CHAPTER THREE

USER CENTERED DESIGN APPROACH

3.1 Introduction

This chapter focuses on two main sections that are about user centered approach and applying this approach to design of the Blue Air Travel website.

3.2 User Centered Design Approach

User-Centered Design (UCD) is a multidisciplinary design approach based on the active involvement of users to improve the understanding of user and task requirements, iteration of design and evaluation (Vredenburg et al., 2002; Marcus, 2003 and McCracken et al., 2004). It is widely considered the key to product usefulness, usability and an effective approach to overcoming the limitations of traditional system-centered design (Vredenburg et al., 2005). The process of UCD involves many stages where each stage carries out several UCD techniques. Techniques are activities carried out to gather feedback from participants at individual stages of UCD process. Some of the techniques are described in section 3.3.

There are many differences between user centered design and the traditional approach of designing. Table 3.1 illustrates the differences. The main difference that can be seen from this table is that the UCD approach involves users throughout the design process whereas the traditional approach only allows the users to be involved after the designs have been made.

Table 3.1: User-Centered Approach to Design Vs Traditional Approach to Design
(Source from Vredenburg et al., 2002)

User-centered approach to design	**Traditional approach to design**
User driven	Technology driven
User focus	Component focus
Multidisciplinary team approach	Limited multidisciplinary interaction
Specialization in user experience	No specialization in user experience
User validation prior to development	Development prior to user validation
User view of quality	Product defect view of quality
Focus on user measurement	Focus on technical benchmarking

Users are not a primary concern in any traditional design approach where the primary concern is on the development and incorporation of code components that consist of system functionality (Vredenburg et al., 2002). Traditionally more concern is given to release of the website on a short schedule because working with users takes time training, setting appointment and getting the right candidate. Only when a developer discovers the website is a failure, does then he go and get user feedback which in turn costs more time and more money. Preece et al., 2002 has stated that UCD is the best way to overcome the usability drawbacks of a traditional system centered design.

The targeted users for this research are elderly. Through applying UCD approach it can solve the neglected elderly usability problems because it has a certain degree of sensitivity and awareness when collecting data from the elderly.

3.3 UCD Lifecycle Models

UCD model have been formulated by researchers, interaction design consultants such as IBM and software development companies. This research focuses on two UCD models that are STAR lifecycle model developed by Hartson and Hix (1989) and Interaction Design model by Jennifer Preece (Preece et al.,2002).

3.3.1 STAR Lifecycle Model (Hartson and Hix, 1989)

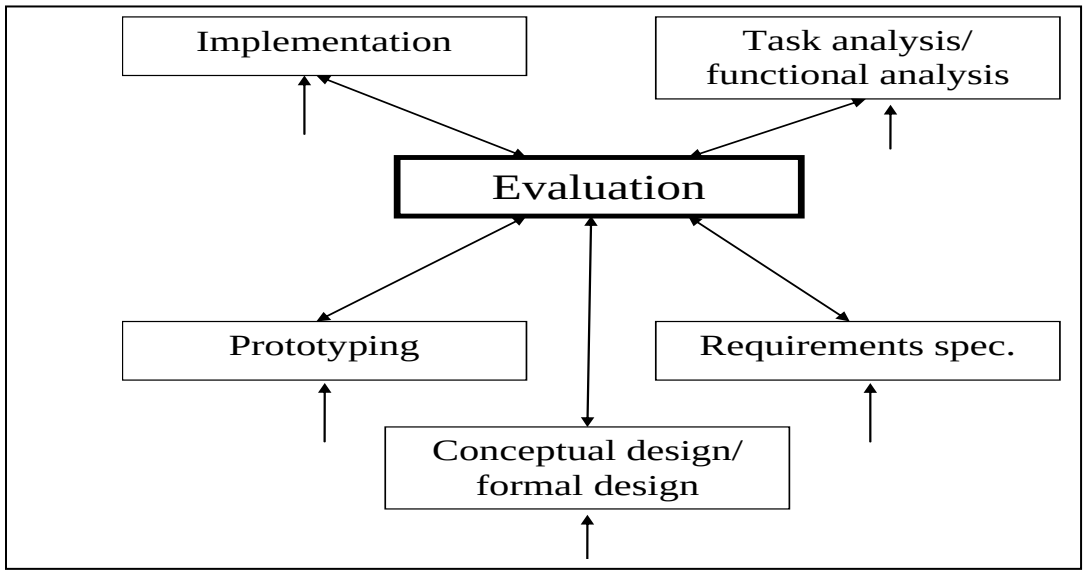

Figure 3.1: STAR Lifecycle Model (Hartson and Hix, 1989)

The STAR model was developed by Hartson and Hix in 1989. It has six stages which includes Implementation, Task analysis, Evaluation, Prototyping, Requirements specification and Conceptual design. The activities carried out at each stage are:

- Task Analysis : The users' goals are identified
- Implementation: The system is build to meet users' requirements and feedbacks.
- Evaluation: Result of each stage that is completed has to go through evaluation with the users to obtain feedback before going to the next stage.
- Prototyping: At this stage the users' ideas are brought to life.
- Requirement: Finding out what users need from the system will be carried out at this stage.
- Conceptual Design: An overall idea for the system is created.

