reading group. The reading patterns of the heavy-reading group and the light-reading group are analyzed from five different perspectives in this section as well.

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5.1.3.1. Linearity

All participants in the heavy-reading group exhibited a strictly linear reading pattern, just as they did for other readings. The reading took place from top to bottom, left to right. All the participants in the heavy-reading group read the web page by reading sections: reading the left section first and the right section after that. There were only two graphics (icons) that do not say much about anything on the top left of each reading block, to which no one paid attention. Fig 5.5 shows the linear reading pattern of the heavy-reading group.

Fig 5.5. Reading direction for the heavy-reading group for retrieving information
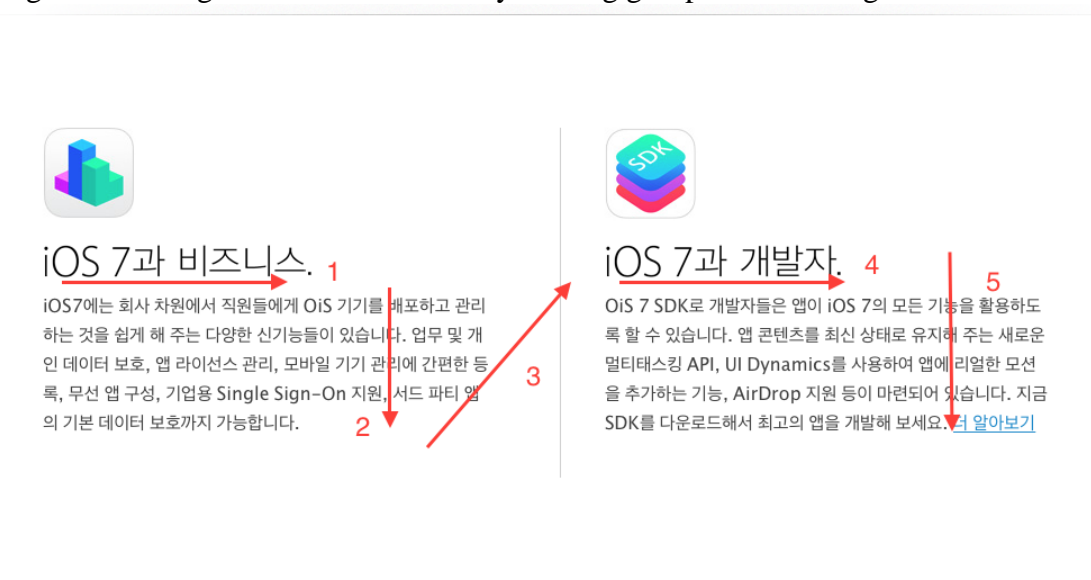
For the light-reading group, nine participants (P11, P12, P14, P15, P16, P17, P18, P19, and P20) showed a circular reading pattern. As there were no graphics or pictures to depend on, all the participants read some portion of the content. Four participants (P12, P13, P17, and P18) *attempted to* read from left to right, and top to bottom. However, only one participant (P13) showed a linear reading pattern all the way to the end, and three participants (P12, P17 and P18) changed their reading from linear to circular within 10 seconds of reading, expressing their frustration. An interesting finding was that six participants (P11, P14, P15, P16, P19, and P20) in the light-reading group read the titles first for both sections, and then read the body of the texts. The light-reading group's reading direction is marked in Fig 5.6. The circulation direction was different among readers. Some read clockwise and some read counter-clockwise. The marks in 3 and 4 are just to show how the readings are circular.

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Fig 5.6. Reading direction for the light-reading group for retrieving information

5.1.3.2. Content coverage

All participants in the heavy-reading group read the text thoroughly. As the first sentences in both sections were translated extremely literally to trigger mistranslation errors, participants in the heavy-reading group read the first sentence multiple times. When they did not understand what was written, all the participants in the heavy-reading group went back to the first line and re-read the sentence multiple times. The content coverage for this group was thus more than 100%.

In the light-reading group, only three participants (P12, P13, and P17) showed thorough reading and the rest of them just looked for clues starting from the center of the texts. No one complained about not having graphics that could have facilitated their understanding, but the cursor movement shows that they were looking for some kind of aid materials: the scroll bars moved up and down multiple times to make sure whether there were other references. When the participants in this group were unable to understand due to the mistranslation errors, instead of rereading, they simply gave up and stopped reading activities. Their answers were simply "I don't know" or "I was unable to understand."

In sum, the heavy-reading group reads the entire textual information, even more than once to retrieve information. On the other hand, the light-reading group reads to try to find the clues for the answers. When the clues do not exist or are unsearchable, the readers in the light-reading group stop reading. This implies that the error tolerance level is higher in the heavy-reading group than in the light-reading group, which will be discussed further in a later section.

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5.1.3.3. Dependence on textual elements and non-textual elements

The absence of non-textual elements clearly exhibited what each group depends on for comprehension. As the non-textual elements were minimal for this section, comparing the dependence between textual information and non-textual information is meaningless. The heavy-reading group did not seem to even notice that there were no graphics, as textual information was their main tool of comprehension, whereas the light-reading group looked for some kind of aid materials by scrolling the screen up and down a few times, as previously described. When the participants in the light-reading group figured out that there were no other elements to depend on other than the textual information, they began reading the text. Even so, the reading was neither linear nor thorough.

5.1.3.4. Cognitive processing

The number and frequency of pauses in the heavy-reading group was the highest for this reading pattern, as the literal translation (mistranslation) interfered heavily with comprehension, however the duration of pauses were not much longer. Most participants in the heavy-reading group paused when they detected the translation errors but they quickly went back to the beginning of the sentence and reread the text. Except for P02 and P06, who used longer pauses, the participants paused 2-3 seconds before they read the second sentence, which is rather significant in the heavy-reading group, as such pauses were not found for other reading purposes. Some participants in the heavy-reading group were bothered by the mistranslation errors, and all of them made comments on the error. However, they continued finding the information that the question asked. In the end, they provided answers that they thought were correct.

In the case of the light-reading group, the participants were mostly quiet while looking for keywords and clues and also processing the information. It seemed that the light-reading group tried to internalize the reading and understanding by being quiet, which is common for Asian readers, as explained in Chapter 2. However, as their verbal activities were low, it was not clear if the participants were reading or pausing. Other than that, this group exhibited similar patterns in pauses. One interesting finding for this section was about the frustration level. The mistranslation error increased the frustration level among the participants in the light-reading group, which resulted in discontinuance in reading. How frustration affected the readers will be discussed further in later sections.

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It was interesting to observe how easily some readers can be frustrated by mistranslation, but as the severity of error due to a too literal translation turned out to be particularly high in this reading section which already was highly technical, it was difficult to determine how this specific reading purpose affected the reading patterns.

5.1.3.5. Critical analysis

Unlike general reading or reading for studying subject matter, participants in the heavy-reading group rarely showed critical attitudes. The participants in the heavy-reading group were busy looking for the answers, rather than criticizing the errors. Given that some participants in the heavy-reading group (P01 and P06) felt that their incomprehension came from their own lack of knowledge about the subject matter, this lack of confidence seemed to have contributed to them losing critical attitudes and becoming passive recipients for this reading purpose.

