ANALYSIS ON WEBSITE DESIGN USING USABILITY PRINCIPLES

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Abstract

Although Internet booking system has reached its peak in the recent years many previous researches say there is always a growing interest in the role and nature of design in HCI principles. Small difference can create a large impact in the business of Internet booking system. The future of any online booking system will be heavily depended on how easy and how friendly the system is designed. In our thesis, we are going to suggest what aspects of usability principles are important in making the user interface of current flight booking systems to reach a high degree of usability. For the above purpose we will find usability flaws in the current user interface design of flight booking systems and highlight the potential factors or aspects that make user interface more acceptable to users. To reach this purpose we will use a case study and analyze using an explanation building technique. The empirical data was collected through satisfaction questionnaire which was based on nine “preset tasks” which are designed depending on various usability principles. In our thesis, we will create an understanding on the aspects of usability principles used to make a user interface more acceptable to the users. This understanding will lead future researches in the betterment of interface design of flight booking system.

Keywords used: HCI Principles, User Centered Interface design, Usability Principles.
Thanks to Almighty

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Regards
Manojbabu & Santhoshganapathy
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1 INTRODUCTION

1.1 BACK GROUND

In the technological world, the Internet plays a vital role in the day-to-day life of every human being. The usage of Internet was commenced in different departments like social communities, online educational systems, organizational curriculums and online reservation systems for example trains, flights, cruises, buses, theatres etc. From the above listed departments online reservation system is a special area, where travelling has always been a daily duty to all humans in different perspectives. Therefore, a very high competition lies in the business of Internet booking systems. An Internet booking system customs user interface as interacting software and many researches takes place in this field, where the websites are checked periodically using the appropriate usability principles.

The evolution of a computer reservation system has made a significant change in the airline industry such as airlines independent websites (i.e. Ryanair, Easy jet etc.), websites operated jointly by airlines (i.e. Momondo), online travel agents (i.e. Travelocity) and traditional travel agents websites. These different types of airline booking websites use different perspectives of usability principles to interact with the users. (Sherlock & Ghismar, 2006). A good design of website makes the interaction easy and less mistaking guidance to the users. So the usability research of website design becomes particularly important and a crucial department in an online booking system.

There are many research areas, which can give a contribution to website design study of online booking system. Therefore, we have many related theories to understand. They are human computer interface, Interaction design principles and Usability concepts but all these theories come under the subject area human computer interaction. To create an effective understanding of the usability of website design it is therefore necessary to use all ideas of Human computer interaction. There are also previous researches particularly focused on website design of online booking system. Sebe (2005) has studied that users must clearly understand the expression and needs of input language and output language of the website designed. To create understanding of both these languages, he concludes that we need standard approaches or principles to make functions concise, understandable with proper feedback channels. Cooper (2003) has studied website design and concludes that the key to realize on the usability of website is understood, by evaluating the needs of the users and design the actual provided function. This study also supports our focus on website usability.
A specific scientific area of our study is human computer Interaction. This area is relatively old where the researches are continued, periodically to maintain the user’s expectation and satisfaction were a small difference could create a large impact on the business of online booking system. Chao (2009) has studied about the user focus and active user participation principle on website design and concludes especially that this principle of User centered approach may enhance the user satisfaction. Norman (2006) studied that through the aesthetic visions, the designers should give a resolution to users from the emotional level, which will improve the user’s cognitive efficiency. All these studies support my focus on usability of website design of a flight booking system.

As stated above usability on user interface design plays a vital role in an online booking system. Informatics can be seen as the study of structure, behavior and interaction of natural and artificial devices. (Judith, 2008). In our case artificial device are websites of online reservation system and natural device is a traditional paper and pen method of natural booking system. Therefore, the study between artificial and natural booking systems can create a large number of opportunities in IT. One challenge in our field is to determine how far, principles derived from the natural booking systems are applicable to the development of online reservation system. Another challenge is to explore the many ways in which the information systems of website usability can help to solve problems faced by the Online booking customers. The research on the usability of website design and their implications on the online booking systems are of great relevance to the scientific field of informatics.

In general there are many airline booking websites, but what interns the user to choose a particular website for booking tickets. According to Mushtaq, Sulaiman and Lovisach (2010), the ability to respond to change in use situation makes the user choose a particular website for booking. There are also some critical factors in the website design of flight booking systems where the user should feel a good visual rather than annoying visuals. (Safavi, 2009). The above issue is analyzed for an airline-booking website using usability principles, which leads to the problem statement.

1.2 STATEMENT OF PROBLEM

Many Internet booking systems have a low degree of usability (Safavi, 2009). User experiences problems while interacting with the websites of an online reservation system. For example, during the booking process, some of them give unclear error messages while performing navigation feature on the booking process. In a flight booking website the visual features like colors, graphics, extra images, appropriate fonts sizes etc may increase the response time, page
download speed of the system. The user experiences frustration, which will in turn affect the usability of websites (Deborah & Patterson, 2005). Internet booking systems are virtual booking systems where the websites acts as a human for selling tickets. This implies the importance for researches periodically on the usability of an online booking website, where small difference can create a big impact in the business of online booking systems. (Wilkins & Nyamapfene, 2009). Therefore, we are going to perform a case study research on Ryanair website for the above problem statement.

1.3 RESEARCH QUESTIONS

The intention of the main research question is to suggest what usability aspects are important to consider when designing the website of an online reservation system. This is going to be achieved by first figuring out the usability flaws in a current website design by using usability principles. These flaws will be analyzed with website design principles to reach high a degree of usability. This makes us know which usability aspects affect the website to reach a high degree of usability.

What usability aspects are important to consider when designing the website of an airline reservation system to reach a higher degree of usability?

Sub questions

1. Does the design of current airline booking website contain major usability flaws?

2. How can the website design of an airline booking system reach a higher degree of usability?

1.4 RESEARCH PURPOSE

Many airline booking websites have a low degree of usability in the use situation. Many users experience problems when interacting with the websites of airline reservation systems because the systems have not been designed using appropriate usability principles. (Safavi, 2009). Therefore, in our thesis we would like to find out, what usability aspects are important to consider when designing the airline website to reach high degree of usability. Therefore, our research will create an understanding of some important usability principles that enhances the usability of a current airline website to reach a high degree of usability.

1.5 TARGETED GROUP

- Our target groups are professionals who design the website of airline reservation system.
Travel agencies, who want to know what usability aspects are important for developing a leading airline websites.

Business analysts who needs to analyze the business strategy on airline reservation system.

People who work in informatics field i.e. Information Systems of online reservation system.

Future researchers on website design of airline reservation systems.

But in our research as we have particularly analyzed the usability of Ryanair website with a case study, they have become our major target group.

1.6 **DELIMITATION**

Due to time constraints, a single case study has been done and we have focused only the major usability flaws on the website design of an airline reservation system.

Transaction processing pages of an airline booking website also have not been analyzed.

1.7 **EXPECTED OUTCOME**

Our findings will provide what usability aspects need to be improved when designing the website of an airline reservation system to reach a high degree of usability. The result of our main research question will provide how these usability aspects manage to be more effective in getting the potential, of the customer into the booking process with less confusion and friction i.e. making the website more usable and highly versatile. Our analysis when implemented may increase the usability of an airline-booking website.

1.8 **STRUCTURE OF THESIS**

**Introduction:**

In this chapter, the background leads to the statement of problem followed by the research questions and the research purpose, which argues for their relevance in connection to informatics. We present delimitation i.e. boundaries to our research. In this section, we also present our own experiences and the result that we expect in our research.

**Research Design:**

In this chapter, according to our research purpose the research perspective is chosen with an argument for the respective research approach. This in turn leads to the research strategy where
the data is collected, analyzed and validated. To explain in brief about our research strategy various methods for conducting research are explained and arguments for choosing a particular method are presented.

**Theoretical Study**

In this chapter, the framework theories that are used for analysis are presented. Some general, systematic theoretical principles with previous researches have been briefed in the earlier sections of the chapter. The concepts of the briefed principles are explained in detail on the later chapters. At the end of this chapter, a summary of theoretical findings is presented. The theoretical findings leads to the theoretical framework designed for analyzing data in chapter 5.

**Empirical Survey**

In the empirical part of the study, the usability evaluation of an airline reservation system i.e. Ryanair website is verified through user’s tasks with interviews. Also the factors and characters of the participants are identified through email interviews. These interviews uses questionnaire as a tool for collecting data. Finally, the results are shown using graphs and pie charts.

**Analysis and Result**

The results of the empirical study are analyzed using the theoretical framework emerged from the theoretical study and the results are tabulated.

**Discussion**

In this chapter, the conclusion for our research purpose will be presented. A discussion on the implication of the result for informatics is also performed. Results are evaluated to maintain the quality of research and the ideas of continued research are presented at the end of our thesis. The below diagram represents the structure of thesis
Figure 1: STRUCTURE OF THESIS IN A DIAGRAM
2 RESEARCH DESIGN

The quality of any research can be determined only by a better understanding of the research design. In this chapter, we will outline a research design or set of procedures for the knowledge that we would like to create in this research. This chapter also explains the initial stages of our research and embosses the importance of choosing a particular research approach and a strategy with the necessary arguments.

2.1 RESEARCH PERSPECTIVE

The character of the knowledge that will be created can be of different kinds. In our thesis, we would like to create an understanding for some important usability principles that could be used to enhance the usability of a current airline-booking website in the use situations. Therefore, the character of knowledge is primarily aimed towards comprehension. Normally knowledge of this kind will answer questions about “what” something instead of explaining “why” something is the way it is. (Lind, 2005). The understanding character in our research purpose therefore embodies the decision-making on knowledge strategies.

There are two main scientific perspectives positivist and hermeneutics. Since our research objective is to create a comprehension knowledge through sound interpretation, hermeneutics is the most relevant approach because it aims at interpreting and explaining meaningful concepts. (Gilje & Grimen, 1992). Interpretive researches are based on theory that access to representativeness (Given or socially constructed) is only through social constructions such as language, shared meanings and consciousness. The philosophical base of interpretive research is hermeneutics and phenomenology. (Boland, 1985). An interpretive study usually tries to understand phenomena through the meanings that people consign to them. The interpretive methods of research in Information Systems are "aimed at producing an understanding of the context of the information system and the process whereby the information system influences, and is influenced by the context". (Walsham, 1993).

According to Forster (2007) "hermeneutics" is the theory of achieving and understanding of texts, utterances and so on. The Text has a meaning which is independent of interpreted object, and researchers who consider interpretation as a condition for all understanding. (Rudestam & Newton, 2001). Bernstein (1987) has stated that she cannot study a concept unbiased because it is not possible for human beings to think in a construing and uncomprehending manner. So, text
is thus not limited to the meanings that the author was aware of but reaches beyond that. (Nystrom, 2002).

The idea of a hermeneutic circle refers to the dialectic concerning the understanding of the text as a whole and the interpretation of its parts, in which explanations are guided by anticipated descriptions (Gadamer, 1976). It follows from this, that we have an expectation of meaning from the context of what has gone before. The movement of understanding "is constantly from the whole to the part and back to the whole" (Myers, 1997). As Gadamer explains, "It is a circular relationship. The anticipation of meaning in which the whole is comprehended becomes explicit understanding in that the parts which are determined by the whole, they also determine this whole" Ricoeur suggests "Interpretation is the work of thought which consists in deciphering the hidden meaning in the apparent meaning, in unfolding the levels of meaning implied in the literal meaning" (Ricoeur, 1974).

The perspective of Gadamer requires that the reader perceives the text as true to reach an understanding. This seems to exclude a more critical approach in our research. Therefore, we do not choose this perspective. Ricoeur’s perspective means that the text creates a symbolic world that we can take in and understand (Lind, 2005). To understand the empirical as well as the theoretical material it may also be necessary for us to take a closer look at the situation and the conditions present when the texts were created. We therefore choose Ricoeur’s perspective on hermeneutics.

If hermeneutic analysis is carried out in an informatics study, the object of the interpretive strength becomes one attempt to make sense of the organization as a text-analogue. During booking process in an airline-booking website, users can have confused, incomplete, cloudy and contradictory views on many issues. The aim of the hermeneutic analysis becomes one of the trying attempts to make sense of whole, and the relationship between user, the organization, and information technology.

In qualitative approach, the researcher makes knowledge claims depending on constructivist perspectives (i.e. multiple meanings of individual experiences and theories socially and historically constructed) or advocacy/participatory perspectives or both. (Creswell, 2003). In this approach, the researcher develops themes that are based on open-ended, emerging data collection. This approach also uses strategies of inquiry such as narratives, phenomenology’s, case studies, grounded theory studies or ethnographies. (Creswell, 2003). In regard to our paper, comprehension knowledge is well developed using theoretical study. As our research purpose is heavily depended on the understanding character, we will carry our research in an explaining text
rather than proving it with mathematical verification. This congruently shows that the qualitative research is our suitable approach where the problem area is made clear as well. A combination of theoretical study and qualitative research method gives us factual figures that help to create deeper understanding of the situation.

