CHAPTER – 2

REVIEW OF LITERATURE

“There never comes a point where a theory can be said to be true. The most that anyone can claim for any theory is that it has shared the successes of all its rivals and that it has passed at least one test, which they have failed.”

- A.J. Ayer

2.1 Introduction

The Information and Communication Technology (ICT) has been vigorously developing since the end of 20th century. This advancement has rooted itself in all the disciplines and facets of life. The influence of such technological advancements in education and other services has been studied by sociologists, anthropologists, policymakers, and managers [Ben, 12].

Among the wide range of technology in the day-to-day life, E-learning has become remarkable with User Interface Designs in education. User interface development and maintenance give a burden for many developers from its beginning. For the desire to improve the user’s computing experience, UIDs need to be better explored, therefore the literature of the past is reviewed.

The learning has expanded beyond the walls of the classroom, the proliferation of devices and applications, which have greatly expanded how and where the information is to be presented [Ber, 10a]. The increasing importance of User Interface Design in the field of E-learning raises the challenge of its design parameters. The human factors affect remarkably the
learners in pedagogy. So, these factors are dealt in designing the UIDs. These human factors that influence the cognitive factors in the enhancement of the UID are studied.

2.2 Basic Concepts

This section describes the basic concepts to enable the learners to have a better understanding.

2.2.1 Human Factors

Human Factors [Tan, 12] is a discipline, regarding human psychological, social, physical, and biological characteristics. It includes Personality, Emotional Quotient, Intelligent Quotient, Attitude, Stress and Learning style.

**Personality** in the view of Scientific Psychology [Pia, 13], has a higher-level abstraction encompassing traits, sets of stable dispositions toward action, belief, and attitude formation. Personality traits differ across individuals, are relatively stable over time, and influence behaviour.

**Emotional Quotient** [Gol, 95] is a quantification of one’s ability to monitor his or her emotions, to cope with pressures and demands, and to control his or her thoughts and actions. EQ measures the abilities to assess and generate emotions that assist thought, understand emotions and knowledge, and reflectively regulate emotions in order to promote intellectual growth.
**Intelligence** [Plo, 10] is a driving force or an ability to acquire and use knowledge and skills, or to inference in problem solving. An IQ is an attempt to measure a person's intelligence. IQ is often measured because it correlates well with success in a variety of life events. People with high IQs generally finish a higher level of education, have bigger incomes, do better at their jobs, have lower violent crime rates and have better health. It should be noted that IQ seems to be independent of self-assessed levels of happiness.

### 2.2.2 Cognitive Aspects

Cognition is a term referring to the mental processes involved in gaining knowledge and comprehension. These processes incorporate the aspects such as attention, selection, comprehension, recollection, retention, and abstraction. These are higher-level functions of the brain and encompass language, imagination, perception, and planning. Cognitive factors are important because they are directly related to the learner’s ability to comprehend and complete the portion.

**Cognitive science** is an interdisciplinary science that draws upon many fields including neuroscience, psychology, philosophy, computer science, artificial intelligence and linguistics. The purpose of cognitive science is to develop models that help explain human cognition - perception, thinking, and learning [Tha, 11]. The research work concentrates on recollection and retention skills that are described below.
**Cognitive Architecture** includes two major parts in the model: working memory and long-term memory. Working memory provides temporary storage and transformation of verbal and pictorial information that is currently in the focus of attention. The working memory becomes overloaded if more than a few chunks of information are processed simultaneously [Rob, 05]. Long-term memory represents a large store of organized information with effectively unlimited storage capacity and duration. It contains a huge number of organized knowledge structures (schemas) that effectively determines the capabilities to function successfully in complex environments.

**Recollection** [Sim, 08] is the retrieval or recall of memory. A temporary failure to retrieve information from memory is known as the tip-of-tongue phenomenon. Various means, including meta-cognitive strategies, priming, and measures of retention may be employed to make the best use of memory. Recollection is reproduction of what was perceived.

**Retention** is said to be the ability to recall or recognize what has been learned or experienced. It is the production of what has been perceived [Leo, 92].
2.2.3 User Interface

User Interface is a way by which a user communicates with a computer through a particular software application. It is the physical means of communication between a person and a software program or an operating system. Often, a user interface is composed of some common methods for communication as various ActiveX controls as command buttons, menus, icons, etc. User interface design is an integral part of software engineering process that requires a lot of time and effort from a designer.