The attitudes of the light-reading group were different for this reading purpose. Unlike other reading purposes where the participants showed casual, fun, and relaxed attitudes, the readers were more frustrated and impatient. Rather than trying to find the correct answers, some participants in this group just lost track of their task and expressed their frustration before they quit reading.

It was interesting to witness that those who showed critical attitudes blamed themselves for not being able to understand, and those who showed positive attitudes blamed the text for not being clear enough. This indicates that the critical reading by the heavy-reading group might be related to their awareness of the translation profession, which means that the readers were critical of the translators, rather than of the web page or the web page provider.

5.1.4. Reading for sharing information

As expected, this reading pattern triggered the most relaxed reading among both the heavy-reading group and the light-reading group. Their reading patterns are analyzed from five different perspectives in this section as well.

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5.1.4.1. Linearity

This is the only reading purpose where both the heavy-reading group and the light-reading group showed similar patterns. Only two participants (P01 and P10) in the heavy-reading group and one participant (P13) in the light-reading group exhibited a linear reading pattern. The reading took place from the title, and mostly moved to the middle of the reading section, and then developed in a sporadic way. Participants were trying to find the keyword that grabbed their attention.

Fig 5.7. Reading direction for sharing information for both groups

Apple CarPlay.
자동차, iPhone을 만나 더욱 스마트해지다.   1

OSi 기기만이 제공하는 iOS의 우수한 환경이 이제 CarPlay를 통해 새롭게 출시되는 일부 모델의 인대시 시스템과 완벽하게 통합됩니다. CarPlay 지원 차종이라면 iPhone 5 이상 모델을 연결해 자동차 내장 디스플레이와 컨트롤, 또는 Siri 음성 명령 으로 자유롭게 조작할 수 있죠. 이젠 전화 통화를 하고, 음악을 듣고, 메시지를 주고받고, 길을 찾는 등의 다양한 일을 쉽고 안전 하게 할 수 있습니다. iPhone이 운전 중 필요한 일을 대신 신경 써주기 때문에, 당신은 맘 놓고 운전에만 집중할 수 있죠.

2   더 알아보기   2

2.8 km
US-101 S 방면
출구로 나가기
101
9:41
LTE
9:50 도착   9 분   3.0 km
Golden Gate B...

They all read the title (marked "1" in Fig 5.7) just to make sure if that was the assigned section for reading. After that, the readers' cursors moved everywhere (marked "2" in Fig 5.7) without a common pattern. This sporadic reading pattern seems to come from the awareness that there are no correct or incorrect answers for this task. The

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participants in the heavy-reading group who showed goal-driven attitudes seemed to be much more relaxed, knowing the task was asking for personal preference.

5.1.4.2. Content coverage

Only three participants (P01, P03, and P10) in the heavy-reading group and one participant (P13) in the light-reading group read the text thoroughly: The others skimmed the web page to find the information they wanted to share. One thing to note is that the participants in the heavy-reading group had already had enough content exposure while they did the general reading. Due to the thorough reading in the first round of reading (general reading), the participants had already learned new information, and even memorized the content, which contributed to their non-reading pattern. In the case of the light-reading group, most of them did not read to the end, which means they had no previous information or memory on the section used for the task. The reading of the light-reading group was more thorough than that of the heavy-reading group for that reason, but their overall reading coverage was not specifically any higher.

5.1.4.3. Dependence on textual elements and non-textual elements

Both reading groups showed low dependence on textual elements, but high dependence on non-textual elements for this reading purpose. The heavy-reading group relied on the textual elements rather than the non-textual elements to share information, but all the participants consulted the graphic and caption relatively thoroughly. When encountering unfamiliar concepts such as the in-dash system, interested participants in the heavy-reading group reread the text and consulted the graphics to make sense of it. Three participants (P01, P05, and P10) did a web search immediately, and acquired information from there, without rereading or looking at non-textual elements first. After the web search, they reread the text and looked at non-textual elements.

Most participants in the light-reading group referred to both the textual and non-textual elements for sharing information, but more emphasis was placed on non-textual elements. Many participants in this group tried to connect their readings to the graphic by interpreting the graphic based on what they read. Interestingly, no participants in the group did web searches to acquire information.

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5.1.4.4. Cognitive processing

The least number of significant pauses were witnessed for this reading pattern. There were pauses while searching for a keyword to share, but no significant pauses for comprehension were found in either group. Relaxed reading explains the fewer pauses and reading discontinuances. When participants found that the task was asking for personal preferences, they became more relaxed, as was shown by their reading direction, comments, and breathing. It was interesting that this tendency was more evident in the heavy-reading group.

One interesting finding is that many participants in both groups brought their personal backgrounds to this task, saying something like "I love cars, so this section is very interesting," "My mom gets lost all the time, I would like to share this feature with my mom." Participants in both groups were more engaged in the task than any other tasks. In sum, reading for sharing information triggered the most selective, but active, reading among participants, regardless of their experience in reading.

5.1.4.5. Critical analysis

The attitudes of the heavy-reading group and the light-reading group differed for this reading purpose. Even though the task asked for the participants' personal selection to share, the heavy-reading group kept critical attitudes with regard to the content of the web page, in particular concerning country standard errors (transliterations).

On the other hand, the light-reading group kept casual, fun, and relaxed attitudes, showing no critical thought. Transliterations did not seem to interfere with the light-reading group's understanding at a significant level in most cases. Some participants wanted to find out more about it, but did not complain about the errors themselves.

5.2. Translation error detection details per reading purposes

Different reading purposes and reading patterns affected the kind and number of translation errors that the participant detected. In addition, the severity, frequency, and the level of exposure affected the detection rates. Section 5.2 discusses how different reading purposes affected the error detection rates in the heavy-reading group and the light-reading group.

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5.2.1. Reading without a specific purpose

As shown in Chapter 4, the participants in the heavy-reading group detected an average of 3.8 errors out of 5, whereas the light-reading group caught just 0.8 errors out of 5. The detection was highest in Country Standard (transliteration), Mistranslation, Consistency and Style, and Language, in that order, in the heavy-reading group. In the light-reading group, the detection rate was highest in Mistranslation, same in Country Standard, Consistency, and Language, and lowest in Style.

Transliteration (Country Standard) was found to be especially problematic in the heavy-reading group, as the errors were "found in too many places" and were used in explaining the key concepts. All the participants expressed discomfort at encountering transliteration errors, claiming they "don't know what it means" or that they were "unable to understand what is written." However, the light-reading group barely noticed transliteration errors.

On the other hand, the light-reading group thought mistranslation was the most serious error, while the transliterations were hardly noticed. The test had three different kinds of mistranslation errors: ML (too literal translation from using a formal equivalence concept that triggers unnatural and convoluted sentences), ML1 (a local mistranslation coming from misunderstanding a word or implication that affects global meaning), and ML2 (a local mistranslation coming from misunderstanding a word or implication that does not affect global meaning). I expected ML1 would provoke the highest detection rate given the impact and absurdity of the errors. I expected ML2 would not be detected, and ML might be detected by some users.

However, contrary to my expectation, ML gave the highest detection rate in both groups. As convoluted sentences made the entire text very confusing and unintuitive, many readers expressed discomfort and frustration at not being able to read smoothly and to understand. This sheds some insight on how literal translation and formal equivalence is received by readers, especially when such a literal approach is widely accepted in the IT field.