<table>
<thead>
<tr>
<th>QUANTITATIVE</th>
<th>QUALITATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role of theory</td>
<td>Deductive approach, testing of theory.</td>
</tr>
<tr>
<td>Theory of knowledge</td>
<td>Inductive approach, generation of theory</td>
</tr>
<tr>
<td>View of social reality</td>
<td>It is objective and measurable</td>
</tr>
<tr>
<td></td>
<td>It is something constructed by people</td>
</tr>
</tbody>
</table>

Table 1: DIFFERENCES BETWEEN QUANTITATIVE AND QUALITATIVE (Spartt & Robinson, 2004)

2.2 RESEARCH STRATEGY

In this section as decided above, our thesis follows a qualitative research approach, it is necessary to turn into the research strategy for collecting the required data. A research strategy is defined as a box of collecting, analyzing and validating the collected data in a systematic process. Research strategy may use research question to lead the whole performance in the selection of source and types of information (Cooper, 2003). Since, Yin has a vast handling in case study researches we have used his books as our major reference. The research can be available of three different kinds. They are exploratory, descriptive and explanatory. Exploratory research develops knowledge of the research problem which is not well known or the real problem area is not clearly identified. This study also reviews the research problem and builds suggestive ideas. (Yin, 2003). Descriptive research develops knowledge according to the current status of the phenomena what exists in today’s world. (Yin, 2003) In our thesis, we use descriptive research to figure out usability flaws on a current flight booking website. Explanatory research develops knowledge on cause-effect relationships i.e. explaining which causes produced which effects (Chisnall, 1997).
Therefore, we use explanatory research to create understanding on certain website design principles. According to Yin (1994) there are five research strategies to collect data. They are 1. Surveys 2. Case studies 3. History 4. Experiments 5. Archival analysis. Yin (1994) states, the suitable strategy among the five strategies are selected to a relevant research depending on the following conditions.

a) Type of research question posed.
b) The extent of control an investigator has over actual behavioral events.
c) The degree of focus on contemporary as opposed to historical events.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of research Question</th>
<th>Requires Control Of Behavioral Events</th>
<th>Focuses on Contemporary Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>how, why?</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Archival analysis</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes/no</td>
</tr>
<tr>
<td>History</td>
<td>how, why?</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Case study</td>
<td>how, why?</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

Table 2: RELEVANT SITUATIONS FOR DIFFERENT RESEARCH STRATEGIES (Yin, 1994)

Yin (1994) states, that a case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident. According to Yin (1994) the case study is used in many situations to contribute our knowledge of individual, group, organizational, social, political and related phenomena. Not surprisingly, the case study has been a common research strategy in psychology, sociology, political science, social work (Gilgun, 1994), business (Ghauri & Gronhaug, 2002) and community planning. As our thesis, uses a qualitative approach in a hermeneutical perspective for creating understanding on the usability principles. Therefore, we follow a single case study as our suitable strategy. The reason for using single case study in our
research is because multiple case studies leads to cross case analysis, but we plan to use explanation building technique for analyzing case studies. According to Yin (1994) the explanation building technique in the case of multiple case studies may lead to a confusing result and not effective.

- The role of the theoretical study in our thesis is to create an understanding on the concepts used to solve our research questions. i.e. HCI principles in general which covers all our concepts used in our thesis.

- The role of empirical part in our thesis: In the first research question, we would like figure out the usability flaws of an airline-booking website. These flaws are analyzed with the theoretical framework using a case study. To do an empirical study, we need to suggest a sampling for collecting data. The detailed part of the sampling has been explained in chapter 4.2.

2.3 DATA COLLECTION PROCEDURES

Data collection plays a very important role to complete a particular research. According to Denscombe (1998) the data collection can be done in the following ways.

Experimentation

According to Yin (1994) the experimental method involves manipulating one variable to determine whether changes in one variable cause changes in another variable. This strategy is used when the researcher need to evaluate two variables and study their cause-effect relationship. However, in our case the experiment is not a suitable strategy because there is short of control over behavioral events.

Observation

According to Yin (1994) Observation is Systematic viewing of a special phenomenon in its proper setting for the specific purpose. In this participant emotional reaction, deeper insights & context are advantages. Narrow range, loss of objectivity, dual demand leads to an inaccurate recording. This observation does not seem to suit user test with preset tasks where the participant should have full liberty and also the purity of the data should not be lost. (Yin, 1994).

Interviews

Interviewing is a general mean of collecting qualitative data. There are two kinds of interviews. They are “Conversation with purpose” and “person-to-person encounter”. Most commonly used approach is person-to-person encounter interviews. According to Merriam (1998)
there are three different kinds of structures when conducting the interviews they are highly structured, semi structured and unstructured interviews.

Highly Structured: Wordings and order of the questions predetermined.

Semi Structured: Mix of more and less structured question.

Unstructured: Open-ended questions, flexible, exploratory more like a conversational.

As our research strategy, follow a theoretical background we need data to be collected according to our research purpose. To serve the research purpose, we found that the data should be collected in the form of user experiences. We used questionnaire as a tool for collecting data in these types of interviews. This implies that highly structured interviews would be appropriate from the following data collection procedures. Since, we have set preset tasks for conducting user test using interviews which is explained in detail on chapter 4. According to Yin (1994) there is some weakness while conducting face to face interviews, where in some point of time it makes user guided by interviewer and data collected may not be pure. So in our thesis we have conducted interviews through email where the user was given full liberty to answer. There are two types of data collected in our research, primary data and secondary data.

- **Primary data**
  These data are otherwise called empirical data in our thesis. The data collected through interviews are called primary data. These interviews use questionnaire as a tool to collect data. The selection criteria for empirical objects are explained in sample selection.

- **Secondary data**
  The secondary data are data collected from secondary sources, which have been put into triangulation method for validating the data. The secondary sources in our thesis are previous researches and standard principles, articles books etc. (Creswell & Miller, 2000). These are explained in detail in chapter 3.4

**A theoretical study: Text Analysis**

**Literature sampling**

A scientific textbook contains the results of previous research and accepted examples of scientific practice, which is a basis for further research (Kuhn, 1996). Therefore it is important to find such results and examples as a connection to previous traditional knowledge within the area. One sampling method is to state some criteria and use them for choosing literature for the text analysis.
We have stated some criteria and followed those when performing our literature study. Our major criterion is choosing user interface design concepts in the usability perspective and whenever possible we chose universal authors in this field. We will also identify some cognitive authorities within each area and determine that these authorities should write the large part of text used for analysis. The subject areas of our research and the most important cognitive authorities are shown in the figure chapter 3.2.

Theoretical information search

To gather literature for our research, we have searched for material in various databases. For the subject area Informatics we have used Voyager and LIBRIS. The literature sources used in our thesis are the articles published by IEEE and the previous academic thesis presented on universities of Sweden (Boras, Lulea, Lund). We have also found some material relevant for our research on the internet using the search engine Google. Examples of some search phrases that we have used are user interface design, human computer interaction principles and usability principles.

Empirical study: Interviews

We will have open ended interviews using a highly structured setting in order to make the interviewees perform preset tasks. We have selected non-probability sampling, where we would like to choose interviewees with adequate experience in this field. We have sent our interviews a list of airline websites and questions as well as the purpose for the interview and estimated period of time in advance.

Empirical study: Questionnaires

By sending questionnaire, it is not possible to collect data that fully satisfies the research problem because potential data are very expensive. However samples are chosen in particular or some specific criteria’s in the whole population. Since some sample is not exactly representative of the population, from which they are drawn, so the researcher conclusion cannot be generalized to the entire population. According to the nature of our thesis the sample selections for empirical objects are

- We have selected 70 international students doing masters and graduate level programs in the field of informatics, with both international and domestic experiences on flight booking. Since these students are international students, they will have more international flight booking experiences.

- We have selected students at the age group of “18-35” years, because young people are more discovery in internet booking system as when compared to aged people. A research conducted by
AFNOM and TNS Interactive (2005) shows that in a Norwegian survey, 80% of 8-24 years old participants answered that their exposure to e-commerce was only about a day old.

2.4 DATA ANALYSIS

Yin (1994) states that data analysis are used to address the initial proposals of a specified research. Data analysis contains examining, categorizing, tabulating, testing or otherwise recombining both quantitative and qualitative evidence. (Yin, 1994). According to Yin (1994) there are three strategies for analyzing case study evidence. They are

1) Relying on theoretical propositions 2) Setting up a framework based on rival explanations 3) Developing case descriptions

According to Yin (1994) depending on theoretical propositions has suggested strategy for case study. This way of proving research question will be answering the “how” and “why” questions. Any of the above strategies can be applied to five specific techniques for analyzing case studies (Yin, 1994) 1.Pattern matching 2.Explanation building 3.time-series analysis 4.Logic models and 5.Cross-case synthesis. We are going to use explanation-building technique in our research because we have an understanding focus on website usability concepts.

Explanation building:

This is an analytic method, which is in fact a particular type of pattern matching. But the process is more difficult and therefore deserves separate attention .Here the goal is to analyze the case study data by building an explanation about the case. As used in the above chapter, this method is mainly relevant to explanatory studies. But its goal is not to conclude a study but to develop ideas for further study. (Yin, 1994)

Steps of data analysis procedures:

1. Analyzing empirical findings with theoretical framework using explanation-building technique.

2. Comparative analysis of theoretical and empirical findings with explanation building technique and the results are tabulated.

Explanation of Empirical and Theoretical findings:
Empirical findings are the results of interviews conducted using satisfaction questionnaire. Theoretical findings is the framework found in our theoretical study for evaluating usability of the website design of a flight booking system to reach a high degree of usability.

2.5 STRATEGIES FOR VALIDATING OUR FINDINGS

We have used Triangulation method for validating the findings. Triangulation is defined as “the validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study” (Creswell & Miller, 2000). The use of triangulation strengthens the study by combining methods. We have explained our theoretical validation using the below concepts.

- Internal validity
- External validity
- Reliability

2.6 RESULT PRESENTATION METHOD

We will use tables and diagrams to best describe, tabulate and represent our research. We will provide a brief explanation on the tables and diagrams presented in our research results.
3 THEORETICAL STUDY

3.1 KEY CONCEPTS

Usability

Usability is defined as the study in which human made objects are learnt for ease of use. In our research, the usability studies the elegance and clarity with which the interaction with a computer program or a website of an airline reservation system is designed. (Gomez, 2004).

Web Usability

Web usability is an approach in which the websites are designed for easy access to internet users, without requiring him or her to take any specialized training for using the website. (Powell, 2000).

Usability attributes

Usability cannot be studied as a single property where it is a combination of users mental action determined in different perspectives. It is defined as the cognitive study in which the usability is measured. (Nielsen, 1993)

Usability heuristics

These are standard principles universally derived for website design. The objective of these principles is to make the designers understand the user’s needs in the use situations. (Nielsen, 1990).

User Centered Interface Design

It is defined as a process with active user participation periodically during the development of a website. The objective of this approach is that, the total system functions should be designed to meet the user anticipation in use situation. This approach is the main tool for achieving user satisfaction in the E-commerce world. (karat et al., 2003)

Human computer interaction

It is defined as study of understanding the practical experiences with digital artifacts to increase the usability of the website design. The major departments of human computer interaction are interaction design principles, actability, and usability. (Andrews, 2010)
These are the key concepts used in our thesis, which has a detailed study in the chapter 3.5

3.2 SUBJECT AREAS RELEVANT FOR THE RESEARCH

![Diagram](image)

**Figure 2: SUBJECT AREAS RELEVANT FOR RESEARCH QUESTION**

3.3 PREVIOUS RESEARCH

Previous researchers say there is always a growing interest in the role and nature of design in HCI research. (Löwgren & Stolterman, 2004). Online Booking systems have improved very much in the recent years, but still many internet booking systems have a low degree of usability. (Safavi, 2009). This means that many online booking systems are not developed with proper HCI design principles. Human computer interaction has a hierarchical interpretation with these four concepts. They are Concept of Usability, Actability, Interaction Design principles and Graphical User Interface. (Löwgren & Stolterman, 2004).

Usability plays a vital role in the human computer interaction, which embodies the realization of interaction. It is also equally important to evaluate from the user perspective
whether the interface is easy to learn, secure, efficient, promptness and uniqueness is maintained. (Shneiderman, 1997). Many researches were conducted to evaluate the usability of a website. For example: According to Shaclett (2001) 28% of online transaction leads to consumer failure and frustration. 6% of users who leave the website with frustration in mind say, they will never come again and visit the site. So, the usability with all factors in the users perspective must be analyzed throughout the booking process of flight booking system.

While prototyping a few error prone zones in a booking atmosphere are analyzed by usability testing methods. (Chao, 2009). Online booking system uses a user interface for interaction with the users. Powell (2000) stated that usability of user interfaces based on the international standard organization (ISO) as “the extent to which a site can be used by a specified group of users to achieve particular goals with effectiveness, efficiency and satisfaction in a specified context of use”. This means that the degree of usability of a website should be user and task dependent. It reveals how well the user should perform or navigate in a website to explore the situation that should be done efficiently and satisfyingly.

### 3.4 RELEVANT LITERATURE SOURCES

The relevant literature sources used in our thesis are Usability guidelines of web design by Lynch & Horton, 2002 where the usability features of the website design like navigation, Colours fonts, Layout styles etc have been studied. The usability test methods and design principles in human computer interface design by Gong Chao, 2009. These design principles are used to test the usability flaws in flight booking website. Standard usability attributes for evaluating usability of website by Nielsen, 1993. These attributes are universally derived attributes for testing the usability of the user interface design. Usability heuristics for user interface design to reach a high degree of usability by Jacob Nielson, 1990. These heuristics play a vital role to increase the usability on the interface design of airline booking systems. User centred interface design by Preece et al, 1995 where the whole system function of the interface design has been studied. Principles to support usability are the standard principles for evaluating usability of websites. (Dix et al., 1993).