The starting point of this model can be initiated from any of the activity as it does not have any specific ordering of activities. However, this model is highly interconnected through the evaluation process in the centre where every completed stage has to evaluate its result before going on to the next stage. Different kind of evaluation is required after each distinct stage in this lifecycle (Helms et al., 2006). This model may start with task analysis of the users or it may start with requirement gathering or by evaluating existing systems. Through iteration the product gradually becomes well defined.

3.3.2 Interaction Design Model (Preece et al., 2002)

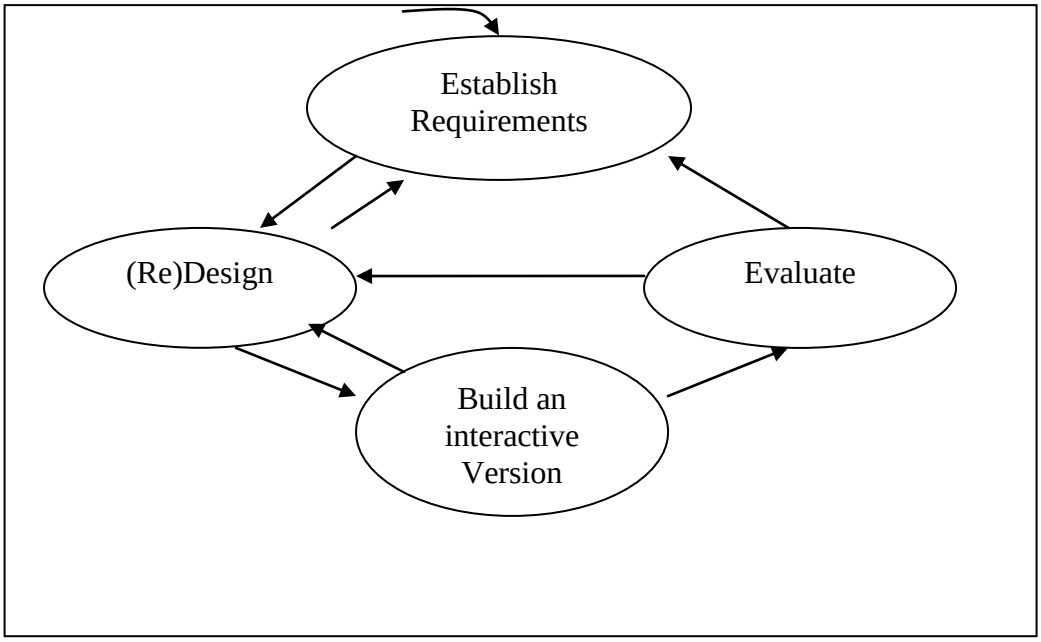

Figure 3.2: Interaction Design Model (Preece et al., 2002)

This model as seen in Figure 3.2 is produced by Jennifer Preece 2002. It has four stages that are:

1. Establishing Requirements: It involves identifying needs and requirements of the targeted users.
2. (Re)Designing: Designing alternative designs that meet those requirements.
3. Building interactive versions: Building of interactive product so that they can be communicated and accessed by users. This product can appear in low- fidelity (paper prototype) or high-fidelity (software prototype) versions.
4. Evaluating: The evaluation involves getting feedback from the users of what is being built throughout the process.

Users are involved throughout the design process to give opportunities for evaluations and essential feedbacks. User's ideas and feedbacks provide the designers the ultimate solution to a flawless design of a system. Iteration process takes place incase requirements gathered at certain stage is not clear, the designer may need to return to requirement stage or designing. The iterations are important to allow designs to be refined. The iteration continues as long as the user's expectation is not achieved. The only factor limiting the number of times through the cycle is the resources that are available but the cycle ends with an evaluation activity that ensures the final product meets the user's expectations.

3.3.3 Comparing the Two UCD Models

Although both the models above can be recommended to be used for software project each has its own drawbacks. The Star Model activities are highly interconnected and each cycle goes through the evaluation process. This is beneficial to produce a satisfactory product. However the developer cannot get an overall view of the development effort because it is an overly flexible model. Thus it makes tracking progress difficult, deliverables are not specified, resources are not allocated and targets are not set towards the aim. The process does not specify that it has to go through each activity in the model.