ML1 and ML2 were detected exactly as expected: the participants in the heavy-reading group and/or those who read the text linearly caught ML1, and the participants in the light-reading group who read the text in a non-linear way caught ML2.

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The consistency error-detection rate also was much higher in the heavy-reading group. Seven out of ten participants in the heavy reading group caught the errors, whereas only one participant caught the error in the light-reading group. Even though the consistency errors were very visible, most light-reading group participants did not notice any problem.

Such a great difference in error detection rates for Mistranslation, Country Standard, and Consistency between the heavy-reading group and the light-reading group implies that the heavy-reading group was reading more thoroughly down to the word level, whereas the light-reading group was reading less thoroughly. In other words, the heavy-reading group tended to read bottom-up, whereas the light reading group tended to read top-down.

The style and language errors showed similar patterns. One interesting finding was that some participants (P2 and P16) who initially found style or language errors seemed to become accustomed to the errors and eventually forgot what they had witnessed. The recoding showed their resistance to some words or style in the beginning, but when they were asked about the overall style, they did not mention those parts.

5.2.2. Reading for studying subject matter

This reading task involves only the Camera section on the web site. The heavy-reading group detected an average of 3.5 errors while the light-reading group detected an average of 0.5 errors, as previously described in Chapter 4. Country Standard was the most problematic error that all the participants detected in the heavy-reading group, while Mistranslation was the most problematic error that three participants detected in the light-reading group.

Eight (P01, P02, P04, P06, P07, P08, P09, and P10) out of ten participants in the heavy-reading group detected ML1, while one participant (P11) detected ML1. Four (P01, P08, P09, and P10) out of ten participants in the heavy reading group detected ML2, while two participants (P15 and P19) detected ML2. As expected, the detection rate for ML1 was higher as it was more severe and located at the beginning of the sentence in the case of the heavy-reading group. In the case of the heavy-reading group, the linear reading pattern contributed to detecting ML1 and thorough and critical reading habits contributed to detecting ML2. In the case of the light-reading group, the non-linear reading pattern by which the readers look at graphics first and then move to

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the text right next to the graphic contributed to detecting ML2. It looks as though P11's detection of ML1 is related more to his profession rather than his reading pattern. In other words, given his profession as a military officer, it is hard to say that the mistranslation error was more serious than others for him; it is just that the word "shooting" had a significant meaning to him.

Use of uncommon and Chinese-based words and/or transliterations for a key feature (Country Standard) was problematic for all readers in the heavy-reading group, as it made little or no sense to the participants. However, interestingly, the Country Standard error was hardly noticed in the light-reading group, as only one participant (P19) barely mentioned it. Some heavy-reading group participants figured out what the word meant after reading the entire passage multiple times, or after looking up the word online. It was also noteworthy that the participants tried to find clues for the misused word by looking around the word in the web page. The only participant who caught the Country Standard error in the light-reading group did not attempt to figure out what it meant.

The consistency error was rarely detected in this section, probably due to the single occurrence of a proper noun, iOS 7. Given the fact that only those who detected all the errors detected the consistency error, it looks as though detecting an isolated consistency error requires detail-oriented reading habits.

Style and language errors were detected by the same participants who detected the same errors when reading without a specific task. It is interesting that nine participants (P01, P02, P03, P04, P06, P07, P08, P09, and P10) in the heavy-reading group detected the style error while only one participant (P19) detected the style error in the light-reading group. It seemed that the participants in the light-reading group just do not care about the style of writing or have much higher tolerance of style errors.

Punctuation (Language) is something of which the participants either detected all or nothing. No one detected partial punctuation errors. Only those who detected the punctuation error at the beginning of the first round of reading detected this error while performing individual tasks.

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5.2.3. Reading for retrieving information

iOS 7 and Business and *iOS 7 and Developer* were chosen to investigate reading patterns for retrieving information. As the titles indicate, the content of this reading section was more technical than others, which means readers have limited background knowledge that they could use to comprehend the web page. The heavy-reading group detected an average of 3.5 errors, as opposed to 0.7 for the light-reading group.

Mistranslation errors caused by using the formal equivalence approach generated convoluted sentence structures, which contributed to the highest detection rate in both groups. All participants in the heavy-reading group and four participants (P12, P13, P15, and P19) out of ten in the light-reading group detected Mistranslation errors. It seems that mistranslation errors affect the readers greatly when the errors are located in meaningful sentences and when the content is not familiar to the readers.

One interesting finding is that three participants (P15, P19, and P20) in the light-reading group gave up reading, due to a high frustration level coming from mistranslation errors. They completely lost interest in reading the web page when they were not able to make sense out of the sentences after just two tries. Having no non-textual elements as references also contributed to discontinuance in reading. On the other hand, the heavy-reading group was very persistent. They tried to understand the web page to the best of their capacity, and provided formulated answers. Not a single participant gave up on reading. This can be explained in a few ways. First the heavy-reading group had more experience in reading, and their tolerance of such errors had been built over time, whereas the light-reading group had relatively less experience in reading, and less exposure to such errors. Second, the heavy-reading group's goal-driven attitude did not allow the participants to quit until they completed the task.

Country Standard errors using many English words without translation or transliterations of the key concepts added to the difficulties in comprehension and hindered the natural reading flow. Five participants (P01, P05, P08, P09, and P10) out of ten in the heavy-reading group, but only one participant (P19) in the light-reading group, detected the Country Standard error. As explained previously, the tendency of the heavy-reading group to try to understand every single word, as the light-reading group tried to find the big picture of the content, contributed to such differences.

Consistency was another error type planted with maximum exposure in this section. Four different versions of "iOS 7" were used in those two 70-word blocks.

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Whereas all of the participants in the heavy-reading group detected the errors, only two participants (P13 and P15) in the light-reading group detected them. The heavy-reading group considered Consistency errors somewhat problematic and harmful for the reputation of the web page, while the light-reading group simply disregarded them as minor errors or asked if they were different names of iOS 7.

Style and Language error detection was made by the same participants in the case of the heavy-reading group, as six participants detected the Style errors and four participants detected the Language errors. However, none of the Style and Language errors were detected in the case of the light-reading group.

5.2.4. Reading for sharing information

The reading for sharing information task exhibited the most relaxed reading patterns in both groups, which triggered the lowest error detection rates. The heavy-reading group detected an average of 1.6 errors, which is significantly lower than other reading purposes, while the light-reading group detected an average of 0.2 errors, which is also lower than other reading purposes.

Even so, Country Standard errors from transliteration were precisely detected by the heavy-reading group, once again, by all ten participants. The light-reading group also showed a relatively higher detection rate in Country Standard, as two participants (P17 and P19) mentioned the errors. I believe the fact that transliteration was planted in a keyword contributed to such high detection rates.

Unlike other reading purposes, the mistranslation error was not caught by any participants in either group. There are a few possible explanations for this: i) readers do not read thoroughly enough down to the word-level if they don't look for specific information, ii) the severity of mistranslation was not high enough, and/or iii) the sentence that included the mistranslation was a flowery marketing-oriented sentence, which readers tend to skip. As explained previously, when the participants felt that they did not have to provide correct answers, their reading became a constant decision-making process. The participants attempted to decide if the word, sentence, or paragraph was worth reading, which seems to have caused skipping in reading.