### 3.5 HUMAN COMPUTER INTERACTION

Human-computer interaction concerns with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them (Andrews, 2010). The principal objective of human computer interaction research and design is “People should not have to change radically to ‘fit in with the system’,
where the system should be designed to match their requirements” (Peerce et al., 1995). In our research, human computer interaction deals with the interaction between the user and the website of a flight booking system. In the technological world, the human computer interaction has four modes of interaction and they are explained below. According to Chao (2009) the process of human computer interaction is actually a process of inputting and outputting the information.

**Data interaction**

Data interactions are the ways in which the human communicate with computers. It contains many kinds of information signs such as figures, graphs and colors. In accordance with our thesis, we deal with the website usability. The interaction can be processed by questioning and answering through digital artifacts by selecting menus, filling booking forms, scanning barcodes and other forms. (Chao, 2009).

**Image interaction**

Human are mainly depended on visual systems to interact from outside and then process and subsequently cognize it. So, the important part of image interaction is how easily the computer observes and recognizes pictures. Commonly, this ability can be divided into three stages: image processing, image recognition and image perception. (Chao, 2009).

**Intelligent interaction**

Here computers can predict what users want to do by the intelligent recognition of user’s behaviors and meet their needs, which are the next generation of user interface. (Chao, 2009).

**The principles of usability of human computer interface by (Chao, 2009)**

Principle of Consistency: It allows the human computer interface to be uniform and unitary. So designers must provide feasible and internally consistent environment. (Chao, 2009).

Principle of Concision: It does not mean simplicity. It tells that the interface must not contain any hard understanding elements which are unaware of the user. So that the use efficiency of the interface can be improved and it can be easily operated. (Chao, 2009).

Principle of Memory: It makes the interface easy to understand and more efficient to use, so that the users can operate the interface conveniently. So in order achieve this designer must use the
familiar symbols, objects in particular places and also group objects and functions in accordance to the usual thinking of users (Cooper & Reimann, 2005).

Interaction between humans and computer can be done in many ways, but the interface serves as a crucial in facilitating this interaction. Many applications use only Graphical User Interface, which supports many of the user interfaces that allows humans to involve and work on them in highly versatile environment. The software system functionality helps the designers to favor either the interdependence of the system or the interface. For that, the interface should be well designed and it should support user’s task. The human computer interaction is built for more weapons that are effective during the World War II, which inspired a study of interaction between the humans and the computers. (Dix et al, 2004). This was their main challenge taken up by the researchers. The development of the human computer interaction took place by influencing the field of information science. The technology rise has taken place such that it matches the requirements and the constraints of the task. This is mainly important in computer science and
system design, where it involves in design, implementation and evaluation of interactive computer systems in the users tasks and work. (Dix et al., 2004). The principles and the methods used in human computer interaction helps in assisting the website design of airline reservation system.

**Interaction design**

The main importance of interaction design is a great challenge in finding out what usability aspects requires a product. For this, the designer must know the mental models and other physiological theories and the application of software design. The user interacts with the computer to accomplish the goals and tasks.

**Mental and Conceptual models**

These models are real and imaginary situations. The small-scale models of the reality anticipated events and the structure of mental model represents the users to acquire their interaction and explanation. (Hudson, 2004). Mainly the mental model characteristics are partial, unstable, inconsistent and interpretation of the device (Dix et al., 2004).

The success of user interface metaphor links the computer file manipulation, with the tasks filing in the typical office environment, where the computerised tasks are easier to understand. When they are used literally, complications may arise. Considering an example, if the user wants to delete a file he can drag the file into the wastebasket or recycle bin. If the user wants to share the file for security reasons, this metaphor breaks down and the user cannot drag the file into the recycle bin, where the user must consider twice in recycling. The user can also drag the floppy disk into the rewritable media. The inaccuracy of the desktop metaphor does not detract from its usefulness. The importance of the metaphor helps the user to work with abstraction of computer by providing interface that improves upon the implementation of the system. (Marriott & Beard, 2004).The problem with the metaphor lies heavily with the cultural bias. This cannot be used successfully in the internationalisation of software. (Nanni, 2004). The upcoming concepts which embody our theoretical study are the components of human computer interaction.

**3.6 USER CENTERED INTERFACE DESIGN**

User centered design is defined as the whole system functions must be designed to meet user requirements, user learning and efficient access to user, where ultimate users should feel the system as useful and functional (Karat et al., 2003). Some basic principles of user centered system design are 1.User focus and active user participation 2.Evolutionary development 3.Prototyping 4.Evaluation of real use 5.Integrated design of usability 6.Local process adaption.
These principles are used to keep the users and user issues in the design process for carrying early testing and evaluation with users to make design successful. (Preece et al., 1995). User centered design integrates the usability principles in the design of product and keeps focus on users during project development. (Manzari, 2006).

Figure 4: METHODS OF USER CENTERED DESIGN (Eason, 1992)

The above user centred design is going to be studied with task-oriented perspective because in our research we would like to conduct a usability test and study usability flaws. This type of study can be carried out only by setting a task to the user and recording the experiences of the interface in the use situation. This way of approaching usability principles is called task oriented user centred interface.

Utility of system

According to Preece et al (1995) utility refers to the functionality of system or system efforts to enhance effectiveness and efficiency, which were fundamental aims. The author says that utility of the system refers to how far the objective of the system is been understood by the users in an effective and efficient way. This can be done only by periodically checking the usability of the system. The author also says utility of the system can be achieved by designing a system using task oriented user centered approach.
System safety

According to Preece et al (1995) safety refers its relation to computer systems which has major importance in the design of safety critical systems. According to the author, system safety is much important as many issues being running throughout the research on airline reservation systems. This system safety also plays a vital role where the online customers are very sensitive in these departments. According to the author, 99% of the online bookers never compromise and return to the website when system safety is not appealing.

User interfaces

In the technological world, human interacts with the digital artifacts in day-to-day life. All the digital artifacts are called as user interface. These digital artifacts in our thesis refer to the website. There are many types of user interfaces and they are

- Graphical user interface
- Voice user interface
- Multi model user interface
- Other user interface

Graphical user interface

Graphical user interface makes computing easier by the separation of logical threads through the visual content of the display device. Some of the features of the interface are (Nanni, 2004)

- Visibility of the object
- Replacement of compound languages for direct manipulation
- Incremental action at the interface
- Syntactic corrections of all actions such that every user has legal operation
- Reversibility of all actions such that user can explore the product without severe penalty.

The robustness and direct manipulation interface is demonstrated by the desktop icons present in it. It also indicates the files and folders being visible to the user as icons. The drag and drop operation cannot be performed. Consider an example if the user wants to move the file to different folder, the command must be synoptically correct. If it is misplaced with other
command it is easier to detect and apply the changes to the folder. This subject area continues with research questions followed with the necessary concepts to solve them. (Nanni, 2004).

1. Does the design of current airline booking website contain major usability?

For the above research question, we have firstly studied the usability attributes in detail with the necessary theoretical concepts identified in the literature study. This study will result in a theoretical framework for analyzing the usability flaws.

Usability can be defined as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in specified context of use. (Hallowgrass, 2008).

3.7 Usability Attributes

According to Powell (2000) the website usability is user and task dependent, how well the user is able to accomplish what they set out to do, how efficiently the user can perform that task and how the user is satisfied during and after the process.

According to Nielsen (1993) there are five usability attributes. They are

Learnability

This principle states that the system must be easy to learn and understand where user can rapidly start some work done with the system. (Nielsen, 1993). This attributes of usability should be maintained throughout the design of websites where the first users should be capable of performing the booking. The reliability of this attributes can be evaluated by counting the number of new users who have successfully performed the booking.

Efficiency of use

According to Nielsen (1993) the systems must be efficient to use, to ensure high degree of productivity. So, when the users once experiences the system can easily use it. This usability attribute is mainly focused by the expert user where the expectations of these users are really high. The efficiency of use mainly determines how efficient the website from the expert user perspective. Hence, this usability attribute plays a vital role in determining the website usability.

Memorability

According to Nielsen (1993) this principle states the system must be easy to remember, so if the user returned to the system after some period there is no need to relearn everything again. This
principle makes the user choose a particular websites for booking. The purpose of this principle is therefore to present the complicated interaction of the website to a simple interaction that makes the user remember the process easily. This principle increases the number of repeated customers who choose particular website for booking.

**Subjective satisfaction**

According to Nielsen (1993) to what extent the system is pleasurable to use by the users is considered as subjective satisfaction. So, user satisfaction is important for system success. This attribute means that the images and textual communication used during the booking process should be much relevant in accordance with the objective of the airline website where the user must not be frustrated and move out of the websites.

**Usability requirements:**

According to Shackel et al (1990) the usability components which are identified can be tested and expressed in the following terms.

- **Learnability:** Time and effort taken to arrive at a certain level of user performance. The user's documentation and help should be complete during the booking process. The text should be context sensitive and explain how to achieve common tasks. (Nielsen, 1993).

- **Throughput:** The completed tasks by experienced users and time taken for completing the task and also errors made during the process. This component is responsible for creating statistical findings in accordance with the completion of a booking process. This component of usability increases the reliability of the system. (Nielsen, 1993).

- **Flexibility:** The website actions and elements should be maintaining a consistent level. Error messages should be explained in the sense to recover from the error. Undo should be available for most of the actions. The action that cannot be performed must be shown with the confirmation messages. The system should reach the customizability to a high extent that satisfies the user needs. Basically a style guide can be used. (Nielsen, 1993).

- **Attitude:** The induction of positive attitude by the system on users. This reveals that the first impression of the website should create a good aesthetic vision that builds the positive attitude to the user. (Nielsen, 1993)

Usability requirements are concerned with the satisfaction of the user, the overall performance and achievements of the system (Peerce et al., 1995). Usability requirements can be stated in terms of performance measures, which are called as usability metrics. (Waqar & Yaqoob, 2009).
According to Tyldesley (1988) there are so many factors which can be used in the development of usability metrics. Depending on the form in which the systems to be tested are selected and from that the suitable metrics is chose. (Waqar & Yaqoob, 2009). In the below table there are possible usability measurement criteria which will be used for the measurement of website usability. (Tyldesley, 1988).

![Possible Usability Measurement Criteria](image)

**Figure 5: MEASUREMENT CRITERIA (Tyldesley, 1988)**

According to Waqar and Yaqoob (2009) the principle of usability engineering is to identify the particular criteria which could be used to evaluate a product for its usability. The experience of users of a particular product is a key to measure its usability.

There are 3 phases in usability engineering life cycle (Gomez, 2004) 1) predesign phase 2) design phase 3) post design phase
Predesign phase:

The predesign phase is

- Getting to know the user population and tasks
- Understand the limitations and expectations

Understand the product intended use. It also includes five important usability goals (Nielsen, 1992). They are learnability, efficiency of use, ease of retention, error handling and satisfaction of the user.

Design phase:

The objective of this phase is to achieve a design, which meets user needs based on prototype. It also confirms participatory design and coordinates design that meets the user’s needs. It is understood by users and is consistent and yet offers flexibility. It also includes usability heuristics, prototyping and empirical testing. (Nielsen, 1992).

Post design phase: In this phase, data is collected for next version and future system releases. (Nielsen, 1992).
3.8 **USABILITY PRINCIPLES ON WEBSITE DESIGN**

Usability principles are used for designing a website to reach high degree of usability in the use situation. These principles are standard usability principles used for analyzing E-Commerce systems and are responsible to increase the user satisfaction. This will in turn build the positive attitude of the users during the booking process.

**Unnecessary use of graphics must be avoided**

According to Condos et al (2002) usage of graphics must be done carefully because the website must look pleasant to the eyes of the user and also it must not occupy the main space on screen where the visibility of important information is lost. Unnecessary use of graphics may distract the user from the booking process. It also increases the page down load time and makes the user to wait which in turn makes the user to psychologically change to other websites.

**Make important options visible to the user**

According to Condos et al (2002) the users can complete the tasks successfully if the important menus or links are directly visible to users. This principle says that we have to maintain the objective of the website throughout the booking process like displaying the important links visible to the user. This principle mainly focus on new user.

**Provide clear and meaningful error messages**

According to Condos et al (2002) when an error occurred in the website it must provide a clear and meaningful error message. This principle is responsible for a good interaction between the user and the website. It means whenever the user makes mistakes during the booking process it gives alert messages, which in turn should guide them in a clear and simple way to get rid of problems occurred.

**Avoid dead ends**

According to Condos et al (2002) the links which are not operational must be removed because when the user browsed the link for some certain information and found that information is not available, the user feels unsatisfying. This principle means that the website must be periodically checked for usability and this may result in avoiding dead ends.

**Format and presentation of content appropriately**

According to Condos et al (2002) the content on the websites must be designed and formatted according to specific characteristics which will be suitable for all kinds of users.
generalizability is very important when it comes to the design of online booking websites. It means all users from various ethnic background and different countries use a website for booking. This clearly indicates that principles derived universally for designing an airline booking websites must be used.