On the other hand the UCD approach by Jennifer Preece is very clear and easy to apply. It is more structured as compared to STAR because it clearly demonstrates the relationship between each stage. The iterative process is also shown very clearly. It is adaptable to a wide range of projects. Deliverables can be specified and target of the final product can be set towards the goals. The steps involve the process of requirement

gathering, design, build and interactive version and finally evaluation to release the product which makes sure the product meets the user's expectations.

3.4 Techniques Practiced at Different Stages of UCD Process

Table 3.2 describes the various techniques that are used at requirements gathering and design stages of the UCD approach.

Table 3.2: Types of Techniques used at Requirement Gathering and Design of UCD (Source from Preece, 2004, and Usability Methods, 2007)

Techniques	Usage Stage	Descriptions/Justification
Focus Group	Requirements Gathering	In this technique targeted users with specific characteristics are invited to a session of discussion. It rises sensitive and diverse issues from the users regard the idea of the product. It brings out participant to share opinions, ideas and attitudes towards a particular product. The designers/facilitators manage the discussion skilfully to stay in topic. It is low in cost to conduct this technique. It also gathers results quickly and is easily scaled.
Task Analysis	Requirements Gathering	Task analysis is to learn about an existing website to analyze the essential rationale. 'The analysis will involve the purpose of what people are doing, what they are trying to archive., why they are trying to

		archive it and how they are going about it'(Preece, 2002). The data abstracted helps to build the new requirements or to design new tasks.
Contextual Enquiry	Requirements Gathering	Contextual inquiry is a technique conducted through combination of observation, interview, discussion and reconstruction of past events. It is carried out at the user's work place to observe and interview what actually happens in the working environment. The users and the interviewer create a partnership between them to understand the users work better and cooperation is much needed from the users. The information gathered through observation must be interpreted through discussions with the users by asking clarifying questions.
Card Sorting	Design	Card sorting is a technique suggesting intuitive structures/categories of the verbs and nouns of a website. Participants are provided an unsorted pack of cards with verb or noun written on it. They are required to sort them into categories of their choice. This multiple individual sorts are combined and analyzed statistically. IBM'S EZ Sort is a tool that helps analyze the result of the user's card sorting activity. This tool comprises two packages that is U

		sort and Ez Calc. U Sort is used by card sorting participants to sort virtual cards or the designer can input after the physical card activity has been done. Later the EZ Calc is used by the test administrator to manage sorted card results from users. Thus it will perform a cluster analysis. EZ Calc generates a dendogram.
Paper Prototyping	Design	It is a mock-up version of the system that is evaluated by users to explain their needs and usability problems. It is known for saving cost and time of the developers as usability problems are identified before the product comes into the market.
User Testing	Evaluation	Tests are done in controlled settings and involve users performing typical tasks with the product while observer collect data related to measurable usability criteria such as usability problems that the product has, quantitative data on participants' performance, navigation path through the product, time taken to complete task and also determine participants' satisfaction with the product.

3.5 The Research Approach

The Interaction Design model by Preece, 2002 is used to produce Blue Air Travel website for the elderly. An overview of the research approach is found in chapter 1 in section 1.5. Figure 3.3 shows the research approach to produce Blue Air Travel Website in detail.

