Chapter - 1

Introduction
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INTRODUCTION

“...what is really important in education is.... that the mind is matured, that energy is aroused.”

- Soren Kierkegaard

1.1 Overview

E-learning includes all forms of electronically supported learning and teaching. The information and communication systems, whether networked learning or not, serve as specific media to implement the learning process. The term will still most likely be utilized to refer out-of-classroom and in-classroom educational experiences via technology, even as advances continue in regard to devices and curriculum. Abbreviations like CBT (Computer-Based Training), IBT (Internet-Based Training) or WBT (Web-Based Training) have been used as synonyms for E-learning [Ahm, 05].

User Interface Design (UID) is the computer and network-enabled transfer of skills and knowledge rendered to the learners. E-learning applications and processes include Web-based learning, Computer-based learning, education opportunities and digital collaboration. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.
It is commonly thought that new technologies can strongly help in education. In young ages especially, children can use the huge interactivity of new media, and develop their skills, knowledge, perception of the world, under their parents monitoring, of course. Many proponents of E-learning believe that everyone must be equipped with basic knowledge in technology, as well as use it as a medium to reach a particular goal [And, 05]. The E-learning modalities, shown in Figure 1.1, are as follows:

<table>
<thead>
<tr>
<th>Individualized self-paced E-learning online</th>
<th>Individualized self-paced E-learning offline</th>
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<tbody>
<tr>
<td>Group-based E-learning synchronously</td>
<td>Group-based E-learning asynchronously</td>
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*Figure 1.1. E-learning Modalities*

*Individualized self-paced E-learning online* refers to situations where an individual learner is accessing learning resources such as a database or course content online via an intranet or the internet. A typical example of this type is a learner studying alone or conducting some research on the internet or a local network.

*Individualized self-paced E-learning offline* refers to situations where an individual learner is using learning resources such as a database or a computer-assisted learning package offline (i.e., while not connected to an intranet or the internet). An example of this is a learner working alone off a hard drive, a CD or DVD.
Group-based E-learning synchronously refers to situations where groups of learners are working together in real-time via an intranet or the internet. It may include text-based conferencing, and one or two-way audio and video conferencing. Examples of this include learners engaged in a real-time chat or an audio-video conference.

Group-based E-learning asynchronously refers to situations where groups of learners are working over an intranet or the internet where exchanges among participants occur with a time delay (i.e., not in real-time). Typical examples of this kind of activity include on-line discussions via electronic mailing lists and text-based conferencing within learning management systems.

1.2 Definition of the Problem

The present UID does not consider the cognitive and human factors of the E-learners that reduce the performance of the learners. There are various human factors involved in the E-learning process such as EQ, Personality, Stress, IQ and Attitude. These factors eventually influence the E-learning process. There is a need to understand the cognitive and human factors of E-learners to improve the overall quality of the UID. Cognitive processes in E-learning incorporate the aspects such as attention, selection, comprehension, recollection, retrieval (retention), and abstraction.

The organization of the E-learning materials such as size of text, inclusion of heading, physical layout and size of the window are also affecting
the E-learning process [Dou, 03]. Shneiderman [Ben, 12] cited a number of cognitive aspects (e.g. short and long-term memory, problem solving, decision making, and searching) related to the user and the task that can have a significant impact on web page design. E-learning enables users to learn anytime and anywhere. E-learning demands proper User Interface Design (UID) [Som, 06]. UI should be designed by matching the skills, experience and expectations of its users [Ian, 04]. UID is the design of software applications and websites with the focus on the user's experience and interaction [Vin, 01] [Jay, 11]. The proposed research work focuses on to put forth a framework for UID based on cognitive process of E-learners. This work improves the quality of the UID which in turn increases the effectiveness of E-learning process.

1.3 Aim and Objectives

The overall aim of this research work is to propose a Framework for UID based on cognitive processes of E-learners. It can be achieved through the following objectives:

- To explore the relationship between Personality Traits and Recollection and Retention skills of E-learners.
- To discover the relationship between Emotional Quotient (EQ) and Recollection & Retention skills of E-learners.
- To investigate the relationship between Intelligent Quotient (IQ) and Recollection & Retention skills of E-learners.
• To propose procedures to improve UID based on Personality Traits, EQ and IQ of E-learners.