**Minimize page download time**

According to Byrne et al (1999) the time required for downloading website pages should be minimized. If the number of bytes per page are minimized page download can be fast (Byrne et al., 1999). Avoiding long home pages with scroll bars may affect the page download time.

**Provide feedback when users must wait**

According to Bouch et al (2000) if the processing is taking time the system status must be shown to the user. During the booking process, the user should know exactly where they are situated. The proper feedback is responsible for a successful booking in an E-commerce.

**Visibility of Home page**

According to Lynch and Horton (2002) the well structured home page must give good impression to users who visit the website. This means the homepage must clearly communicate the site’s purpose and all the major options on the website must be clearly visible to the users.

**Optimize display density**

According to Halverson (2004) to facilitate finding target information on page, the webpage’s must not be too crowded with items of information. This principle says to be precise in presenting the content in your website. This will in turn make the user feel easy to move on with the booking process. Too much of information may affect the human mentality and move out of the page.

**Ensure visual consistency**

According to Adkisson (2002), the visual consistency of website elements within and between web pages must be ensured. It includes size and spacing of characters, colors used for labels, fonts, backgrounds, and location of labels, text and pictures.
Ensure that images do not download slowly

According to Bouch (2000) the images on the website must not slow the page downloading time. To speed page downloading several images must be used rather than a single large image on the page and also designers should minimize the number of colors used in an image.

1.2 How can the website design of an airline reservation system reach a higher degree of usability?

To reach high degree of usability there are many standard principles which should abide, while designing the airline-booking website? A strong theoretical study on the principle will lead to a good theoretical framework design, which can be used as a solid basis for analysis. This is our main motto before creating a theoretical framework.

3.9 GUIDE LINES FOR EVALUATING THE USABILITY OF WEBSITES

Error handling

A system must be designed in a way that the user should not make major errors. If in any case an error is made, then the system should identify the error and provide easy mechanisms for handling the error. When the system is aware and could handle an error automatically, then the system design is said to be highly usable. (Shneiderman, 1998)

Permit easy reversal of actions

This feature will give the user a relief because the user knows that he cannot work without making mistakes. By this, the user can navigate more i.e. navigation of unknown options. Always in the case of booking tickets people use to make mistake, which is a human nature .If the system permits reversal action, it means that the system has better usability. But in today’s world, users expect reversal action in the transaction processing pages where many researches are going in this field of online reservation system. Due to some security and safety factors these rules have not been implemented yet. (Shneiderman, 1998)

Reduce short-term memory load

This rule assists to keep the display simple instead of multi page displays. Sufficient training time should be allotted for codes and sequence of actions. This rule makes the design simple and makes the user interaction efficient and an aesthetic feel to the user .This rule is mainly responsible for creating a user-friendly interface. (Shneiderman, 1998)
Enable frequent users to use shortcuts

According to the frequency of usage, expert users will be satisfied if they had provided with any shortcuts to the make navigation faster. Example: function keys, abbreviations and commands. It is always necessary to have separate short cuts for the expert users because these types of users travel frequently. So shortcut features during the booking process makes the user choose a particular website for booking. (Shneiderman, 1998)

Offer informative feedback

For every action made by the user, there must be a feedback system to record the actions performed. This rule states that after performing an action the user should see the processing of the action with some feedback. The feedback may be represented symbolically or by some alert messages. (Shneiderman, 1998).

Usability Engineering Life Cycle

The usability engineering life cycle offers practical method to attest good user interfaces by placing importance on particular deliverables during the entire software development process (Nielsen, 1992). Usability engineering model stages are accomplished by Nielsen (1993) in the following way to create a website with high degree of usability the website designing should come through all the stages in the usability engineering model.

- Know the user: Individual characteristics, User’s current and desired tasks functional analysis, and the job and users evolution.
- Competitive analysis
- Setting up usability goals.
- Parallel design
- Participatory design
- Coordinated design of the whole interface
- Applying guidelines and heuristic analysis
- Prototyping
- Empirical testing
- Iterative design :Capturing design rationale
- Collecting feedback from field use
By using the below usability heuristics we will solve our second research question by finding which usability principles need to be improved and make the website design more acceptable to the user.

3.10 **USABILITY HEURISTICS AND USABILITY EVALUATION**

Heuristics are design guidelines, which are used to integrate in the design of the products. (Pauline, 2005). There are ten usability heuristics stated by Nielsen (1990) for website design. They are

1) Visibility of system status: This means the system must provide a correct feedback to users about what is happening in the system when their command is processing. (Nielsen, 1990).

2) Use users own language: This means the system must use the user’s own language with words, phrases and concepts that are user familiar. (Nielsen, 1990).

3) User control and freedom: This means user’s generally choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted situation without having to go through an extended dialogue such as undo or redo. (Nielsen, 1990).

4) Consistency and standards: This means that the system must be consistent within itself and also the standards followed in one part of the system must be followed throughout the system. (Nielsen, 1990). For example: If in one part of the system the selection of checkbox button shows a feature is active, that particular standard must be followed through the entire system.

5) Error prevention: The error messages that are helpful to the user are always required. (Nielsen, 1990).

6) Recognition and Recall: This means the system objects, actions and options must be visible to the user so that there is no need for the user to memorize the information contained in one part of dialogue to the other. (Nielsen, 1990).

7) Flexibility and Efficiency of use: The system must be flexible and easy to use for any level of users such as novice user, intermediate users and expert users by providing user manual or online helping to users. (Nielsen, 1990).

8) Aesthetic and minimalist design: The unnecessary information in the dialogues must be removed and also the information that is irrelevant in the dialogue competes with the necessary units of information, which reduce its relative visibility. (Nielsen, 1990).
9) Sensible error messages: The error messages reported must be in the user’s language and must inform about the problem and give a solution (Nielsen, 1990).

Heuristic evaluation:

There are different forms of usability evaluations. They are heuristic evaluation, cognitive walkthroughs with one user or with group of cognitive evaluations and plurastic walkthroughs (Patterson, 2005). Faulkner (2003) States that in any usability evaluations fifteen users are sufficient for test where 90 to 97% of problems can be found. It is a method of usability engineering where a small set of experts or volunteer users evaluate the user interface for design problems by judging its compliance through the recognized usability heuristics. (Manzari, 2006). Heuristic evaluation results will be the list of problems with reference to the violation of actual design principles. (Patterson, 2005).

3.11 PRINCIPLES TO SUPPORT USABILITY

According to Dix et al (1993) there are 3 important principles which support usability. They are

**Learnability**

Learnability relates to the features of the interactive system that allows users to recognize how to use it initially and then how to attain a maximum level of performance. The particular principles that support learnability are as follows. (Dix et al., 1993).

**Predictability**

Predictability of an interactive system refers to how well the user can predict his next step of action with his or her knowledge of the interaction history with the system. The major actions on the website can be limited, where the user is actually required to remember whatever earlier key stroke performed on the system. The user must be able to take advantage of the determinism completely. Therefore, it is not enough for the actions of the computer system to be determined completely from its state alone. (Dix et al., 1993).

**Synthesizability**

Synthesizability refers to the user’s ability to judge the effects of past operations on the present circumstances. Principally, predictability focuses on the user’s ability to find out the consequence of future interaction with the aim to make some sort of predictive model of previous interactions
in order to plan a model of the system behavior. The principle of synthesizability relates to the ability of the user interface to provide a noticeable and instructive account of any related change. (Dix et al., 1993).

**Familiarity**

Familiarity refers to what circumstance the user’s knowledge and experience in real world or computer based departments can be applied while interacting with a new system. For instance, when the word processor was initially introduced, the equivalence of word processor and typewriter were purposefully introduced. The resemblance between the word processor and a typewriter was envisioned to build a new technology more instantly accessible for those who had certain experience with the typewriter. (Dix et al., 1993).

**Generalizability**

Generalizability refers to the support for the user to enlarge the knowledge of a particular interaction within and crosswise application to other related situations. Generally, users try to broaden their knowledge of particular interaction movements to related circumstances. Generalization can be functional to knowledge, which supports to achieve a particular goal or a goal that is some way related with the similar action performed in the website. This increases the generalizability of the website. (Dix et al., 1993).

**Flexibility:** It refers to the multiplicity of ways where user and system can exchange information. The following are the principles that support flexibility

**Dialogue initiative**

It relates to user freedom from artificial constraints on input dialogue forced by the system. (Dix et al., 1993). Dialogue initiative is of two types 1) Pre emptive dialogue 2) User pre-emptive dialogue. In pre-emptive dialogue, system initiates actions where the user just request information. In user pre-emptive dialogue, the user is given freedom to initiate any dialogue towards the system. From the user’s point of view, system driven interaction hinders flexibility whereas user driven interaction favors it. (Dix et al., 1993).

**Multi threading**

Multithreading refers to the ability of the system to allow the user to perform multiple tasks simultaneously. Interleaved multi-threading gives a temporal overlap between different tasks but stipulates that at any given instant, the dialogue is limited to single task. (Dix et al., 1993).
**Task Migratability**: It refers to the ability to give control to perform a given task so that it becomes either internalized by user or system or shared between them (Dix et al., 1993).

**Substitutivity**

It allows equivalent values of input and output to be randomly substituted for each other. According to Dix et al (1993) by avoiding unnecessary calculations in the users head, it can control user errors and cognitive effort.

**Customizability**

It is the ability of modification of user interface by user or system (Dix et al., 1993). It is of two types. They are adaptability and adaptively. Adaptability relates to the user’s ability to adjust input into output whereas adaptively is automatic customization of user interface by system. (Dix et al., 1993).

**Robustness**

According to Dix et al (1993) users interact with computer’s to achieve some goals in specific business domain. The robustness of the interaction contains features that provide support in successful achievement and assessment of the specific goal. The following are the principles which support Robustness.

**Observability**

It allows the user to compare current observed state with the intention and within task action plan with a possibly lead plan revision. It also allows the user to estimate internal state of system with perceivable representation at the interface. (Dix et al., 1993).

**Recoverability**

According to Dix et al (1993) it allows the user to achieve the required goal by recognizing errors in previous interaction. Recoverability is of two types 1) Forward error recovery 2) Backward error recovery. Forward error recovery relates to current state and negotiation from that state towards the desired state, whereas backward error recovery is used to undo the effects of earlier interaction in order to return to a prior state before proceeding.

**Responsiveness**
It is the ability to measure the rate of communication between the systems and user. The time required by the system to express changes in state to the user. According to Dix et al (1993) when an instantaneous response is not obtained, there must be some response to users that the system has received the request and working on the request.

**Task Conformance**

Task conformance refers to the extent in which the system provides services to all the offered task, which the user wants to perform and the way in which the user understands them (Dix et al., 1993). This detailed study on usability principles leads to the summary of theoretical findings

### 3.12 SUMMARY ON THEORETICAL FINDINGS

Our theoretical finding says that there are some standard usability principles to be followed in all the departments of the website design to reach a high degree of usability. In our theoretical study, we found the role of usability attributes during human and computer interaction using the usability principles. We found the importance of usability principles proposed for website design by standard authors, which will be useful in evaluating the usability flaws of a current airline-booking website. We found that these principles could be better understood by recording practical experiences and conducting user test in a current airline-booking website. According to our theoretical findings, we have created a theoretical framework, which leads to an empirical study, where the usability flaws are found and analyzed using our theoretical framework.

**Theoretical framework**

1) **Does the design of current airline booking website contain major usability flaws?**

To answer this question we used previous researches conducted by Nielsen (1993), Chao (2009) & Condos et al (2002), to evaluate usability of an airline-booking website.

**Usability attributes (Nielsen, 1993)**

- Learnability
- Efficiency of use
- Subjective satisfaction

**Usability principles proposed for web design**

Provide feedback when users must wait (Bouch et al., 2000)
Minimize page download time (Byrne et al., 1999)

Ensure that images do not slow downloads (Bouch et al., 2000)

Visibility of Home page (Lynch & Horton, 2002)

Optimize Display density (Halverson & Hornof, 2004)

Provide feedback on the user’s location (Lynch & Horton, 2002)

Ensure visual consistency (Adkisson, 2002)

**Usability principles stated by Chao, 2009**

- Principle of Concision
- Principle of Consistency
- Principle of Memory

**Usability principles stated by Condos et al., 2002.**

- Avoid dead ends
- Make careful use of graphics
- Clear and meaningful error messages
- Make options visible to the user
- Format and presentation of content appropriately

2) **How can the website design of an airline booking system reach a higher degree of usability?**

To answer this question we used the previous researches conducted by Nielsen (1990), Dix et al., 1993 and Peerce et al., 1995 which helps to enhance the user interface design in our theoretical framework.

**Usability heuristics proposed by Nielsen (1990)**

- Sensible error messages
- User control and freedom
- Consistency and Standards
- Error prevention
- Recognition Vs Recall
- Use users own language
Visibility of system status

Aesthetic and minimalist design

Flexibility and efficiency of use

**Principles to support usability (Dix et al., 1993)**

Flexibility and Robustness

**User centered interface design (Preece et al., 1995)**

Utility and Safety
3.13 ARGUMENTS FOR EMPIRICAL STUDY

Our research purpose is to create an understanding on certain usability principles used in the design of current airline booking website. As the theoretical study of usability principles can create understanding only to some extent. There is always a fact that the usability principles can be understood evidently, when it is analyzed through real time applications. Therefore, we would like to find the usability flaws in a current airline-booking website. To identify the usability flaws, we need to record practical experiences. This can be done only through empirical study.
As, there are many airlines booking websites from that, to choose a specific airline booking website, a post test satisfaction questionnaire has been prepared. To achieve this, user has to perform the given task in the selected website and fill posttest satisfaction questionnaire. This means user test with interviews should be done. So the theoretical framework that we identified in theoretical study needs an empirical survey to carry our research.
4 EMPIRICAL SURVEY

This chapter describes the empirical survey. The empirical data was collected through email interviews and a questionnaire.