Style was another error type that some participants caught. The same six participants in the heavy-reading group who were keen on style errors for other reading

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purposes caught the errors in this section as well. No participant in the light-reading group caught the Style error.

Consistency and Language errors were not caught by any participants in either group.

5.3. Hypotheses verification

In this section, I will explain in detail how the test results can verify the initial hypotheses previously proposed in Chapter 3.

5.3.1. H1 verification

The following first initial hypothesis was proven correct:

H1. The heavy-reading group will detect more translation errors than the light-reading group regardless of reading purpose.

The test shows that the heavy-reading group detected 5 to 8 times more translation errors than the light-reading group, regardless of reading purposes. As shown in Chapter 4, the participants in the heavy-reading group detected an average of 3.8 errors whereas the light-reading group caught just 0.8 errors for general reading. For studying subject matter, the heavy-reading group detected an average of 3.5 errors, while the light-reading group detected an average of 0.5 errors. For retrieving information, the heavy-reading group caught 3.5 errors, as opposed to 0.7 for the light-reading group. For sharing information, the heavy-reading group detected an average of 1.6 errors, while the light-reading group detected an average of 0.2 errors. Table 5.1 summarizes the mean for error detection rates for each reading purpose.

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Table 5.1. Summary of mean translation error detection for each reading purpose

	Heavy-reading Group	**Light-reading group**
General reading	3.8	0.8
Studying subject matter	3.5	0.5
Retrieving information	3.5	0.7
Sharing information	1.6	0.2
Overall means	3.1	0.6

General reading had the least difference, while reading for sharing information showed the largest difference between the two groups.

5.3.2. H2 verification

The following second initial hypothesis was proven incorrect:

> H2. The number of translation errors detected will be highest in studying subject matter, followed by retrieving information, sharing information, and reading without a particular task, in descending order.

Initially I assumed readers would not read much, if at all, when no specific purpose was given (general reading). However, as all readings are purposeful by nature, general reading resembled the pattern of studying subject matter, exhibiting the highest error detection rates in both groups. However, given the fact that the reading portion was larger in general reading than in studying subject matter, it would be safer to conclude that general reading and reading for studying subject matter both show high error detection rates.

Interestingly, as Table 5.1 shows, retrieving information triggered the same error detection rate for the heavy-reading group, and an even higher error detection rate for the light-reading group, contrary to my initial hypothesis. However, given the technicality of the assigned reading section for retrieving information and the high severity of mistranslation errors, the average detection rates leave room for argument and adjustment.

It was very clear that reading for sharing information triggered the lowest translation error detection rate for both groups.

For these reasons, H2 was proven incorrect. Instead, the number of translation errors detected did not vary much between studying subject matter, retrieving

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information, and reading without a particular task. Only reading for sharing information triggered clearly lower error detection rates.

5.3.3. Conclusions related to error detection

Error detection was closely related to the reader's critical thinking skills, motivation, and reading method, as well as profession, rather than reading purpose. When the readers' clear goal and motivation are combined with bottom-up approaches (witnessed in the heavy-reading group), the error detection rate was the highest. In other words, when readers' relaxed attitudes with no motivation are combined with top-down reading approaches (witnessed in the light-reading group), the error detection rate was the lowest.

The reason that reading for sharing information showed the lowest error detection rate was that the heavy-reading group, who otherwise used the bottom-up approach, changed the reading method to top-down. It looks as though the change in their goals, from finding correct answers to choosing personal preference, triggered this shift in reading approach. For the heavy-reading group, editing and reviewing (and finding errors) is the daily profession, performing a task involving reading activities seemed to make the participants become mentally ready, consciously and unconsciously. I suspect this mental preparedness triggered an automated reading process. This automation and mental preparedness appears to have contributed to their critical and goal-driven behavior.

For light-reading group, whether the task involves finding *correct* or *accurate* answers does not seem to affect the reading attitudes much. The light-reading group showed more relaxed attitudes when reading for sharing information, but overall they showed relaxed and casual reading patterns compared to the heavy-reading group. As their professions (chef, developers, military official, project manager, etc.) do not involve heavy or critical reading, such mental preparedness or automation process probably did not exist, and this contributed to consistently casual reading.

As previously explained, different reading purposes triggered different reading patterns in linearity, thoroughness, dependence on textual and non-textual information, cognitive process, and critical thinking. However, translation error detection was more related to the individual reading habits rather than reading purposes. For example, four participants (P01, P08, P09, and P10) in the heavy-reading group consistently found

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translation errors whereas three participants (P16, P17, and P18) in the light-reading group consistently found no errors.

5.4. Other qualitative findings

The test revealed many unexpected findings that I did not foresee. The most pervasive finding was how authority affected readers, especially in the light-reading group. A second finding was how low the tolerance level in the light-reading group affected the reading. A third finding was how and when the heavy-reading group lost their critical attitudes. Last finding is the role of pauses in the light-reading group. Each finding will be explained in this section.

5.4.1. Authority

The high degree of trust in the web page affected the participants' positive perception of it among the light-reading group. As previously discussed, three out of the ten participants in the light-reading group showed high trust in the company "Apple," and that trust carried over to the content of the web page. These participants did not find a single error in any of the content. In other words, the trust level among the participants seemed to dominate their perception of the web page. It is notable that only the participants in the light-reading group made this type of comment in relation to trust level. On the other hand, the professions of the participants in the heavy-reading group seemed to prevent them from assuming the authority of the web page. What this implies is that if the web page did not signal high authority, the results could have been different.

5.4.2. Error tolerance level

The light-reading group showed a very high tolerance level of Language, Style, and Consistency, but a very low tolerance level of Mistranslation. This is interesting when compared to the heavy-reading group, which showed high tolerance levels of all errors. Convoluted sentences coming from too-literal translation frustrated some participants in the light-reading group, which eventually made them quit reading. What this means is

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that when sentences are incoherent or just hard to read, most readers just skip those parts.

5.4.3. Changes in critical thinking

As previously described, six out of the ten participants in the heavy-reading group were highly critical when they were reading for studying subject matter. However, four out of the ten participants lost their critical thinking when the texts were incoherent in highly-technical sections. Instead of blaming the mistranslation, they began confessing how little knowledge they had about the section they were reading. Depending on their familiarity with the subject, the participants in the heavy-reading group seem to change their critical thinking. It is also possible for a cultural factor to contribute to such attitudes. Koreans, just like people in many other North East Asians, are particularly likely to find the cause of trouble to be within themselves than in others. Nevertheless, technicality of the web page, subject familiarity, and task completion seem to be the main factors in changing critical attitudes in the heavy-reading group.

5.4.4. Role of pauses

Regardless of reading purposes, the heavy-reading group showed no or few pauses, whereas the light-reading group generally showed more and longer pauses. This tendency was consistent for all reading purposes. Interestingly, despite the lack of linearity, thoroughness, and critical analysis of the content in the light-reading group, it has to be noted that the level of understanding was similar between the two groups given the answers to each question. This means that the light-reading group has its own way of compensating the shortage in linearity, thoroughness and critical thinking. The research showed that the light-reading group used more pauses for longer periods of time and more frequently. The pauses were used to anticipate, analyze, and summarize the content of the web page, which contributed to the high level of comprehension among the light-reading group.