• Finally, to propose a framework for UID.

1.4 Scope of the Research Work

This research work attempts to enhance the quality of UID based on cognitive processes. To improve the quality of the UID, the cognitive factors such as Recollection and Retention, and the human factors such as EQ, Personality and IQ are considered in designing the UID. The personality test is conducted to classify the learners into three categories. The IQ of the learners is segregated into three levels. The EQ levels of the learners are grouped into five categories. The UID framework designs web pages based on the experimental results of the proposed research work for effective E-learning. Though various UID parameters are available, this proposed research work deals the relation between cognitive and human factors with background colour and font type. The research bounds its samples between 20 and 24 years old post graduate science learners.

1.5 Methodology

The methodology for UID using cognitive processes of E-learners is developed by considering UID parameters, cognitive and human computer interaction factors. The Proposed ArcUID Framework comprises of three procedures, namely, User Interface Design Based on Personality (UIDBP),
User Interface Design based on Emotional Quotient (UIDEQ) and User Interface Design based on Intelligent Quotient (UIDIQ), which are applied to bring a better UID in order to make the E-learning effective.

The UIDBP procedure is proposed to explore the relationship between the personality traits and UID parameters. The UIDBP comprises of the Eysenck’s Personality tool, R&R Test and Association Rule Mining technique. Eysenck’s Personality tool is used to classify the learners into three categories namely Extraversion, Neuroticism, and Psychoticism. R&R test is utilized to explore into the appealing characteristics of the UID parameters for better recollection and retention. With the use of Association Rule Mining (ARM) technique, the relationship between UID parameters and personality types are found.

The UIDEQ procedure is proposed to find the relationship among EQ, UID parameters and R & R factors in E-learning environment to improve the UID. Using Trait Emotional Intelligence Questionnaire (TEIQue), the learners are classified into five categories, namely, Well-being, Self-control, Emotionality, Sociability and Global Trait EI. The ARM technique is applied to find out the association between EQ and UID parameters.

The human aspect of Intellectual Quotient is taken into account to design pages for better retention and recollection with the use of the proposed UIDIQ procedure. Intelligent Quotient levels are identified with the IQ tool.
The relationship between the IQ levels and UID parameters are opened up using the R & R test.

Recollection and Retention are considered as cognitive processes of E-learners to cull out the characteristic preferences. Cognition based User Interface Design Framework for effective E-learning is proposed with the three procedures, namely, UID Based on Personality (UIDBP), UID Based on IQ (UIDIQ) and UID Based on EQ (UIDEQ).

With the Association Rule Mining (ARM) technique, the analysis is made using support and confidence measures. It has been applied to find out the relationship between UID parameters and human factors. R & R tests are carried out again with the pages generated from the inferred rules of ARM technique to show improvement in the performance of the learners.

1.6 Chapter Organization

The thesis consists of seven chapters. The format of the thesis is as follows:

- **Chapter 1** is the Introduction; it covered concisely the theoretical background of the topic and conceptual understanding of the cognitive processes.

- **Chapter 2** highlights the review of the background literature and the abstracts of the previous research findings, which provide the baseline to proceed with the research work.
• **Chapter 3** describes the proposed method for UID based on Personality.

• **Chapter 4** elucidates the proposed method for UID based on Emotional Quotient.

• **Chapter 5** deals with the proposed method for UID based on Intelligence Quotient.

• **Chapter 6** elaborates on the proposed ArCUID Framework.

• **Chapter 7** concludes with the salient findings of the proposed methodology for UID based on human and cognitive factors. It is followed by References and Appendices.

### 1.7 Chapter Summary

The basis and the need of this research work are presented and justified in this chapter. It consists of basic information regarding E-learning and its importance in the pedagogy. It explains the need for developing a framework to improve the performance of the learners. This chapter highlights the need for the consideration of cognitive and human factors in designing a user interface.

Various objectives of the research, that are to be achieved, are also presented. It includes the boundary within which the current research work is conducted. The description of the definition and validation of ArCUID Framework is put forward in this chapter. Finally, it is concluded with the chapter organization which briefly discusses the purpose of each chapter in the thesis. The next chapter reviews the literature and previous research findings. It provides the motivation for the proposed research work.