4.1 PURPOSE

The purpose of our empirical study is to find out the important usability aspects, which need to be improved in a current airline booking website to reach high degree of usability. Since usability and empirical study are mutually dependent, we feel an effective empirical study is needed which could validate our findings. The main purpose of empirical study in our thesis is to recording practical experiences of the user where the usability can be studied. This can be done only with an empirical survey. Hence, the empirical survey is needed to find the usability flaws which affect the current website design of an airline reservation system. To do an effective, empirical study nine preset task has been identified and will be performed by the participants to increase the validity of the collected data. The collected data is checked and analyzed against the theoretical frame work to answer the main research question.

4.2 SAMPLING

Since the gathering of information about each and every individual is a very huge task, we go for a selection of small subset of population called sampling. In our thesis we use sampling, because it is less expensive, less time consuming and more accurate. Probability sample are normally generalized to entire population. (Karen, 2003). The author targeted the international students studying in Sweden who have different flight booking experiences. As mentioned in chapter 2, the evaluation criteria were used for the empirical data collection. Based on that, a questionnaire was sent to 70 participants. Out of the 52 respondents, 30 are males and 22 were females. All the 52 participants represented various ethnic backgrounds such as Asian, middle eastern and European.

4.3 INTERVIEWS

All the interviews were made through e-mails. We read about how to perform interviews and constructed interview structure that could secure all the information that we needed. We did not perform a pilot study since it was very difficult for us to find respondents from appropriate field in relation to our research. No explanation was given to the customer while performing the interviews to maintain the purity of data. The results of these interviews are depicted in the upcoming sections.
4.4 FIRST INTERVIEW

The first interviewer is a website developer in India with 6 years of experience. He shared his experiences and opinions for this research in an email interview. His detailed email response makes us feel how passionate he is about website designing. An expert questionnaire was prepared for this interview especially. His answers to interview questions are explained below.

He said that technology has been developed to the core in all the departments. But it creates hatred when it comes to online reservation systems, where he points out that transaction processing systems are left unchanged.

Ryanair is a low-cost airline which has its services throughout Europe. It has been heavy competition in this field where Ryanair has to take some necessary steps when it comes to technology. Their website seems to be less aesthetically appealing. No usability principles have been used perfectly which is clearly visible while performing booking. Mainly the color combination is very poor, where the new users will move on or change to the other websites.

He says that the current airline booking websites have a very good competition when it comes to website usability. But there are still some basic aspects of usability that need to be fulfilled where a small difference can create a large impact in the business sector of E-booking. So the research in this area should be appreciated with special interest.

He says keep the sign up simple and then make the shoppers feel safe. Confirmation message should be shown during each step of the booking process. He says that HCI researches on website usability play a vital role where the study of interactive elements between human and the computer could create a website with better understandability. The main reason for HCI researches in this field is how far the principle derived from the traditional booking system can be implemented in the online reservation system. This area of study when implemented could create user satisfaction which is very much important in E-booking. He also says that ability to respond to change in the use situation makes the user to choose particular websites for booking. During the end of interview, he has said contradictory questions will not be answered where all the website developer’s work for their best out comes.

4.5 SECOND INTERVIEW

The second interview is a travel agent who arranges E-Tickets for customers. He was very involved in his work and was ready to share his experiences on airline bookings. The response of his interview is explained below. The satisfaction questionnaires with separate additional interview questions have been sent. We have only shown only the important responses of the interview.
He says that some webpages in the Ryanair site are containing unnecessary information where the main feature of the page is lost. The consistency of the fonts used during booking process is not maintained through out the booking stages. While performing task 7 and task 8 the user was not able to find the relevant information where the subjective satisfaction was missing in parts of the websites. Since the home page is very long it increases the downloading time of web pages. Error messages are not found while clicking on the advertisement which is not working. It is a very bad sign for creating a website with high degree of usability. While performing task 8 it shows error messages which creates panic to the user. The background and color image on the home page needs to be revised. Many unwanted images increases the download time while performing task 1, 8 and 9.

He says that delta airlines are the finest website which is very different and matchless. Deltas home page is visually attractive and the primary stages of the booking process are exposed rear to the bare essentials. The booking method or form is spaciously laid out which gives a pleasing feel to the eyes. Delta uses live chat as the tactic to assist people book their flight as quickly as the people move in the booking process. Above all that, booking a flight on Delta is a 4 step booking process which is in fact very comfortable for the users.

He says that in his experience there are 3 things which kill the website usability and they are 1. Not using proper using of white space 2. Wrong color choices may kill a business 3. Ignore keep everything above the fold mantra which may be a frustrating issue to the user view.

4.6 QUESTIONNAIRES

According to Deborah & Patterson (2005) the participants should follow the below mentioned steps, as we conduct user test with questionnaires. Where we can find usability flaws in a current website of airline reservation system?

1. The participants should read the pretest instructions
2. Filling out the pre-test Satisfaction Questionnaire(First Interview)
3. Reading of the task instructions
4. Performing the task
5. Filling out the post -test Satisfaction Questionnaire(Second Interview)

Questionnaire was used as a major tool for collecting data. In our thesis we used two types of questionnaire. They are pre test satisfaction questionnaire and post test satisfaction questionnaire.
**Guidelines for writing questions**

Maria & Auriat (2005) proposed few guidelines while preparing questions:

- Keep the vocabulary simple.
- Keep the question short.
- Avoid double barreled questions.
- Avoid complications or technical terms

These were the guidelines which we followed while preparing the questionnaire. The type of the questionnaire selected for the case study was Satisfaction questionnaire. To confirm that these questionnaires are not misinterpreted, after the selection of the question it was sent to 50 online bookers and mistakes have been rectified according to their related ideas. In our thesis, we have two satisfaction questionnaires of the same kind but held in different situations of the participants for example Pre-test and Post-test.

**Pre-test satisfaction questionnaire**

These questions are filled by the participants before performing the required task. The reason for having such kind of questions is that the participants will be sharing previous experiences on the airline booking. In our case, we would like to find the previous airline booking websites visited by the participants and also the errors faced while booking tickets. These questions are fully open ended where the participants have full liberty to share their previous experiences.

The pre-test satisfaction questionnaire has been sent to 52 participants. In that 30 participants replied they use Ryanair often and 15 participants replied Qantas and 10 participants replied Allegiant website. Majority of the participants said that they are confused with the website design of Ryanair. All the data is collected through questionnaire, with the main intension to find which airline website is used by many users. Since the question was prepared to fetch the real time user’s experience, face to face interviews were avoided to maintain the purity of data.

After filling the pre test satisfaction questionnaire, the below tasks are performed by the use.
<table>
<thead>
<tr>
<th>Task</th>
<th>Task description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect to ryanair.com and view the home page</td>
</tr>
<tr>
<td>2</td>
<td>Go to cheap hotel offers menu and check latest travel offers</td>
</tr>
<tr>
<td>3</td>
<td>Fill in the search step of booking process</td>
</tr>
<tr>
<td>4</td>
<td>Fill in the select step of booking process</td>
</tr>
<tr>
<td>5</td>
<td>Fill in the services step (Optional step) of booking process</td>
</tr>
<tr>
<td>6</td>
<td>Go news menu and read some news about ryanair</td>
</tr>
<tr>
<td>7</td>
<td>Select the advertisements on home page</td>
</tr>
<tr>
<td>8</td>
<td>Go to free city guide menu and enter some city to get guidance</td>
</tr>
<tr>
<td>9</td>
<td>Go to travel insurance menu and quote it</td>
</tr>
</tbody>
</table>

**Table 3: TASK TABLE**

**Post test satisfaction questionnaire**

Post-Test Satisfaction Questionnaire: These questions are based on the correlation with major task performed by the participant. This Questionnaire had both open ended and close ended questions. These questions had two departments of the following usability flaws faced while performing the tasks and User interface design discomforts faced by the user. The knowledge created while answering these questions, are the data collected and presented in the upcoming sections. The below preset tasks are performed and the results are shown in graphs, bar chart and pie charts.

**4.7 QUESTIONNAIRE PRESENTATION**

In this section the empirical data collected are presented. The presentation is divided into two sections i.e. a basic introduction on the ryanair.com and the collected data respectively. We will present the data collected through the questionnaire, which is based on the preset tasks performed by the users on airline booking website system. The below presentation follows our research question posed, Conceptualized and the literature was reviewed.
RYANAIR.COM

RYANAIR.com is one of the Europe’s largest low-cost airline which has its headquarters in Ireland at Dublin airport. It operates 254 aircrafts with more than 1100 routes throughout the Europe. The data base operation of these airlines is performed in Dublin airport and London Stansted Airport. (Wikipedia, 2010). This airline has contacts with many of the accommodation websites in Europe and provides very good deals for the customers. Many exciting gift vouchers for the travelers are also provided to travelers in their entertainment zones. The site is updated throughout the day (www.ryanair.com). The data presented in accordance with the following research question. In the literature, we have studied HCI concepts such as usability principles, interaction design concepts, and user interface design attributes for Flight booking systems. In our Research Design chapter we have formed preset tasks based on HCI concepts for Flight booking systems to answer our first research question i.e. According to the preset task performed by the participants the collected data have been presented below.

1.1 Does the design of current airline booking website contain major usability flaws?

Task 1: Open www.ryanair.com and view the home page.

When the users opened the Ryanair webpage, they found travel related offers like hire taxi, accommodation, and some advertisements. Many of the users felt that text and fonts were good, but the images on the site were not up to the expectation. The color combinations for the page are not aesthetically appealing. The language selection for the site was a good option where users can select language according to their nativity. However there were more than 15 menus such as book cheap hotels, travel insurance, route map, free city guides, news, cheap flights, and so on which were easily adopted by the user. The users were satisfied with a highlight option, which follows when the user keeps the mouse point on the navigation tabs and menus displayed. Users felt that the search FAQ’s option in the home page which guides the user in understanding the website was very useful. The language on the homepage is easy to understand according to the users. The users reported that there is ‘Home’ button on the page for easy navigation throughout site. The users stated that the loading time of the page is more. The home page has many repeated advertisements, which made the users feel uncomfortable.

Task 2: Go to cheap hotels menu and enter the city name and check for cheap accommodation

The information on the page is rich in context. In order to find a cheap hotel the user entered the destination name in search box to find the corresponding hotel offers. Some users did not get the
results because of an additional space between keywords. The users got confused as how to go on with the task. When some users misspelt the name of the cities, the system shows appropriate suggestion of cities that enables the users to complete the task.

**Task3: Fill the search step of the booking process**

During the first step of the booking process all the user’s felt it was easy to select the destinations, travel dates with the drop down list provided. The users have entered the destination and dates to travel for the availability of flights. All the text, fonts are good according to the users. The check box provided for terms and conditions makes the users get into the habit of accepting them before commencing the booking process. The first step indicates the current position of the booking process, which the users felt very useful. Users stated that no system status is shown while proceeding to the next step of the booking process, where many users felt that the website at present is fast in processing the tasks.

**Task4: Fill the select step of the booking process**

In the second step of the booking process, many users stated that visibility of the page is low due to color combination being very dull and the flight dates are not clear where the font size is not maintained properly. The second step indicates the current position of the booking process, which the users felt very useful. In this step, the side of webpage shows the selected flights where many users are satisfied for the clear information on selected flights before confirming.

**Task5: Fill the services step of the booking process**

In the step three of the booking process, the users were not satisfied with the deals and the page construction. Many users felt that it is good about that they are warned of not selecting travel insurance service while going to the next step of the booking process even though they forgot to register the travel insurance in a hurry. According to users, the navigation buttons used for the booking process performed consistently. Many users felt that security feature is good because there is time limit for each transaction and if the user remains idle for that time the page expires and the user is asked to redo the booking process. All users reported that the selected flights list is shown on the side of the page, as they do not need to go back to previous page to view the selected flights.

**Task6: Go to the news menu and read about the new updates of fights in Ryanair**

The users selected the news menu and read the new updates of flights where the users felt the language was easy to understand.
Task 7. Select the advertisements on the home page

When the users selected the advertisements on the home page, some of them are not operational and there was no proper feedback to user’s. There were many repeated advertisements in the homepage that made the user frustrating.

Task 8: Go to free city guide menu and enter the city to get guidance

When the users went to free city guide menu they found that downloading time of page is more, most of them felt the language is familiar but they cannot recognize the purpose of the menu. Many users stated that the check box named “select destination” has relatively low visibility, due to more advertisements on the web page which are not related to the search task. Here also drop down list is provided to the users while entering the destination. When some users selected the destination to get guidance, it displayed an error message that “This destination guide is currently being redeveloped and we hope to you new content soon”. Here also the users are not satisfied with downloading time of the page where they found many graphics on the page.