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This last chapter will conclude the research in a few separate sections. Section 6.1 will summarize the general findings based on initial questions, 6.2 will describe shortcomings, 6.3 will explain the recommends for the localization industry, and 6.4 will suggest future research ideas.

6.1. Summary of findings

My research began from curiosity about the extent to which readers actually read web pages, and what things they read, especially when the web page is translated. There has been increasing research on how to improve usability and bring excitement to web sites in terms of web design. However, there has not been much research on how users read translated web pages, or how translators read translated web pages. My research has aimed to examine reading pattern differences between the heavy-reading group including translators and the light-reading group, and also the effects of different purposes, and has been able to show clear results.

6.1.1. Occupational differences

In order to compare occupational differences in reading patterns of translated web pages, the research used two reading groups: the heavy-reading group, whose participants are reading professionals such as translators, editors and proofreaders, and the light-reading group, whose professions do not involve intensive reading, such as chefs, engineers, and military personnel. The reason why the heavy-reading group included editors and proofreaders, in addition to translators, is because most translators are deeply involved in editing and proofreading, and those three tasks are not separable in many cases, given the nature of the translation and localization practice, at least in the United States.

Regardless of reading purposes, the heavy-reading group generally showed a linear and thorough reading pattern, with critical attitudes and no or few pauses,

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whereas the light-reading group generally showed a circular and not-thorough reading pattern, with non-critical attitudes and more and longer pauses. This tendency was consistent for all reading purposes. Thus, the general finding is that those who read professionally read differently, compared to those who do not.

Interestingly, there seems to be a trade-off among all the factors mentioned above, especially between the presence of critical thinking and pauses in regard to comprehension. Despite a lack of linearity, thoroughness, and critical analysis of content by the light-reading group, it has to be noted that that the level of understanding was similar between the two groups, given their answers to each question. This means that the light-reading group has its own way of compensating for their lack of linearity, thoroughness and critical thinking. The research showed that the light-reading group had higher dependence on non-textual information such as graphics, and used more pauses for longer periods of time and more frequently. The pauses were used to anticipate, analyze, and summarize the content of the web page, which contributed to the high level of comprehension among the light-reading group.

Nevertheless, the result does not overlook the fact that all the participants in the heavy-reading group had degrees in translation and they have learned, at schools and in industries, how to describe and enunciate translation errors, which seems to be closely linked to their use of critical analysis.

The linearity and thoroughness of the heavy-reading group was reconfirmed with the number and types of translation errors. The heavy-reading group found 5 to 8 times more errors than the light-reading group, regardless reading patterns. The heavy-reading group found Country Standard errors (transliterations) most problematic, followed by Mistranslations (too-literal translation), whereas the light-reading group found Mistranslations (too-literal translation) most problematic, followed by Country Standard errors (transliterations). Consistency errors were detected only by the heavy-reading group, and only when the errors repeatedly showed up in short passages. The light-reading group rarely detected consistency errors. Language and Style were considered not as important as other errors by the heavy-reading group. Even the parts that the heavy-reading group considered problematic were forgiven as the reading continued. The light-reading group considered the Style and Language errors unimportant. In most cases, they were not even able to detect those errors.

Based on the analysis of research and the above findings, the heavy-reading

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group had a strong tendency to read bottom-up and the light-reading group read top-down for most reading purposes. By definition, *bottom-up processing* is word-driven, whereas *top-down processing* is driven by our knowledge, experience, and intentions. Many studies suggest that experienced readers read top-down and less experienced readers or those who read in foreign languages read bottom-up. In this context, our result can be surprising. However, there is also evidence that excessive top-down processing can hinder doing a specific task and solving problems (Lovrich 2003, 2004), as the readers' anticipation and background knowledge can lead to misinterpretation of written text in top-down processing. Based on this, it seems that the heavy-reading group had learned that bottom-up processing is safer when they are seeking an accurate answer. This also explains why reading for sharing information triggers more top-down reading in both groups.

The research also revealed interesting differences with respect to authority and critical attitudes. Whereas the authority of the ST did not affect the heavy-reading group at all, it gave rise to presumed values among some of the participants in the light-reading group. Those who had a positive impression of Apple immediately linked the positive brand image with the supposed quality of web page. Those participants in the light-reading group assumed that there were not, or could not be, any mistakes in the web page.

In terms of critical attitudes, the heavy-reading group, who consistently showed critical attitudes, in many cases completely lost their critical thinking when the content of the web page was technical. The level of critical attitudes seemed to be determined by the technicality of the content and the reader's confidence level in comprehension. The light-reading group showed absolutely no critical attitudes, regardless of the technicality of the content or confidence level. Interestingly, the heavy-reading group blamed themselves when they were not able to comprehend, as opposed to the light-reading group, which blamed solely the content for the incomprehensibility. This will be further explained in 6.1.2.

6.1.2. Purpose-based differences

The research also studied how different reading purposes affect reading patterns. The participants in both groups completed four different tasks that were designed to activate four different reading purposes: i) reading without a specific task, ii) reading for

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studying subject matter, iii) reading for retrieving information, and iv) reading for sharing information. In order to learn more about how readers perceive the translation errors and to show the relations between the reading patterns and reading purpose, five different types of translation errors, based on the LISA evaluation form, were planted in the web page.

Tests on how different reading purposes affect the reading patterns of these two groups led to many interesting findings. As all reading is purposeful, it turned out that there was no real "reading without a specific task." Such general reading was very much like reading to study subject matter, for both groups, which means when reading occurs with no specific purpose, readers focus on the meaning of what is written. Both general reading and reading for studying subject matter gave the most linear and thorough readings in both groups, although the heavy-reading group read in a much more linear and thorough way, as previously discussed. The heavy-reading group displayed critical attitudes about how the content was written in the web page, whereas the light-reading group showed non-critical attitudes. The light-reading group seemed to have much more fun while reading, compared to the heavy-reading group.

In both groups, reading to retrieve information gave patterns similar to those of studying subject matter in terms of linearity and coverage. However, the critical analysis in the heavy-reading group changed dramatically when the participants encountered technical content combined with too-literal translation, and the troubleshooting tactics associated with the problem also differed between the two groups. Many participants in the heavy-reading group lost their critical attitudes and began criticizing themselves for not being able to understand the content and for not having enough background knowledge. The light-reading group unanimously blamed how the content was written, and some became very frustrated at not being able to understand. As the task called for a specific answer by retrieving specific information from the web page, some participants in the light-reading group became so frustrated that they were not able to do the task. In this sense, the reading pattern for retrieving information shed some light on the interaction between the technicality of the ST and the severity of translation errors. When the level of difficulty is high, the severity of translation errors seems to be perceived more seriously. In this case, the incomprehensibility made some readers in the light-reading group completely stop reading and give up on the task.

As for ways to troubleshoot translation errors and incomprehensibility, the

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heavy-reading group chose to read the content slowly and repeatedly and look for references on the web in many cases, while the light-reading group chose to look for cues within the content by sporadically reading, consulting non-textual elements such as pictures and graphics, or by pausing for an extended time. Overall, the concentration span and error tolerance level were much higher in the heavy-reading group.