Principles of UID are more fundamental, widely applicable, and enduring for efficient designs. The ISO 9241 standard Ergonomics of Human-System Interaction focuses on admirable goals: effectiveness, efficiency and satisfaction. A few intrinsic principles of UID [Ben, 10], to achieve its goals, are given below:

- Designing with an understanding of the intended users, including the population profiles which reflect their age, gender, physical and cognitive abilities, education, and personality.
- Analysing the tasks to understand its frequencies and sequences.
- Choosing the parameters for designing
- Consistency in design
**E-learning** [Min, 09] is defined as, “the use of computer network technology, primarily, over or through the internet, to deliver information and instruction to individuals”. E-learning is generally quoted when learning procedure is involved with information and communication technologies. It has attracted considerable interests and increased divergence of theoretical perspectives in the past decades. Most E-learning tools are based on objectivist learning model, in which learning is the transfer of knowledge from instructor to learner.

E-learning has emerged as the new paradigm of modern education with its flexibility to access, just-in-time delivery, and cost effectiveness. It has increased attention with the significant and professional role of the educators.

**Knowledge Base** is a database used for knowledge sharing and management that contain a set of data, often in the form of rules that describe the knowledge in a logically consistent manner. The knowledge base in particular to solve a real-life task has patterns that are formed in a process. It is considered same as other computer-based information systems for development process [Raj, 10].

**Pattern** [Rog, 05] is a named nugget of insight which conveys the essence of a proven solution to recurring problem within a certain context amidst competing concerns. The intent of design pattern is to provide a description that enables a designer to determine:
The pattern is applicable to the current work,

- The pattern can be reused (hence, saving the time), and
- The pattern can serve as a guide for developing a similar, but functionally or structurally different pattern.

A Pattern contains set of preferences of the UID parameters that were selected based on various tests. The best engineers in any field have an uncanny ability to see patterns that characterize a problem and corresponding patterns that can be combined to create a solution.

**Page Base** has self-contained units that include learning objects such as keywords, statements, images and contents often stored in files. Creating an E-learning tool requires putting together a sequence of learning objects provided from Page base.

**Designer** refers to an individual who practices an intellectual profession, and not simply a trade or a service for enterprises. Designing involves creative activity whose aim is to prepare E-content with the subject matter present in Page base.

### 2.3 Stratified Random Sampling

The domain of E-learners is huge enough to fit within a boundary. The study focuses only on the student community E-learners. For this purpose the domain of E-learners is restricted to post graduate science students of Bharathidasan University.
Sampling Technique plays a vital role in selecting the appropriate sample size. The stratified sampling technique is effectively utilized to give representation of each category of learners. The main advantage with stratified sampling is how it captures key population characteristics in the sample. Similar to a weighted average, this method of sampling produces characteristics in the sample that are proportional to the overall population [Wil, 97]. The study decided four strata representing autonomous government colleges, non-autonomous government colleges, autonomous private colleges and non-autonomous private colleges affiliated to the University. In each stratum due weightage was given, to select sample points [Pau, 08]. Within each stratum, selection is restricted by using simple random sampling. The optimum sample size was fixed as 150 and tests were conducted for this purpose. Selection of sample points was scientifically validated by using the appropriate sampling technique. Such a sample is employed throughout the research.

2.4 Mining and Performance Analysis Techniques

This section discusses the mining and the appraisal tools that are utilized in proposed research work. Association Rule Mining and Co-efficient of Correlation are explained below.

2.4.1 Association Rule Mining

In data mining, Association Rule Mining is a popular and well researched technique for discovering interesting relations or associations
between specific values of categorical variables in large databases. Piatetsky Shapiro [Pia, 91] describes analyzing and presenting strong rules discovered in databases using different measures of interestingness. Based on the concept of strong rules, Agrawal et al. [Agr, 93] introduced association rules for discovering regularities between products in large scale transaction data recorded by Point-Of-Sale (POS) systems in supermarkets. Association rule mining finds interesting associations and/or correlation relationships among a large set of data items. Association rules show attributed value conditions that occur frequently together in a given dataset. Mining association rules on large data sets have received considerable attention in recent years. Association rules are useful for determining correlations between attributes of a relation and have applications in marketing, financial, and retail sectors. Furthermore, optimized association rules are an effective way to focus on the most interesting characteristics involving certain attributes. Optimized association rules are permitted to contain uninstantiated attributes and the problem is to determine instantiations such that either the support or confidence of the rule is maximized.