Task 9: Go to travel insurance menu and quote insurance

When the users went to travel insurance menu, they were asked to enter country of residence, start date and end date of travel and age with the drop down list provided. The users felt the registration process is easier which is same as the booking process of tickets. In addition, users stated that time limit is given for each transaction and if the user remains idle for a specified time, the page expires and the users are asked to redo the registration process.

How can the website design of an airline booking system reach a higher degree of usability?

The earlier research states that user centered interface design principles and usability principle plays a vital role to enhance interface design. In our thesis we intend to find out whether the airline booking website contains usability flaws and in second research question we will suggests some solutions using previous researches conducted by Preece et al., 1995, Nielsen (1993), Dix et al., 1993 to make the user interface to reach a high degree of usability.

RYANAIR.COM

Use users own language

In Ryanair.com while performing all the tasks, the language was simple and easy to the users. Especially the vocabulary was easy to understand on the home page where the users performed
different tasks. The vocabulary was easy to understand when the users searched for cheap hotel offers.

**Visibility of system status**

When task 3, 4 and 5 were executed on the website, there is no visibility of the system status. In addition, when the remaining tasks are executed no system status is visible to the users. The users are not shown any waiting or information processing status on the screen. However, according to the users the website at present is fast in processing these tasks. Therefore, there is no need for a system status.

**User control and freedom**

The users navigated throughout the booking process during task 3,4,5 using select, continue and back buttons and also while performing the tasks 2,6,7 8 and 9 the user is provided with ‘Home’ button which takes the user to home page.

**Recognition versus Recall**

During the tasks 3, 4 and 5 the users searched the availability of flights for the desired routes and then proceeds to book the ticket for travel. In the next step when the users are in the services tab, the information from the previous steps i.e. the flight fee and route are displayed in the right hand side of the screen. This allows the users to verify the basic information before booking on with the services step and thus completing task 3, 4 and 5. During the tasks 2,6,7,8 and 9 when the user selected the menus on the home page the selected menu will be highlighted while the remaining menus will look dull.

**Consistency and Standards**

The font size in home page is clear, but when the booking process is started during task 3, 4 and 5 the font size is not standardly maintained, but the task performed by checkbox buttons ‘continue, search ’and back’ in the booking process is showing the same feature throughout the website.

**Error prevention**

Users reported that during task7 in Ryanair.com when the users selected the advertisements on the home page many of the advertisements are not operational and did not display any error messages.
Flexibility of use

In Ryanair.com during all the tasks1 to 9, the users easily navigated and within a short time the users are successful and are confident to perform different tasks. Especially in task 1, there is an option for language selection by the user according to his nativity.

Robustness

Many users reported that the task 8 “Go to free city guide menu and select the city” was not completely successful, because it is not giving the guidance for all the cities selected and where some users stated that guidance for some cities are not operational. Also in task 2 when the user entered the destination name in search box to find the corresponding hotel offers, some users did not get the results because of space between keywords. Here the users got confused how to go on with the task. Here an alternative such as dropdown list is not provided by the system. When the user misspells the name of the cities, the system is smart enough to show appropriate suggestion of cities that enables the users to complete the task.

Sensible error messages

In ryanair.com the errors occurred two times during tasks 7 and 8. In task 7 when the user selected the advertisements on home page some of them are not operational and did not produce any error message. While performing task 8, the users reported that when they selected some destinations for the guidance it shows an error message stating that “This destination guide is currently being redeveloped and we hope to you new content soon”.

Utility

Ryanair.com provides functional efficiency to perform all the basic tasks such as booking process, checking for cheap hotel offers, travel insurance, reading news about Ryanair and so on where the users did not report any major problems.

Aesthetic and minimalist design

In ryanair.com, the web pages were found to be less aesthetically appealing. The users were not happy with the color combinations on the home page during task 1. Many advertisements were displayed twice on the home page, which are wasting the web page space and making the necessary information less visible. For instance during task 8, many users felt that advertisements are shown are not related to search task which gives the user some wrong information.
Safety

The main task 3 to 5 which is the booking process where all users stated that there is system safety because the time limit is given for each transaction and if the user remains idle for that time the page expires and the user is asked to redo the booking process. The same safety is given while the users are registering for travel insurance also. To increase the understandability of the presented results a diagrammatic approach has been used.

![Gender Chart](image)

**Figure 8: SHOWING GENDER RESPONDENT OF PRE-TEST SATISFACTION QUESTIONNAIRE**

From the total respondents, females were 58% (N=30) and males were 42% (N=22)

![Airline Website Chart](image)

**Figure 9: GRAPH OF RESPONSES ABOUT RELEVANT INFORMATION ON THE WEBSITE**
The above diagram shows that 42% (N=22) of the respondents check for the Booking information and secondly 38% (N=20) of the respondents look for the discounts. And only 20% (N=10) look for information about the website.

![Frequently visited website](image)

**Figure 10: GRAPH SHOWING STATISTICS OF FREQUENTLY VISITED WEBSITE**

From the above diagram, we can easily see that ryanair is the most frequently visited website.

![Website Information](image)

**Figure 11: RESPONSES OF RYANAIR WEBSITE PROVIDE REQUIRED INFORMATION**

Regarding the website information for airline booking: 81% (N=42) of respondents said that the Ryanair provides the required information.
People who select the airlines are mainly for their business purpose are 67% (N=35) and their personal visit 33% (N=17).

The online purchasing of the flights 46% (N=24) have responded as satisfactory since it is convenient for the users. Others
Responders are mainly attracted by their appearance 38% (N=20) where the content is very less 15 % (N=8). Other browsing play only a small role in the booking website.

**Figure 15: RESULTS OF BOOKING PROCESS OF RYANAIR**

Many of responders consider booking process is much easier 29% (N=15) but mostly ryanair provide insufficient information 35% (N=18).

**Figure 16: DIAGRAM OF RESPONDENTS REPLY TO REVISIT**

The majority of the responders consider they like to revisit the website 76% (N=40) for various reasons.
4.8 **EMPIRICAL RESEARCH RESULTS**

### 4.8.1 STATISTICAL SUMMARY

The respondents in this questionnaire are from various backgrounds that are professionals, travel agents and frequent flyers of ryanair. Out of 70 questionnaires distributed through email. We collected 52 responses.

**Pre test satisfaction Questionnaire**

For the pre test satisfaction questionnaire, out of 52 respondents Males are 42% (N=22) and females were 58% (N=30). The pre test satisfaction questionnaire females look into the best website opting for the best offers and the deals they provide. Depending upon the age factor many of them are in the age group of 25-38 and vast differentiated range. Many of the responders travel for their business oriented rather than other holidays. The 67% (N=35) of respondents travel on their business purpose and in executive class as we observed. 57% of respondents book their tickets through online where no respondent is willing to buy tickets through travel agent.

**Post test satisfaction Questionnaire**

For the post test satisfaction questionnaire out of 52 respondents 38% (N=20) respondents say they are not satisfied with the appearance of home page. While surfing inside the website the 48% (N=25) respondents said the page down load time is very slow. 8 respondents said the content in the website is not appealing. 20% (N=10) respondents say that the menus font sizes are not maintained through out the system.

### 4.8.2 EMPIRICAL FINDINGS AND RESEARCH QUESTIONS

The questionnaire was designed to answer the research questions

**Main Question:** What usability aspects are important to consider when designing the website of a flight booking system to reach a higher degree of usability?

1.1. **Does the design of current airline booking website contain major usability flaws?**

Some webpages are containing unnecessary information where main feature of the page is lost. Font size in the booking process is not standardly maintained which is important for Internet booking systems. When the user searched for necessary information they did not find relevant information. While performing task 7 and task 8. Some webpages containing graphics increases the
downloading time of webpages. It is not producing any error messages when some advertisements are not working while performing task7. When the user is searching for some information while performing task8 in free city guide menu, it shows an error messages. While performing task1, 8 and 9 page download time is more as there are more images on the page. While performing task 1, 8 and 9 users found many images on the page which increases the download time.

1.2. How can the website design of an airline booking system reach a higher degree of usability?

A complex page layout should be avoided. You need to have an eye on making a simple yet attractive homepage for a better first appearance. Overdoing graphical mastery is not always useful. An aesthetical approach is required here otherwise the page will be exploited unnecessarily. But still having a balanced appearance of text and images is good. Better to opt for simple and easier navigation is important. Here creativity in selecting symbols can be useful. Taking advice from known providers of creative web services can be a good idea. A website not only tells directly what product or service you want to sell. It can also be a good idea to let your visitors know about your product as quick as possible. Creative web services gives you the freedom to openly highlight your product features even in homepage by using interesting symbols and images.
DATA ANALYSIS AND RESULTS

5.1 DATA ANALYSIS

Case Analysis

In this chapter we analyze the data presented in the previous chapter. We are using explanation-building technique for analyzing the case study. We have followed the emerged framework in chapter 3 as our procedure to analyze the presented data.

1. Does the design of current airline booking website contain major usability flaws?

Principle of Concision

As explained in section 3.5 this principle states that the interface must not contain any unnecessary and ‘hard to understand’ elements which are unaware to the user. It should reduce unnecessary elements and keep the necessary information. So that the use efficiency of the interface can be improved and it can be easily operated. In ryanair.com during the task 1, when the users are viewing the homepage there are some advertisements displayed twice which amounts to wastage of space on the homepage. This makes the homepage to appear crowded, which creates confusion to the user. Also during the task 8, many users felt that advertisements shown are not related to search task which gives the user some wrong information. So, here the main feature of the webpage is getting lost in the advertisements. Therefore, the Ryanair.com does not support this principle.

Principle of memory

As explained in section 3.5 the interface must be easy to understand and used more efficient, so that the users can operate the interface conveniently. So in order to achieve these designers must use the familiar symbols, objects in particular places and must group objects and functions in accordance to the usual thinking of users. In ryanair.com all the important menus such as travel insurance, free city guide, news, latest cheap hotel offers and so on regarding the travel are highlighted where the users easily found the necessary information regarding their travel by selecting those links. So the user's memory load can be minimized. Therefore, Ryanair.com supports this principle.
**Principle of Consistency**

As explained in section 3.5 the system should be uniform and unitary which mean the standard followed in one part of the system must be followed throughout the process. For example the operations of functions, tasks must be consistent. In ryanair.com during tasks 3-5 standard font size is not maintained throughout the booking process because of which the users felt little difficult to read the contents. The navigation buttons used, performed consistently throughout the booking process (tasks 3to5) i.e. consistent action of traversing to next or previous page. So, the ryanair.com partially supports the principle of consistency.

**Learnability**

As explained in section 3.7 this principle states that the system must be easy to learn and understand where user can rapidly start some work done with the system. To test learnability factor different tasks were conducted. For example the tasks “Go to the news menu and read about the new updates of flights in Ryanair”, “Go to travel insurance menu and quote insurance” are conducted to test learnability. The users checked the learnability by performing all the tasks successfully by moving around the website and in short time they became familiar with the website. Therefore, the Ryanair.com supports the learnability principle.

**Efficiency of use**

As explained in section 3.7 the systems must be efficient to use to ensure high degree of productivity, so when the users once experienced the system they can easily use it. In Ryanair.com during all the tasks 1 to 9, the users easily navigated and in short time the users are successful and are confident to perform different tasks. Therefore, the ryanair.com is efficient to use and it supports the theory.

**Subjective satisfaction**

As explained in section 3.7 how much extent the system is pleasurable to use by the users is considered as subjective satisfaction. So user satisfaction is important for system success .To check the subjective satisfaction, the tasks 1 to 9 is designed. During the task7, the users selected the advertisements on the home page and found some of them are not operational. During task8 when the user went to city guide menu and selected the destination it reported an error message which some users felt repulsive. Therefore, the ryanair.com partially supports the theory.
Make careful use of graphics

As explained in section 3.8 the usage of graphics must be done carefully because the website must look pleasant to the eyes of the user and also it must not occupy the main space on screen where important information visibility is lost. In ryanair.com users found that the web pages are containing more graphics which is increasing the downloading time of the web pages. Mainly in task8 when the users went to free city guide menu, they found more images on the page, which are increasing the downloading time of the page. It also causes the users to feel that the main feature of the webpage is lost in images. During task1 user felt the same problem. Therefore, Ryanair.com does not support the theory.

Make important options visible to the user

As explained in section 3.8 the users can complete the tasks successfully if the important menus or links are directly visible to users. In ryanair.com all the important menus such as travel insurance, free city guides, news, cheap hotel offers and so on regarding the travel are highlighted where the users easily found the necessary information regarding their travel by selecting those menus. Therefore, ryanair.com supports the theory.

Provide clear and meaningful error messages

As explained in section 3.8 when an error occurred in the website it must provide a clear and meaningful error message. In ryanair.com during task8, the users reported that when they selected some destinations for the guidance it shown an error message stating that “This destination guide is currently being redeveloped and we hope to you new content soon”. But in task 7 the users reported that, when they selected advertisements on the homepage some of them are not operational and also did not report any error messages. Therefore, the ryanair.com partially supports the theory.