Reading for sharing information showed somewhat different reading patterns, as it triggered much less linear and much less thorough reading in both groups. The difference was much larger within the heavy-reading group, as their readings were much more linear and thorough for other reading purposes. When the task did not require objectively correct answers, participants were much more relaxed and linked their background experience and knowledge to the reading. The reading became much more personal in interpreting the information and choosing the content to share. This implies that when the reading takes place in more casual and personal settings, the role of personal experience and background knowledge increases considerably. This seems to be linked to fewer pauses in the light-reading group as well. In terms of error detection, reading for sharing information triggered the lowest detection rates for all the errors, as the reading coverage was much lower in both groups, and the readers were not as goal-driven as other tasks in the heavy-reading group. The participants did the most active research to find more about some words that were not clearly written (intended as Country Standard errors) without frustration, even in the light-reading group.

In-depth analysis of the research suggests that reading purposes do affect the reading pattern of the participants. In particular, whether the reading requires objectively correct answers affects the reading patterns greatly in both groups, but in a different way. The research was able to give some insight into how those reading purposes affect participants' cognitive processes, readiness, and critical and goal-oriented attitudes. The research was also meaningful in that it showed the relation between the severity of translation errors and the technicality of the content.

6.2. Limitations and shortcomings

Designing this qualitative research project was a constant battle with the problem of variable selection. As the difference between the pilot test and the main test shows, my main concern was to reduce to number of variables so as to enable a clear interpretation

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of the results. Nevertheless, the research ended up looking at many variables: readers, reading purposes, and translation errors, which made it difficult to construct the test. In the end, the research design was robust enough, since it gave clear results, and the results were relatively easy to interpret. However, in spite of careful design and constant effort to simplify the test design, a number of shortcomings were found as the test progressed. The following sections point out each shortcoming.

6.2.1. Number of participants

As the test aimed at examining general reading patterns qualitatively and there were time constraints, I assumed 20 participants, ten in each group, would be enough. It was enough in that each group showed meaningful results in a consistent way. Nevertheless, some unexpected yet interesting factors, such as frustration level and authority, were found in some participants, which was worth investigating. However, due to the small number of participants, it was difficult to further investigate and generalize those findings. More generally, a larger number of participants could have made the research more compelling overall.

6.2.2. Interaction between the severity of translation errors and technicality of the start text

Even though there is no single way to determine the severity of translation errors, as previously mentioned, I tried to design the errors at similar levels. However, when the test was implemented, some errors were perceived as being much more serious than others, especially when the technicality of the content was high.

This means that I overlooked the interaction between the technicality of the content and the severity and frequency of errors, which resulted in excessive frustration levels among the participants in the light-reading group. Some participants quit reading; others planted translation errors were undetected, as they did not even read the content. Given the fact that the results for this specific reading pattern were consistent with other reading patterns within the light-reading group, I assume that the results would not have not been very different. However, the interaction between the content technicality and the severity of errors should have been considered carefully to avoid statistic distortion.

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6.2.3. No consideration of translator training

All the professionals in the heavy-reading group had earned Masters degrees in translation and/or interpretation. The training they received was intensive and extensive in both practice and theory, which means the heavy-reading group participants had received training on how to find errors, and more importantly, how to accurately describe the errors. Such training could have had a significant impact on the participants' TAPs. My research described the ability to detect and precisely describe issues such as critical thinking or analysis, but those descriptions might be the results of intensive translation error finding practice. In other words, the participants in the light-reading group could have noticed something strange (errors) but were not able to articulate or verbalize it or thought the degree of strangeness was not great enough to merit verbalizing.

As the relations between critical thinking and translator training is not the main focus of my research, and I did not have any self-taught translators without training, I did not investigate this issue further. However if the participants had had different backgrounds, the results could have been different. If I foresaw this issue before designing the research, I could have had a good mix of self-taught novice translators and trained translators.

6.3. Recommendations for the localization industry

6.3.1. Understanding readers and their reading patterns

As my research shows, ordinary readers do not read the content of a web page in most cases. Even when they have to read the content for a specific purpose, they skip a great deal of information and try to find a clue by reading sporadically and relying on non-textual elements. In other words, ordinary readers try to avoid reading as much as possible, consciously and unconsciously. As their web readings are mostly top-down, their recognition of the authority of web page, personal experience, and background knowledge take on a much greater role in their reading. For example, if the web page is published by a world famous company that the readers are aware of, a great web design

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and good graphics might be enough to deliver the content of the web site. In that case, the role of translation can be minimal, regardless of its quality. What this suggests to the industry is that web design and quality non-textual information are much more important than language to ordinary users. However, the industry should not forget that ordinary readers' presumptions are based on authority and personal experience. Even one significant error, when noticed, can undermine the illusion of authority, and can do so across the whole brand.

6.3.2. Error-free translation vs cost-effective process

Many IT companies with good reputations, such as Apple, spend an astronomical amount of money to translate, review, and proofread their products. Such efforts are made whenever products are designed, built, and upgraded. Even the smallest string changes or updates such as adding or deleting a period are reviewed repeatedly. The reason for the intensive reviews is to make the translation error-free, rather than to increase the usability or quality.

There are a few reasons for this. First, there are many different ways to determine what is quality translation. Discussion about how to increase usability and translation quality can open the door to personal and preferential debates among translators, editors, and proofreaders. Those debates are often time-consuming, and, what is worse, fail to suggest one version with which every party can be satisfied. Second, errors can be used in the blame game. Given the corporate culture in the U.S., where employees are often fired for their mistakes or similar reasons, those who are in charge of any kind of localization project always take the most conservative approach, so that they can be out of the circle of the blame game. The easiest way of doing that is to eliminate errors in the product. Exactly the same logic applies to translators. Translation is often to blame when there is an issue. To avoid such criticism, translators also try to provide error-free translation, so that reviewers cannot point out mistakes.

Producing error-free translation is certainly desirable and even noble. However, according to my research, ordinary readers do not even know if there are errors unless the errors are so severe that the readers cannot continue reading. There are, of course, groups of people who will always be keen on spotting those errors like the heavy-reading group in my research, but most readers do not see or cannot detect errors on

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web pages. Even if they do, their casual reading pattern easily forgives the errors. The question is now why does the localization industry spend so much money and resources to make web pages error-free? It is perhaps worth discussing how the industry can streamline the review process and reallocate resources and time for a more efficient process.

6.3.3. Contextual translation vs literal translation

There has been a constant tendency in translation and its evaluation practice: a high preference for literal translation and consistency, and low tolerance for contextual translation and style variation, as previously mentioned in Chapter 1. Even those with extensive experience and high reputations in the localization industry have to justify their translations and edits if they choose to consider the contexts and purposes of the target texts more than each word of the source texts. In other words, those who think usability is the single most important factor when doing translation and editing web pages, software, apps, and other forms of localization products are often challenged by client reviewers for not being *faithful* to the ST.

Many factors contribute to this tendency. Translators do not want to take on the burden of reformatting the ST, since they are fully aware that most clients do not appreciate such approaches. As many clients use an evaluation or feedback form based on the LISA standard (Fig 1.1), translators choose to do *safe* translations. In addition, in my personal experience, contextual translation takes a lot more time and effort than literal translation, and requires more linguistic flexibility.