These powerful exploratory techniques have a wide range of applications in many areas of business practice and also research - from the analysis of consumer preferences or human resource management, to the history of language. These techniques enable analysts and researchers to uncover hidden patterns in large data sets. The implementation of the so-called A-priori
algorithm allows rapid processing of huge data sets for such associations, based on predefined "threshold" values for detection.

Association Rules finds rules of the kind If \( X \) then (likely) \( Y \) where \( X \) and \( Y \) can be single values, items, words, etc., or conjunctions of values, items, words, etc. (e.g., if (Car=Porsche and Gender=Male and Age<20) then (Risk=High and Insurance=High)). The program can be used to analyze simple categorical variables, dichotomous variables, and/or multiple response variables. The algorithm will determine association rules without requiring the user to specify the number of distinct categories present in the data, or any prior knowledge regarding the maximum factorial degree or complexity of the important associations. In a sense, the algorithm will construct cross-tabulation tables without the need to specify the number of dimensions for the tables, or the number of categories for each dimension. Hence, this technique is particularly well suited for data and text mining.

The association rules problem can be formulated as follows:

Let \( I = \{i_1, i_2, ..., i_n\} \) be a set of literals call items. Let \( D \) be a set of all transactions where each transaction \( T \) is a set of items such that \( T \subseteq I \). Let \( X, Y \) be a set of items such that \( X, Y \subseteq I \). An association rule is an implication in the form \( X \Rightarrow Y \), where \( X \subset I, Y \subseteq I, X \cap Y = \emptyset \) [Agr, 93].
2.4.1.1 Measures of Association Rules

Essentially, association mining is about discovering a set of rules that is shared among a large percentage of the data [Zak, 00]. Association rules mining tend to produce a large number of rules. The goal is to find the rules that are useful to users. There are two ways of measuring usefulness, being objectively and subjectively. Objective measures involve statistical analysis of the data, such as support and confidence [Agr, 93].

Support: The rule \( X \Rightarrow Y \) holds with support \( s \) if \( s\% \) of transactions in \( D \) contain \( X \cup Y \). Rules that have a \( s \) greater than a user-specified support is said to have minimum support.

Confidence: The rule \( X \Rightarrow Y \) holds with confidence \( c \) if \( c\% \) of the transactions in \( D \) that contain \( X \) also contains \( Y \). Rules that have a \( c \) greater than a user-specified confidence is said to have minimum confidence.

2.4.2 Correlation Analysis

The data in which measures of one variable for each individual is called a univariate distribution. If a pairs of measures on two variables of each individual is given, then the joint presentation of the two sets of scores is called a bivariate distribution. In a bivariate distribution the pair of scores made by the same set of individuals on two variables are given. If the change in one variable appears to be accompanied by a change in the other variable, the two variables are said to be co-related and this inter-dependence is called correlation.
To measure the degree of relationship between two variables quantitatively, an index of relationship is used and is termed as co-efficient of correlation. Co-efficient of correlation is a single number that tells us to what extent the two variables are related and to what extent the variations in one variable changes with the variations in the other. The co-efficient of correlation is always symbolized either by \( r \) or \( \rho \) (Rho). The notion 'r' is known as product moment correlation co-efficient or Karl Pearson's co-efficient of correlation. The symbol ‘\( \rho \)’ is known as Rank Difference correlation co-efficient or Spearman's Rank correlation co-efficient.

### 2.4.2.1 Different types of Correlation

The measurement of correlation between two variables results in a maximum value that ranges from -1 to +1, through zero as shown in Figure 2.1. The ±1 values denote perfect co-efficient of correlation. When the increase in one variable (X) is followed by a corresponding increase in the other variable (Y); the correlation is said to be positive. The positive correlations range from 0 to +1; the upper limit i.e. +1 is the perfect positive co-efficient of correlation. The perfect positive correlation specifies that, for every unit increase in one variable, there is proportional increase in the other. For example, "Heat" and "Temperature" have a perfect positive correlation [Ber, 10].

If, on the other hand, the increase in one variable (X) results in a corresponding decreases in the other variable (Y), the correlation is said to be
negative. The negative correlation ranges from 0 to -1; the lower limit giving the perfect negative correlation. The perfect negative correlation indicates that for every unit increase in one variable, there is proportional unit decrease in the other.