Avoid dead ends

As explained in section 3.8 the links which are not operational must be removed because when the user browsed the link for some certain information and found that information is not available, it discourages the use of website frequently. During task8 when the user went to free city guide menu and selected the destination for guidance, it displayed an error message that “This destination guide is currently being redeveloped and we hope the new content will be soon updated” which makes the user feel that site is not updated properly. So, the ryanair.com does not completely support the theory.
Format and presentation of content appropriately

As explained in section 3.8 the content on the websites must be designed and formatted according to specific characteristics that will be suitable for all kinds of user’s. In ryanair.com the format and presentation of content is good. Because in task1 when the users connected to the ryanair.com they found all the information regarding the travel such as travel insurance, free city guide, latest travel offers, news and so on, which are well formatted and well arranged which makes the user to feel the site is informative and well summarized. Therefore, the ryanair.com supports this principle.

Minimize page download time

As explained in section 3.8 the page download time should be minimized. If the number of bytes per page are minimized page download can be fast. In task1 when the users connected to ryanair.com, many users felt that page download time is more and during task8 also the users reported the same problem. Therefore, ryanair.com does not support this principle.

Provide feedback when users must wait

As explained in section 3.8 if the processing is taking time the system status must be shown to the user. When tasks 3, 4 and 5 were executed on the website there is no visibility of the system status. Also when the remaining tasks are executed there is no system status that is visible to the users. The user is not shown any waiting or information processing status on the screen. But according to the users the website at present is fast in processing these tasks, so there is no need for a system status. But in future when the operational capacity of the website increases this becomes an essential principle that needs to be implemented. Therefore, ryanair.com does not support this principle.

Visibility of Home page

As explained in section 3.8 the well-structured homepage must give good impression to users visiting the website. This means the homepage must clearly communicate the site’s purpose and all the major options on the website must be clearly visible to the users. In task1 when users viewed the home page, all the important menus regarding the travel i.e. cheap hotels, travel insurance, news, and free city guide and so on was located at the top. But many users are not happy with the color combination and images on the page. The language option on the home page made users feels of flexibility to select the language according to their nativity. Therefore, in
ryanaire.com visibility of the home page is not so good according to users. Therefore, ryanair.com partially supports the principle.

**Optimize display density**

As explained in section 3.8 to facilitate finding target information on page, the web pages must not be too crowded with items of information. In task 8 when the users went to free city guide menu, most of them cannot recognize the purpose of the menu, because there is a check box named “select destination” whose visibility was relatively low, due to more advertisements on the web page, which are not related to the search task. So here, the main feature of webpage is getting lost in advertisements. Therefore, ryanair.com does not support this principle.

**Provide feedback on user’s location**

As explained in section 3.8 the feedback must be provided to the users when they are browsing in the website. In ryanair.com when the users selected a particular menu item (i.e. cheap hotels, travel insurance, free city guide, news and so on) it will navigate to the related page where the other menu items will be disabled by highlighting the selected menu item on the top of the page. So, the users can know where they are in the website. Also during the tasks 3, 4 and 5 of booking process, the user’s location is shown on the page as search step, select step and services step. Therefore, ryanair.com supports this principle.

**Ensure visual consistency**

As explained in section 3.8 the visual consistency of website elements within and between web pages must be ensured. It includes size and spacing of characters, colors used for labels, fonts and backgrounds and locations of labels, text and pictures. In task 3, users did not report any problems on font size or color which is the first step of the booking process. However, in task 4, which is the second step of the booking process, many users stated that visibility of the page is low because the color combination is very dull and the flight dates are not clear and also the font size is not maintained properly. Therefore, there is no visual consistency in ryanair.com between the web pages. Therefore, ryanair.com does not support the theory.

**Ensure that images do not slow download**

As explained in section 3.8 the images on the website must not slow the page downloading time. To speed page downloading several images must be used than a single large image on the page and also designers should minimize the number of colors used in an image. In task 1, users stated that there are many images on the home page, which are increasing the downloading time of the
home page. In task8 also the users stated the same problem. Therefore, ryanair.com does not support the theory.

1.2 How can the website design of a current airline booking system reach a higher degree of usability?

1) Error prevention

As explained in section 3.10 the error messages that are helpful to the user are always required. In Ryanair.com during task7, when the users selected the advertisements on the home page many of the advertisements are not operational and did not display any error messages. So according to this, ryanair.com does not support this principle.

2) Consistency and standards

As explained in section 3.10 the system must be consistent within itself and also the standards followed in one part of the system must be followed throughout the system. For example if in one section of the system there is a design associated with the selection of checkbox button that particular standard must be followed through the entire system. In Ryanair.com the consistency and standards are partially followed because the font size in home page is clear, but when the booking process is started during task 3, 4 and 5 the font size is not standardly maintained, but the task performed by checkbox buttons ‘continue, search, and back options in the booking process is showing the same feature throughout the website. So this principle is partially fulfilled by the Ryanair.com.

3) User control and freedom

As explained in section 3.10 this principle states that user’s generally choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted situation without having to go through an extended dialogue such as undo or redo. The user control and freedom was guaranteed on Ryanair.com, because users navigated throughout the booking process during task 3,4,5 using select, continue and back buttons and also while performing the tasks 2,6,7,8, 9 the users is provided with ‘Home’ button which takes the user to home page. Therefore, the Ryanair.com supports this principle.
4) **Use users own language**

As explained in section 3.10 the system must use the users own language with words, phrases and concepts that are user familiar. In Ryanair.com while performing all the tasks, the language was simple and easy to the users. Especially the vocabulary was easy to understand on the home page where the users performed different tasks. The vocabulary was easy to understand when the user searched for cheap hotel offers. The users did not report any problems with the language while performing the tasks. Therefore, ryanair.com supports this principle.

5) **Visibility of system status**

As explained in section 3.10 it states that the system must provide a correct feedback to users about what is happening in the system when their task is being processed. When tasks 3, 4 and 5 were executed on the website there is no visibility of the system status. Also when the remaining tasks are executed there is no system status that is visible to the users. The user is not shown any waiting or information processing status on the screen. But according to the users the website at present is fast in processing these tasks, so there is no need for a system status. But in future when the operational capacity of the website increases this becomes an essential principle that needs to be implemented. Therefore, the ryanair.com does not support this principle.

6) **Recognition vs Recall**

As explained in section 3.10 it states that the system objects, actions and options must be visible to the user, so that there is no need for the user to memorize the information contained in one part of dialogue to the other. During the tasks 3, 4 and 5 the users searched the availability of flights for the desired routes and then proceeds to book the ticket for travel. In the next step when the users are in the services tab the information from the previous steps i.e. the flight fee and route are displayed in the right hand side of the screen. This allows the users to verify or rewind the basic information before booking on with the services step and thus completing task 3, 4 and 5. So the user memory load can be minimized. The tasks 2, 6, 7, 8 and 9 also supports this principle because when the user selected the menus on the home page the selected menu will be highlighted while the remaining menus will look dull. Therefore, Ryanair.com supports this principle.
7) Flexibility and Efficiency of use

As explained in section 3.11 system must be flexible and easy to use for any level of user such as a novice user, Intermediate users and expert users by providing user manual or online help to users. The ryanair.com provides good flexibility for the user. In Ryanair.com during all the tasks 1 to 9, the users easily navigated and within a short span of time, the users are successful and are confident to perform different tasks. Therefore, the ryanair.com is efficient to use and it supports the theory.

8) Aesthetic and minimalist design

As explained in section 3.10 the unnecessary information in the dialogues must be removed and also the information which is irrelevant in the dialogue competes with the necessary units of information which reduce its relative visibility. In ryanair.com the web pages were found to be less aesthetically appealing. The users were not happy with the color combinations on the home page during task1. Many ads were displayed twice on the home page which is wasting the web page space and makes the necessary information less visible. For instance, during task 8 many users felt that advertisements are shown are not related to search task which gives the user some wrong information. So here the main feature of the webpage is getting lost in the advertisements. So ryanair.com is not supporting this principle.

9) Sensible error messages

As explained in section 3.10 the error messages reported must be in user’s language and must inform about the problem and give a solution. In ryanair.com the errors occurred two times during tasks 7 and 8. In task 7 when the users selected the advertisements on home page some of them are not operational and did not produce any error message. While performing task 8 the users reported that when they selected some destinations for the guidance it shows an error message stating “This destination guide is currently being redeveloped and we hope to you new content soon”. Therefore, ryanair.com supports this principle.

10) Robustness

As explained in section 3.11 users interact with computers to achieve some goals in specific business domain. The robustness of the interaction contains features which provide support in successful achievement and assessment of the specific goal. To check the robustness different tasks were conducted. For instance the task 8 “ Go to free city guide menu and select the city”
was not completely successful, because it is not giving the guidance for all the cities selected where some users stated that guidance for some cities are not operational. Also in task 2 when the user entered the destination name in the search box to find the corresponding hotel offers, some users did not get the results because of space between keywords where the users got confused how to go on with the task. Here an alternative such as dropdown list is not provided by the system. However, when some users misspell the name of the cities the system is smart enough to show appropriate suggestion of cities, which enables the users to complete the task. Therefore, ryanair.com does not completely support the theory of robustness.

Utility of system

As explained in section 3.6 utility refers to the functionality of system or system efforts to enhance effectiveness and efficiency, which were fundamental aims. The ryanair.com provides functional efficiency to perform all the basic tasks such as booking process, checking for cheap hotel offers, travel insurance, reading news about Ryanair and so on where the users did not report any major problems. Therefore, the ryanair.com is fully operational to carry out all basic tasks. So Ryanair.com supports the theory.

System safety

As explained in section 3.6 safety refers its relation to computer systems which has major importance in the design of safety critical systems. As the ryanair.com is airline booking website the system safety is important. The main task 3to5 which is the booking process where all users stated that there is system safety because the time limit is given for each transaction and if the user remains idle for that time the page expires and the user is asked to redo the booking process. The same safety is given while the users are registering for travel insurance in task 9. Therefore, the Ryanair.com supports the theory.
5.2 **RESULTS**

**RQ.1 Does the design of current airline booking website contain major usability flaws?**

In our study we found the usability flaws in the current airline booking website which is shown in the below table.

<table>
<thead>
<tr>
<th>Evaluation criteria</th>
<th>Grading</th>
<th>Usability Flaws</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle of Concision</td>
<td>Needs to improve</td>
<td>Some web pages are containing unnecessary information where main feature of page is lost.</td>
</tr>
<tr>
<td>Principle of Consistency</td>
<td>Needs to improve</td>
<td>Font size in the booking process is not standardly maintained which is important for Internet booking systems</td>
</tr>
<tr>
<td>Principle of memory</td>
<td>Good enough</td>
<td></td>
</tr>
<tr>
<td>Principle of Learnability</td>
<td>Good enough</td>
<td></td>
</tr>
<tr>
<td>Principle of Efficiency</td>
<td>Good enough</td>
<td></td>
</tr>
<tr>
<td>Subjective satisfaction</td>
<td>Needs to improve</td>
<td>When the user searched for necessary information they did not find relevant information. While performing task 7 and task 8.</td>
</tr>
<tr>
<td>Make careful use of graphics</td>
<td>Needs to improve</td>
<td>Some webpages containing graphics increases the downloading time of webpages.</td>
</tr>
<tr>
<td>Make important options visible</td>
<td>Good enough</td>
<td></td>
</tr>
<tr>
<td>Clear meaningful error messages</td>
<td>Needs to improve</td>
<td>It is not producing any error messages when some advertisements are not working while performing task 7.</td>
</tr>
<tr>
<td>Avoid dead ends</td>
<td>Needs to improve</td>
<td>When the user is searching for some information while performing task 8 in free city guide menu it shows an error messages.</td>
</tr>
<tr>
<td>Appropriate Format and Content</td>
<td>Good enough</td>
<td></td>
</tr>
<tr>
<td>Minimize page download time</td>
<td>Needs to improve</td>
<td>While performing task 1, 8 and 9 page download time is more as there are more images on the page.</td>
</tr>
<tr>
<td>Provide feedback when users must wait</td>
<td>Needs to improve</td>
<td>At present, the website is fast in processing the tasks, but when operational capacity of site increases this principle must be implemented.</td>
</tr>
<tr>
<td>Visibility of the home</td>
<td>Needs to</td>
<td>Users are not happy with background color and</td>
</tr>
</tbody>
</table>
Table 4: RESULT OF SUB QUESTION 1

RQ.2 How can the website design of a current airline booking system reach a high degree of usability?

Our study shows that some web design principles such as visibility of system, Error prevention and aesthetic and minimalist design are not implemented while design the website. Principles like consistency and standards and robustness are partially implemented in the design of current airline website. These principles when fully implemented make the current website highly usable.

<table>
<thead>
<tr>
<th>Website Design principles to reach high degree of usability</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility of system status</td>
<td>Not implemented</td>
</tr>
<tr>
<td>Users Own language</td>
<td>Implemented</td>
</tr>
<tr>
<td>Error Prevention</td>
<td>Not implemented</td>
</tr>
<tr>
<td>Consistency and standards</td>
<td>Partially implemented</td>
</tr>
<tr>
<td>Recognition vs Recall</td>
<td>Implemented</td>
</tr>
<tr>
<td>User control and freedom</td>
<td>Implemented</td>
</tr>
<tr>
<td>Aesthetic and Minimalist design</td>
<td>Not implemented</td>
</tr>
<tr>
<td>Sensible Error messages</td>
<td>Implemented</td>
</tr>
<tr>
<td>Robustness</td>
<td>Partially implemented</td>
</tr>
<tr>
<td>System utility</td>
<td>Implemented</td>
</tr>
<tr>
<td>System safety</td>
<td>Implemented</td>
</tr>
<tr>
<td>Flexibility and efficiency of use</td>
<td>Implemented</td>
</tr>
</tbody>
</table>

Table 5: RESULTS OF SECOND SUB QUESTION 2
Main Research question

1. What usability aspects are important to consider when designing the website of an airline reservation system to reach a higher degree of usability?