However, my study suggests that when the translation matches the ST closely in format and syntax, disregarding the natural and common structures of the target language, readers are not intuitively able to understand the content, regardless of their degree of experience in reading. Although our professional readers put in their best efforts to make sense of the literal sentences, most "ordinary" readers skipped the problematic parts, either consciously or unconsciously, or completely stopped reading. What this implies is that if the translated content in a web page does not conform to the expectations or anticipations of target readers and/or does not show a clear logical and coherent flow, the content will be overlooked, and will not generate any interest or excitement. This can be a critical issue if the web page is built to sell products, advertise a new release, or simply to communicate with potential customers. Accelerating product

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cycles and the increasing tendency of readers not to read only aggravates the problem.

There should be a clear understanding in the localization industry that contextual translation does not lead to meaning distortion. What it means is that fidelity in translation is to the target users or readers who will actually read the web page in a way to serve the purpose of the translated web page. The widely-used evaluation format should be able to reflect such an approach and should not penalize those who try to translate contextually with usability in mind. The localization industry is changing faster than ever with various translation technologies, but the basic translation and evaluation practice has stayed the same for 20 years. The industry's emphasis on the efficiency of translation only regards the speed, volume, and cost, which is understandable, but what the industry is missing is that times are changing, and so is language use.

6.4. Future research

All reading is personal and purposeful. Reading is strongly linked to readers' cognitive processes in terms of readiness, critical thinking, and goal-driven attitudes, anticipation, and troubleshooting strategies, as well as their personal history and background knowledge. Different reading purposes change reading patterns among readers. My research has demonstrated these relations clearly.

Translation Studies has focused on texts, languages, and cultures rather than on cognition (Jääskeläinen 2000). Examining how the brain works is obviously a complicated process, but O'Brien (2011: 1) explains this is due to the methodological challenges and the need to cooperate with other disciplines such as psycholinguistics and cognitive science, since TS scholars are not experts in science, biology or psychology themselves. However, there has been an increasing number of studies on how translation happens. *Probing the Processes in Translation* (Hansen 1999), *Tapping and Mapping the Process of Translation and Interpreting* (Tirkkonen-Condit and Jääskeläinen 2000), *Triangulating Translation* (Alves 2003), *Looking at eyes: Eye tracking Studies of Reading and Translation Processing* (Göpferich et al. 2008) are few examples among others (see Shreve and Angelone 2010). Still, there has not been much research on how translators read from monolingual perspectives when they do not have to translate.

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Examining how professional readers, including translators, cognitively perceive information from written materials both on paper and on the web can provide insight into many aspects of reading and translation. As previously discussed, there has been some research on the reading patterns by occupational differences and purpose variances (e.g. Jakobsen and Jensen 2008), but my research suggests other findings in regards to how translators and non-translators read differently, and what kind of details are important to translators and non-translators. Among the findings, the changes in critical attitudes, the error tolerance level, the frustration level, and the interaction between the authority and readers' trust level are of particular interest to the industry.

One interesting research question is whether such exceptional reading skills are necessary to do translation as well. If a translator has low reading skills such as were found in the light-reading group, are the translators bound to produce low-quality translation? If the answer is yes, wouldn't it be only the heavy-reading group that will notice the problem anyway? If the answer is no, what would be the point where the readers decide the translation is bad enough that they lose trust in the web page, and eventually develop a negative perception of the brand name? According to my research, consistently low frustration levels among ordinary users and high tolerance levels of errors among translators might compensate for each other and consequently show a certain range around the authority threshold. Determining that point may help companies decide where and how to invest their resources in localizing web pages and potentially other products. Finding answers to the aforementioned questions will also lead to many interesting questions on the correlations between reading skills and translation techniques, and the relations between the threshold in reading frustration and brand image.

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Appendices

Appendix 1. Research Participant Information and Consent Form

Web Reading Pattern Research Prof. Yoonji Choi
1. EXPLANATION OF THE RESEARCH

You are being asked to participate in a "how we read a web page" test for research conducted for Monterey Institute of International Studies in Monterey, CA and the Intercultural Studies Group at the Rovira i Virgili University in Tarragona, Spain. The research is being conducted by Prof. Yooji Choi and will be part of her Doctoral dissertation.

You will be performing usual web reading activities such as logging in with the credentials we provide (no personal information needs to be provided), retrieving certain information, finding specific content, etc. according to the task sheet we will provide. The reading will take place in a natural setting of your choice i.e. your office, your home, or the researcher's testing place.

Your key strokes, sound, and video will be recorded with BB Flashback Express software, which can be downloaded without any viruses or cost from the manufacturer's official web page, http://www.bbsoftware.co.uk/BBFlashBack_FreePlayer.aspx. We have used this software for reading researches in the past. It is considered safe because the software saves all the recorded information on your local computer. It is largely compatible with most Operating Systems, but we cannot guarantee it will work on your Operating System. If you are reluctant to install the software for any reason, you can perform the testing with the researcher's designated computers with the software already installed. After the testing, you will be required to answer a few questions on paper. The testing will take 15-20 minutes.

The recordings will inevitably show your identity as your voice will be recorded. The survey will also have to reveal your identity as we will have to compare the recordings with the survey for analysis. However, only the researcher will have access to the recordings and your personal information will be kept confidential on the researcher's external hard drives until the analysis is complete (approximately 2 years). After the analysis is complete, the external hard drive will be reformatted and all the files will be deleted in an unrecoverable way.

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2. YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW

Participation in this research project is completely voluntary. You have the right to say no. You may change your mind at any time and withdraw. You may choose not to answer specific questions or to stop participating at any time. Whether you choose to participate or not will have no effect on your grade or evaluation.

3. COSTS AND COMPENSATION FOR BEING IN THE RESEARCH

There will be no compensation for being in the research.

4. CONTACT INFORMATION FOR QUESTIONS AND CONCERNS

If you have concerns or questions about this study or how to do any part of it, you can contact the researcher Prof. Yoonji Choi at the Korean Department of the Graduate School of Translation, Interpretation and Language Education, Monterey Institute of International Studies, 460 Pierce ST, Monterey, CA 93940 (Phone No: 831-643-3549, Email: yoonjic@miis.edu)

If you have any questions about your status as a participant in a research project, if you would like to obtain information or offer input, or if you would like to register a complaint about this study, please contact the Middlebury-MIIS Institutional Review Board at IRB@middlebury.edu

3. DOCUMENTATION OF INFORMED CONSENT

Your signature below means that you voluntarily agree to participate in this research study and you grant permission for the evaluation data generated from the above methods to be published in dissertations and future publications by the Intercultural Studies Group and Monterey Institute of International Studies. If you agree, please sign below and mail the form to Assistant Professor Yoonji Choi, Korean Department of Graduate School of Translation, Interpretation and Language Education, Monterey Institute of International Studies, 460 Pierce ST, Monterey, CA 93940 or place a digital signature and email the form to yoonjic@miis.edu.