Zero correlation means no relationship between the two variables $X$ and $Y$; i.e. the change in one variable ($X$) is not associated with the change in the other variable ($Y$). For example, body weight and intelligence, shoe size and monthly salary; etc. The zero correlation is the mid-point of the range -1 to +1. Figure 2.1 shows the scatter diagram for varying degree of relationship between $X$ and $Y$.

![Figure 2.1. Scatter Diagrams Showing Varying Degree of Relationship between $X$ and $Y$](image)

The rule of thumb for interpreting the size of a correlation co-efficient is presented in Table 2.1.
Table 2.1. Interpretation of Sizes of Correlation [Ber, 10]

<table>
<thead>
<tr>
<th>Size of Correlation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>±1</td>
<td>Perfect Positive/Negative Correlation</td>
</tr>
<tr>
<td>±.90 to ±.99</td>
<td>Very High Positive/Negative Correlation</td>
</tr>
<tr>
<td>±.70 to ±.90</td>
<td>High Positive/Negative Correlation</td>
</tr>
<tr>
<td>±.50 to ±.70</td>
<td>Moderate Positive/Negative Correlation</td>
</tr>
<tr>
<td>±.30 to ±.50</td>
<td>Low Positive/Negative Correlation</td>
</tr>
<tr>
<td>±.10 to ±.30</td>
<td>Very Low Positive/Negative Correlation</td>
</tr>
<tr>
<td>±.00 to ±.10</td>
<td>Markedly Low and Negligible Positive/Negative Correlation</td>
</tr>
</tbody>
</table>

2.5 Related works

The Researchers created the interdisciplinary design science of Human-Computer Interaction, as the UI designers harnessed the advance technologies to serve human needs, by applying the methods of experimental Psychology to the powerful tools of Computer Science [Ben, 12].

E-learning enabled users to learn anytime and anywhere. E-learning demanded proper UID [Nai, 06]. UID should be designed by matching the skills, experience and expectations of its users [Ian, 04]. It is good to consider the design of software applications and websites with the focus on the user's experience and interaction [Vir, 01] [Jay, 11].

Wang [Wan, 09] highlighted that the dominance of technology-oriented approaches made E-learning practices less goal effective, and accordingly made them perceive to be poor in quality and design. E-learning development was focused on the technical issues of design parameters.
Mayer [Mayer, 01] stated that, with the rapid development and increasing use of the World Wide Web (WWW), studying through the web interfaces became popular. And web-based learning environment served as motivational, instructional, modelling, feedback and assessment tool to the E-learning process. These environments made considerable impact on the cognitive and social behaviour of learners.

The success or failure of any UID often depends on the precision and completeness of the understanding among the learners and implementers. Early researches in UIDs were done largely by introspection and intuition, but those approaches suffered from a lack of validity, generality, and precision. For this reason, the psychological and cognition oriented analysis could be employed for a deeper understanding of the fundamental principles of human interaction with UIDs [Ben, 12].

The organization of the E-learning materials such as size of text, inclusion of heading, physical layout and size of window were also affecting the E-learning process [Dou, 03].

2.5.1 Personality and UID

Seto Mulyadi [Set, 11] took an experiment on Personality Development through Learning with Process Approach in E-learning. The main objective was to produce university graduates who have excellent intellectual giftedness and creative personality. He observed with process approach within E-earning
program, which integrated the elements of motion, audio, colour, and image in the learning materials. With the E-learning programs, which integrated learning-by-doing methods, the learners were trained to design learning materials that were not limited only to the theories but also to the applications. The learning method was believed to develop an advanced intellectual giftedness because the learning became more interesting and meaningful. Therefore, the learning material was mastered. The model of learning enabled the development of a creative personality.

Stephen R. Gulliver et al. [Ste, 10] from Informatics Research Centre, UK, researched on cognitive style and personality that had an impact on multimedia perception. The main purpose was to explore the relationship between cognitive style, user personality and perceived multimedia quality. He used cognitive Style Analysis and an adapted Myers-Briggs questionnaire to assess cognitive style and user personality respectively. He utilized an adapted Quality of Perception metric to assess user-perceived multimedia quality. He showed on assessing the outcome that, personality type and user cognitive style affects information assimilation, self-perceived achievement and learner level of confidence.

Essaid El Bachari et al. [Ess, 09] carried out a research and presented an Adaptive E-learning model based on learner’s personality. To recognize the learner’s personality, the system used was the Myers-Briggs Type Indicator's
(MBTI) personality dimensions and they proposed a Personalized Education System Learn Fit Framework that suggested a learning style matching with learner’s preference in online learning education.