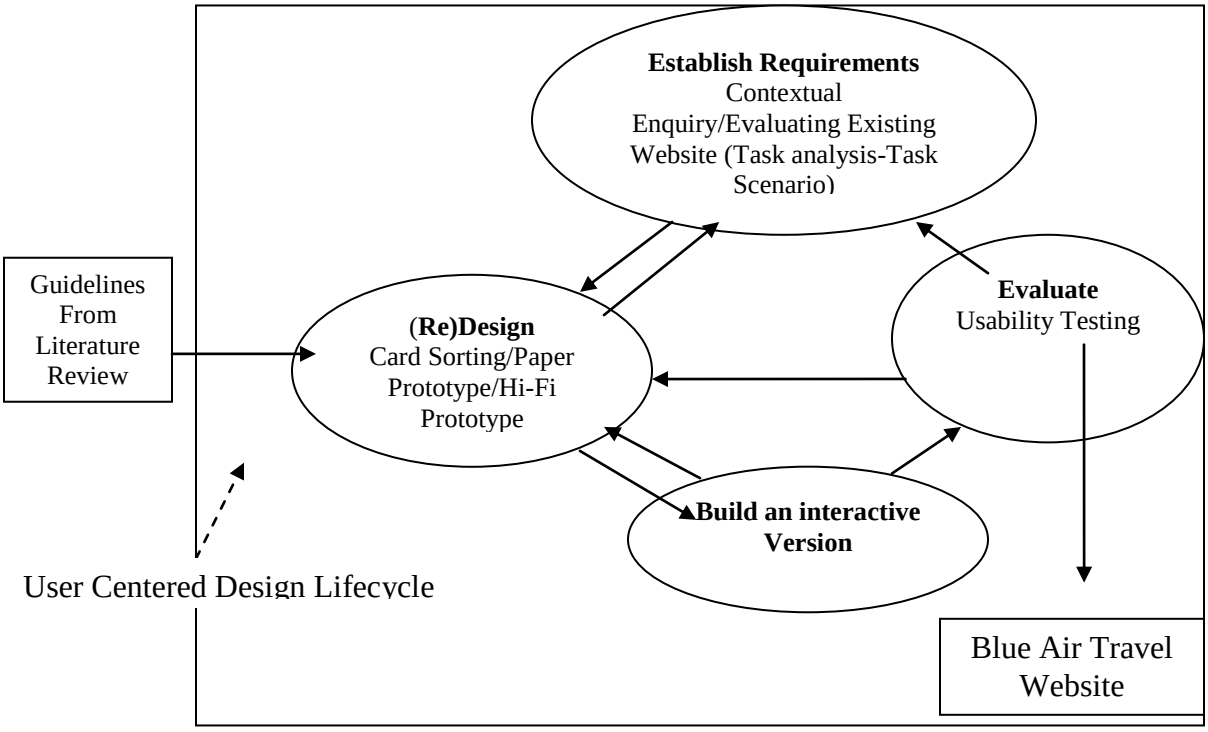

Figure 3.3: The Research Approach to Produce Blue Air Travel Website

There are four stages in this process which are establishing requirement, design; building an interactive version and evaluation. In Chapter 4, the process of establishing requirement is described. Techniques applied are contextual inquiry and evaluating an existing travel website. Contextual inquiry gathers user interface requirements through interviews and observations. Evaluation of existing travel website gathers functional

requirements and user interface requirements through task analysis and task scenarios. Summary of findings from contextual inquiry and evaluation of an existing travel website gathers a list of user interface requirements. These outcomes are embedded at the design stage.

In Chapter 5, the design and implementation of Blue Air Travel website is described. Stages of design and building an interactive version are strongly interrelated. At this stage three techniques are applied that are card sorting, paper prototype (low-fidelity) and high-fidelity. Each technique produces an interactive version for an evaluation through user testing. The card sorting activity is carried out to identify the website's information categories. The result of card sorting supports the design and building of paper prototype (low-fidelity prototype) together with user interface requirements and functional requirements findings from chapter 4. The paper prototype is user tested through task scenarios to identify usability problem which derives a list of usability requirements. This finding is then applied in the high-fidelity prototype 1 along with the most recommended guidelines from chapter 2 (table 2.3) and part of the user interface requirements from chapter 4. This interactive version of high- fidelity prototype 1 is user tested to identify usability problems to be improved in the Blue Air Travel website (high-fidelity prototype 2).

In chapter 6 a final user testing is conducted on the Blue Air Travels website (high-fidelity prototype 2). Questionnaires are used to test the usability of the Blue Air Travel Website and to know the success of implementing the recommended guidelines. This final user testing involves eight elderly participants.

Table 3.3 presents the summary of techniques and its outcomes as well as at which chapter they are described at.

Table 3.3: Techniques and Outcomes in the Development of Blue Air Travel Website

Stage	Task	Outcome	Chapter
Establishing Requirement	Contextual Inquiry	User interface requirement	4
	Evaluating Existing Website using Task analysis and Task scenarios	Functional Requirement and user interface requirement	4
Design, Build an Interactive version and Evaluation	Card Sorting	Categories of information.	5
	Design, Paper prototype (Low fidelity Prototype) and User Testing.	Usability Requirements	5
	Design, Website Prototype (High-Fidelity Prototype 1) and User Testing	Usability Requirements	5
	Design, Blue Air	Conclusion and	6 & 7

	Travel Website (High-Fidelity Prototype 2) and final User Testing.	Discussion	

3.6 Conclusion

This chapter focuses on the user centered design approach. At the initial stage there are discussions on comparisons between the traditional approaches of designing and UCD. Next, two models of UCD are reviewed. Then several UCD techniques at the requirement gathering and the design stages of the UCD methodology are described. Lastly the strategies applying the UCD approach are highlighted for designing the Blue Air Travel website.