_____

Research   Participant   (Name   and   Signature)

_____

Location, Date

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Appendices

Appendix 2. Task Sheet

You have been asked to complete this survey as part of a research project conducted by Prof. Choi, a faculty member at the Middlebury Institute of international Studies at Monterey (MIIS). The research project is designed to study how you read on the web. The test is designed to examine your reading pattern when you have different reading purposes. There is no exam, which means there are no right or wrong answers.

Your responses are entirely voluntary, and you may refuse to complete any part or all of this survey. By completing and submitting the survey, you affirm that you are at least 18 years old and that you give your consent for the researcher to use your answers in her research. If you have any questions about this research before or after you complete the survey, please contact Prof. Choi at yoonjic@miis.edu or 831-643-3349. If you are a MIIS student, and have any concerns or questions about your rights as a participant in this research, please contact the Chair of the Middlebury College Institutional Review Board, Michael Sheridan, at 802-443-3382 or msherida@middlebury.edu.

Before you begin the experiment

Download and install the recording software (If you already have BBFlashBack program on your computer, you can skip this step).

Please go to http://www.bbsoftware.co.uk/BBFlashBack_FreePlayer.aspx and download BBFlashback Express on your computer. The software will be used to record your voice and key strokes. It will send you the download link on your computer. Or click http://ds.bbsoftware.co.uk/dp.aspx?link=c14ea1f00d0b49b0a0ab6cc6c03b6024&lng=en to begin the download.

Install the software. You can either register or just continue without registration. Choose to record your voice and fullscreen. Video recording is not required.

Click the red dot (recording button) at the bottom. It will now record your voice and key strokes. Try to speak and browse any web page for about 30 seconds and see if the software recorded your activities correctly. If it did, you are ready to move on. If not, please let me know.

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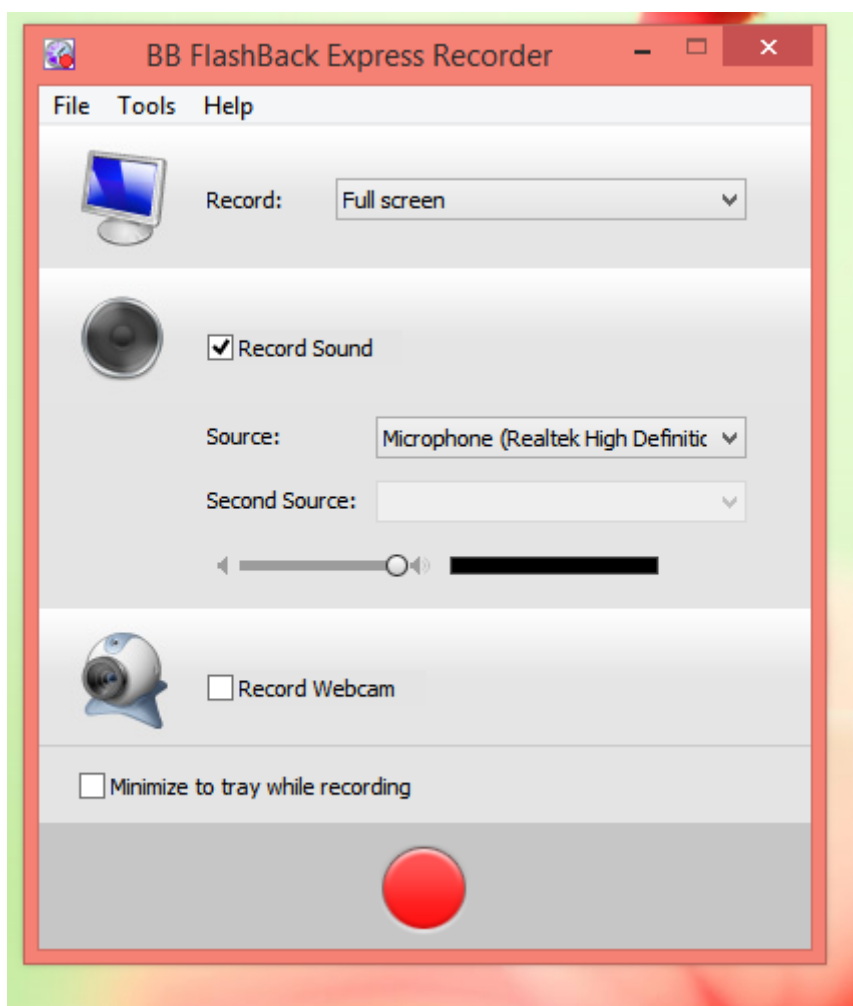
If you are ready, go to the next page.

Appendices

Appendix 3. Survey (used for pilot test)

1. What is your gender? Male   Female
2. What is your age?
3. What is your profession?
4. How may we contact you? Please provide contact information.

Task Instruction

We will use Talk-Aloud Protocol, which means you verbalize all your activities and whatever comes to your mind, as I explained. I understand this is not natural and might feel awkward, but try to speak while you read.

1. When you are ready, begin a recording using BBFlashBack.

2. Visit http://www.est-translationstudies.org/apple/korean/Apple_iOS7_korean.html.

3. Please read through the web page in a casual way from the beginning to the end just to familiarize the idea. Please verbalize whatever comes to your mind.

4. When you are done, answer the following questions. You can always go back and reread as many times as you wish. Please verbalize whatever comes to your mind. Please remember that this experiment is not designed to see if you answer the questions correctly. There are no incorrect answers.

Q1. What are the overall new features in Camera and Photo with iOS7? Do not copy and paste the answer. Please write it down based on your own understanding.

Q2. Which devices are compatible with iOS7?

Q3. If we ask you to choose a certain part to post on the web on your SNS, i.e. FaceBook or Twitter, which part would that be? Please copy and paste the area, and rewrite the content as you would post in the real world.

Q4. Did you find that the web page looks linguistically professional? If not, please explain.

Thank you very much for your participation.

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Appendix 4. Survey (used for main test)

1. What is your gender? Male   Female

2. What is your age?

3. What is your profession?

4. How may we contact you? Please provide contact information.

Task Instruction

Important: We will use Talk-Aloud Protocol, which means you verbalize all your activities and whatever comes to your mind. I understand this is not natural and might feel awkward. Please watch one minute video on how TAP is used in verbalizing the thoughts at the following addresss: http://s3.amazonaws.com/media.nngroup.com/media/editor/2014/08/18/thinking-aloud-demo.mp4.

1. When you are ready, begin a recording using BBFlashBack.

2. Visit   http://www.est-translationstudies.org/apple_2/korean/Apple_iOS7_korean.html.

3. Please read through the web page in a casual way from the beginning to the end just to familiarize the idea. Please verbalize whatever comes to your mind.

4. When you are done, answer the following questions. You can always go back and reread as many times as you wish. Please verbalize whatever comes to your mind. Please remember that this experiment is not designed to see if you answer the questions correctly. There are no correct answers.

Q1. What are the overall new features in Camera and Photo with iOS7? Please verbalize your answer.

Q2. How does iOS7 help business and developers? Please verbalize your answer.

Q3. If we ask you to choose a certain part in Apple Carplay to post on the web on your SNS, i.e. FaceBook or Twitter, which part would that be? Please verbalize your answer.

Q4. Did you find that the web page looks linguistically professional? If not, please explain.

Thank you very much for your participation.

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