Fatahi. S et al. [Fat, 09] speculated on Design and Implementation of an E-Learning Model by Considering Learner’s Personality. They analyzed that people with different personalities show different emotions in facing an event. In the case of teaching and learning, personality difference between learners played an important role.

Probing into the influence of personality in E-learning systems, Amal Al-Dujaily et al. [Ama, 08] conducted a research. The aim of the study was to understand how learners with different personality respond to an E-learning content structure. An experiment was ventured to find the relationship between the learner’s personality type and the learning sequence design. It was revealed that a different personality type had a markedly different effect on learning performance. They finally found that the task performances by the two different personality groups (introverted and extraverted) were significantly affected by the different learning sequence. Those findings strongly indicated that the personality type could be an influential indicator of learning performance. The empirical study showed that the personality type affected the learning process.
In his research, Jannica [Jan, 00] had concluded that personality influences the learning. Personality traits were expressed in learning styles, which were in turn reflected in learning strategies that produced a certain outcome.

Servet Bayram et al. [Ser, 08] in “The Role of Personality Traits in Web Based Education” aimed at investigating the relationships among personality traits and learners’ academic achievement in a web based environment and attitudes towards web based education. The learners numbering about 120 enrolled in the E-MBA Masters Degree of Bilgi University constituted the study group of the research. A survey method was used for the study and the data were collected by Web Based Education Attitudes Scale and the Adjective Check List (ACL). At the end of the study, it was revealed that the learners were successful in the web based education environment with the average of 3.091 out of 4.00. The average of learners’ attitudes towards web based education was 97.212 out of 135. The arithmetical average of the items in the attitudes scale was 3.738 out of 5.00. Also, significant relationships were found between learners’ personality traits, academic achievement and attitudes towards web based education. The findings revealed that personality traits explain about 53.2% of the academic achievement, and 52.7% of the attitudes towards web based education.
Du Jin et al. [DuJ, 05] endeavoured the Research of Mining Association Rules between Personality and Behaviour of learner under Web-Based Learning Environment. They found that discovering the relationship between behaviour and personality of learner in the Web-Based Learning environment was the key to guide learners in the learning process. They proposed a new concept called personality mining to find the “deep” personality through the observed data about the behaviour. A learner model which includes personality model and behaviour model was proposed. They designed and implemented an improved algorithm, which was based on Apriori algorithm, a widely used in market basket analysis, to identify the relationship. Finally, they discussed on various issues like constructing the learner model, unifying the value domain of heterogeneous model attributes, and improving Apriori algorithm with decision domain. Experiment result indicated that the algorithm for mining association rules between behaviour and personality was feasible and efficient. The future work was to analyze their behaviour and how to adopt the proper study strategy and settle adaptive leaning material.

User Study for Generating Personalized Summary Profiles, a research study made by Lalitha Agnihotri et al. [Lal, 05] presented a methodology and a supporting user study for generating user profiles and content features that can be used to automatically create personalized summaries of broadcast television content. They determined a mapping, from users’ personality traits measured by commonly available personality tests, to computable video features that such
personality traits appear to prefer. Three common personality profiles were elicited from 59 subjects, together with their preferred summary of news, music, and talk show videos. A factor analysis between the personality traits and the features in preferred summaries indicated that only some traits (e.g., gender, extraversion, control orientation, intuitiveness, etc.) and only some features (e.g., faces, reportage, text, chorus, host, etc.) had predictive value. The mapping of personality to feature also differed by genre. However, in general, extraverted users tended to prefer directly experienced content, while introverted users preferred content mediated through analysis.

In a study on Perceived Quality of Multimedia Content: A Cognitive Style Approach by Gheorghita Ghinea et al. [Ghe, 06], the relationship between user cognitive styles and perceptual multimedia quality was investigated, in which users had the possibility to specify their desired Quality of Service settings in terms of frame rates and colour depth. Results showed that whilst colour choice was impacted by a participant’s cognitive style, such Quality of Service parameters which do not significantly affect perceived multimedia quality, and that users do not necessarily choose optimum presentation settings to enhance their perceived enjoyment and assimilation of multimedia informational content.