When analyzing the sub questions in this chapter we identified some usability aspects which are important to consider when designing the website of the current flight booking system to reach high degree of usability. The result of our study is shown in the diagram below.

Description of the result diagram:

We have found out what usability flaws affects a current airline booking website i.e. ryanair.com with the standard usability evaluation principles, which is our first sub research question. The usability flaws which are situated in these usability principles needs to be improved as shown in the diagram. We have secondly studied those usability flaws with website design principles to reach high degree of usability and found what usability aspects have not been implemented and also what aspects have been partially implemented. The usability aspects shown in the below diagram needs to be improved in the current website design of flight booking system to reach high degree of usability.
Keys take away points to design a current airline website with high degree of usability

- Page load times should be fast as possible.
- Don’t forget to discourse your customer’s pain-points during the booking process and also don’t underestimate that they can do it without help.
o It’s not all about nuts and bolts of good website design and usability of it. We should also use profile-raising wording and images to attract the customers through to the payment stage of the booking process.

o Preferably customer support via click to chat to answer questions.
6 DISCUSSION

6.1 CONCLUSION

Our study has found some usability aspects in the current website design of flight booking system to reach high a degree of usability and the understanding of the usability principles depending on it. The usability principles identified in the theoretical part were verified in the empirical part. Although important concepts of website design principles and usability principles has been used properly, there are still some aspects of usability principles mentioned in chapter 3 need to be improved. Our analysis suggests some aspects to enhance the website design of Ryanair.com. According to our study, all the major usability principles are implemented on the Ryanair website such as flexibility, learnability, efficiency of use, memorability, system safety and utility.

As there are no major usability flaws in user interface design, there are still some principles such as error prevention, aesthetic and minimalist design, robustness, consistency and visibility of system status, which needs to be properly implemented to make the website design more acceptable to the users. Although the website is flexible and efficient to use, the website's visual appeal must give a pleasant look to the users. For example, while performing task1 on Ryanair.com the home page contains many images that are not aesthetically appealing. Also in task 8 and task 9, there are more images on the page, due to which the main feature of the page is lost in the images. There must be careful use of graphics which may affect usability of the website. So the website designer should be careful when using the graphics on the web pages.

In task 7 when users selected advertisements on the home page some of them failed to respond and also they did not produce any error messages. Users felt that they did not select the advertisements properly and started to select them repeatedly which gave users the feel that the advertisements were inactive. These problems can be eliminated if the website is tested periodically by professional testers.

The users interact with the system to achieve a specific task with the website. In task 2, in order to find a cheap hotel the user must write the name of the place in the search box provided to get the desired information. So while entering the name of the place many users did not get the results because of space between the keywords, which was not recognized by the website. In this case, the users were not provided with any alternative such as drop down list, which increases the perceived user experience attained through the system.
In our second research question we went through thirteen usability principles when implemented completely will make the user interface of an airline booking website more acceptable to the user. The perceived level of user satisfaction resulting from the usage of the system will also increase. All these findings finally gave us a result that some usability aspects need to be improved which is shown in the chapter 5.

6.2 IMPLICATION FOR INFORMATICS

The informatics area in our thesis may be regarded in a dialectical relationship between the user and the developer practices. The implication of our result may influence the current user interface design of Ryanair website and provide a good user-friendly interface with high degree of usability.

6.3 METHOD EVALUATION

The purpose of the text analysis has been to find relevant properties of different subject areas and relate these contexts to User interface design concepts. This method has thus made it possible to relate our research question to previous research and existing theories. The problem in using these methods is to filter out the literature study and make it combine our results, where ever possible during the research. To verify the aspects identified in the theoretical study we have performed interviews professionally to record the practical experiences of the user in the use situation. So to maintain the purity of data, face to face interviews were neglected (Yin, 1994). These interviews had two phases to answer the first one is the pre-test and post test. Pre-test intention was to record users previous experiences and post-test was to record the users experience in accordance with the preset task preformed by the users according to the research question. According to our research problem, we had multiple solutions where there were no problems faced during questionnaire preparation for conducting interviews and we got much information than we expected.

6.4 RESULT EVALUATION

In our thesis we have used triangulation method for evaluating the primary and secondary data. These primary and secondary data are interpreted using hermeneutic perspective. The main
advantage of using hermeneutic is the movement of understanding is constantly from the whole to the part and back to the whole.

Our mean circle was to discover which user experience we should ask to get a plan of what we should observe from them. The threat was as a consequence that we would have questioned for website usability that did not exist and hence our upcoming questions would not be accurately answered. However, our knowledge emerged as we collected secondary data from standard principles used to evaluate usability. We comprehended how to pose the questions, and to whom they should be asked for, in order to center the attention in absolute relation to the problem. Also, responses of interviews and questionnaires embody what usability study we actually assumed to evaluate. So, we argue that were able to evaluate what we initially wanted to signify. It is our belief that the thesis has a high degree of internal validity, and the outcome matches the reality.

External validity for a research, questions whether the empirical findings could be generalized or not. One technique of performing this validity is to custom many external sources and produces a good explanation with the variety of inputs. We used quite a lot of sources to increase the external validity. All the external sources used in our thesis are standard universal sources used for user interface design. Thus, all airline booking websites facing the stated problem needs to follow a similar pattern drawn in this thesis in order to succeed with the implementation of a usability principle. Inside that framework, we argue that the study conducted for Ryanair website can be generalized. In order to increase the validity, we have performed a detailed task table which will act as a guide for user interface design of flight booking system. So testing students can successfully perform their tasks.

Reliability deals with the difficult of the grade to which the research would produce the same results if repeated. According to Merriam, if the researched area is dynamic, the definition reliability in a conventional meaning is impossible to reach. We do not believe that the usability flaws of Ryanair website are dynamic; so we believe that the usability study of it will be significant also in the future. It is our hope that the thesis will enable Ryanair website to reach a high degree of usability with our conclusions. A user interface design of flight booking system as a whole is based on conventional economic theory. This results that, the reader has to understand and also it is irrational to deviate from conventional economic theory. Moreover, since strategies as such have their foundation in economic theory, the risk of variation is minor or at least very slow. Accordingly, if a similar study were to be conducted with our perspective and methodology it would be expected to give the same results. Two important things that can increase reliability are use case protocol and the development of a case study database (Chisnall, 1997). To increase the reliability, we have prepared open-ended questions.
6.5 POSSIBILITIES TO GENERALISE

Our study has viewed the user interface design from a usability perspective but has especially focused on usability principles of user interface of flight booking system to reach a high degree of usability. Since the interaction between users and interface design of flight booking systems is related to standard usability principles, this interaction seems to be adequate for internet booking system. Therefore, this perspective will not affect the research validity in the case of generalizability.

Theories of standard usability principles on user interface design of flight booking system have been used to illuminate the usability aspects without limiting any specific group of principles in the case of single airlines. The identified usability aspects can therefore be expected to apply to any user interface design of flight booking systems. Theories of knowledge creation on usability aspects to reach a high degree of usability were collected mainly from the social constructive perspective. This reason for this is, because the specific character of usability aspects of user interface focuses on interaction between users and Internet booking activities. Theoretical results can therefore be valid for any kind of user interface of flight booking systems.

The empirical research consists of interviews from single user interface of flight booking system. We have tried to avoid any specific partiality and have interviewed various ethnic backgrounds. Nevertheless, Since we have done user test with interviews for studying a single airline website it is possible that multiple airline websites would have given another result as stated in chapter 1. It is thus possible to say, that the theoretical part of our study possesses a high degree of generalizability whereas the generalizability is more uncertain when it comes to empirical part.

6.6 IDEA OF CONTINUED RESEARCH

Our empirical study found flaws in the user interface of flight booking system with a single case study. A multiple case study research can be continued with cross case synthesis where the differences between the usability aspects can be studied in detail. A multiple case study research produces comprehensive study with much numerical material which would enable a quantitative analysis that shows significance. Such an analysis could illuminate research questions in a new way. The present study focuses on the major usability flaws in user interface design of flight booking systems, where the future research can be continued with few usability aspects and study them thorough.
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Appendix

Pre test questionnaire

This questionnaire is prepared for thesis at University of Boras that seeks to analyze on flight booking system based on the requirements of usability principles. This is a pre test questionnaire form and we request your contribution in analyzing the usability principles and the design of flight booking system, in order to improvise and predict which website design is been used frequently.

The comments will be treated with utmost confidential and will be used only for our research purpose.

Personal information

1. Name: __________________

2. Age: ________________

3. Gender  □  Male  □  Female

4. What information do u look in a airline website?
   □  Information about lowest fares
   □  Booking and Reservation
   □  Information about the new discounts available
   □  Others (describe)

5. How many airline website have u visited?
   □  2-6
   □  7-12

6. Which is the most popular and efficient website according to you?
   □  Ryanair
   □  Qantas
   □  Allegiant
7. Along with your flight ticket will you book a hotel room?

☐ Yes
☐ No

8. Are you a frequent flyer?

☐ Yes, Business travel
☐ Yes, On Personal Visit
☐ No

9. How do you book your airline tickets?

☐ Online
☐ Booking Agents

10. Did you ever change your flight timings? If so, did they change?

☐ Yes, they did not support
☐ No

11. How was the service provided to you?

☐ Satisfactory
☐ Good
☐ Poor

**Post test Questionnaire**

This questionnaire is prepared for thesis at University of Boras that seeks to analyze on flight booking system based on the requirements of usability principles. This is a post test questionnaire form and we request your contribution in analyzing the usability principles and the design of flight booking system, in order to improvise and predict which website design is been used frequently.

The comments will be treated with utmost confidential and will be used only for our research purpose.
Please tick (✓) for the below given questions. You are allowed to select more than one answer.

Personal information

1. Name:__________________

2. Age:___________________

3. Gender   □  Male   □  Female

4. How do you benefit from Ryanair website?
   □  Gives the best fare deals to your destination
   □  Allows you to select flexible dates
   □  Allows in changing of flights on the same day

5. If you have used Ryanair website for purchasing what do you think of the online purchasing?
   □  Satisfactory
   □  Good
   □  Poor

6. What do you think about this website?

   It’s appearance
   □  Satisfactory
   □  Not Satisfactory
   □  Poor

   Surfing ease
   □  Satisfactory
   □  Not Satisfactory
   □  Poor
Content

☐ Satisfactory
☐ Not Satisfactory
☐ Poor

Menus

☐ Satisfactory
☐ Not Satisfactory
☐ Poor

7. How would you grade Ryanair website in general?

☐ Satisfactory
☐ Not Satisfactory
☐ Poor

8. Is Ryanair website easy to learn and navigate?

☐ Yes
☐ No

9. How was the booking process of Ryanair website?

☐ Easy booking
☐ Searching for the icons
☐ Difficult
☐ Information not provided properly

10. Would you like to revisit our website?

☐ Yes
☐ No
11. How would you rate the minimum time for a page download of web pages?
   - [ ] Very fast
   - [ ] Medium
   - [ ] Slow

12. Have you ever received any error messages while performing the tasks?
   - [ ] Yes
   - [ ] No

13. Have you successfully completed all the tasks in the booking process?
   - [ ] Yes
   - [ ] No

14. Did you like the web design of Ryanair?
   - [ ] Yes
   - [ ] No

Interview Questions

1. How long are you working in the field of website design?

2. What changes have the online reservation systems brought to traditional booking system?

3. What do you feel about Ryanair website in the use situation?

4. What is your opinion about HCI researches in website design?

5. How can the website design be made more usable

6. Which is the best airline website which abides to maximum usability?

7. How the best airline which you choose is different from other airlines?

8. Your views about what can make a killer website?
University of Borås is a modern university in the city center. We give courses in business administration and informatics, library and information science, fashion and textiles, behavioral sciences and teacher education, engineering and health sciences.

In the School of Business and Informatics (IDA), we have focused on the students’ future needs. Therefore we have created programs in which employability is a key word. Subject integration and contextualization are other important concepts. The department has a closeness, both between students and teachers as well as between industry and education.

Our courses in business administration give students the opportunity to learn more about different businesses and governments and how governance and organization of these activities take place. They may also learn about society development and organizations’ adaptation to the outside world. They have the opportunity to improve their ability to analyze, develop and control activities, whether they want to engage in auditing, management or marketing.

Among our IT courses, there’s always something for those who want to design the future of IT-based communications, analyze the needs and demands on organizations’ information to design their content structures, integrating IT and business development, developing their ability to analyze and design business processes or focus on programming and development of good use of IT in enterprises and organizations.

The research in the school is well recognized and oriented towards professionalism as well as design and development. The overall research profile is Business-IT-Services which combine knowledge and skills in informatics as well as in business administration. The research is profession-oriented, which is reflected in the research, in many cases conducted on action research-based grounds, with businesses and government organizations at local, national and international arenas. The research design and professional orientation is manifested also in InnovationLab, which is the department’s and university’s unit for research-supporting system development.