2.5.2 Emotional Quotient and UID

An evident inquiry into the relationship between the Emotional Intelligence and Cognition was conducted by Robin Berenson et al. [Rob, 08]
on “Emotional Intelligence as a Predictor for Success in Online Learning”. They declared online learner academic performance and made a comparison of emotional factors and personality test with respect to semester mark. The Grade Point Average (GPA) played a significant role in this process. This research experiment selected all aged learners and conducted an online test for emotional quotient and personality. They concluded that there exists relationship among the emotional quotient, personality and academic successes.

Christine Wibhowo et al. [Chr, 10] explained about E-learning as one of the most powerful learning. E-learning learners are very active and intelligent compared to traditional learners. They found that there are problems associated with the E-learning learners with respect to emotion, motivation, self-discipline, stress, and social skills. If these problems are solved, the E-learning learners can perform better in all aspects.

Badri Shatalebhi [Bad, 11] on examining the relationship between EI and learning styles declared that EQ, as skill, knowledge and understanding, can guide incentives to make success in life. He explained the conduct of emotional intelligence and the relationship between emotional quotient and the academic success of the E-learning students. He suggested a brief review of the concept of emotional intelligence, how to measure the emotional intelligence, and academic achievements.

Goleman [Gol, 98] considered Emotional Intelligence to be a general structure that can be the reason for the individuals’ success in different aspects.
of life. He stated that those individuals, who, somehow, control their emotions and interact with other people more effectively, have a more meaningful life. He concluded that emotional intelligence influenced the facets of life.

An experiment was conducted by Azita et al. [Azi, 11] to find if there was a correlation between the learners’ Emotional Intelligence and their academic progress. He concluded with an accuracy of 99% that there exists a positive correlation between the EI and the academic progress. The main components of EI included self-motivation, self-awareness, self-control, social awareness and social skills.

Nada Salem Abisamra et al. [Nad, 11] had conducted an online emotional test and compared EQ of the learners with their final semester marks. Finally, they found a relationship between Emotional Intelligence and academic achievement and suggested to revise the school curricula to improve learners based on Emotional Intelligence.

Corroborating emotion theory with Role Theory and Agent Technology, Bogdan Florin Marin et al. [Bog, 06] designed a Framework for Designing Emotional Agents as Tutoring Entities. They discussed about computer based learning and teaching, and discovered that motivation level of the learners increased. The actions based on their emotion, attitude and their personality were widely considered.

Nada Salem Abisamra [Nad, 00] conducted a research on “The relationship between Emotional Intelligence and academic achievement in eleventh grade”.
The author suggested that there exists relation between EQ and the academic success. They selected 500 eleventh grade learners and conducted 30 minutes online emotional test using Baron Emotional Quotient inventory Test, and compared their test results and their final semester marks. Finally, the authors concluded and found a relationship between Emotional Intelligence and academic achievement. Hence, Emotional Intelligence was incorporated in the schools curricula.

In his analysis entitled, “The importance of online community in student academic performance”, Martin Graff [Mar, 06] dealt about four parts of issues regarding the student’s performance of the learning environment. The issues hovered on identifying any relationship between cognitive aspects and academic performance, any relationship between learner’s academic performance and three coursework assignments, any relationship between learner’s course assignment and online community, and finally any relationship between online community score and their engagement of online assessment. The results were discussed in terms of a consideration of these four factors in course design within a blended learning framework.

Richard Culver [Ric, 99] analysis on “the Optimum Academic Performance and its Relation to Emotional Intelligence” showed that effect of emotional intelligence optimized the performance of the learners by developing the discipline and skills for effective learning.
2.5.3 Intelligent Quotient and UID

Two thousand years ago Plato said, “All learning has emotional foundation, and are emotional”. Since then, many researches were in the process to identify the relation between intelligence and performance of learners [Ali, 10].

Daniel Golman [Dan, 96] in his book on “Emotional Intelligence” discussed interesting information about the brains, emotions and behaviour. He believed that the emotional abilities in relation to cognitive abilities are more important in the personal, social and professional success. This try out postulates that the relationship between Intelligence Quotient (IQ) and Recollection and Retention (R & R) in an assortment of aspects using Spatial, Verbal, Logical, Mathematical intelligences with various web elements using Text, Colour and Image. They also explained about web user interface design, cognitive science, intelligence quotient, recollection and retention. These suggestions lead to many later investigations [Man, 10].

Robert W. Service [Rob, 05] said that a high IQ does not always correlate with success in life. This manuscript examined the intelligence quotient test scale, measures, factors and importance of successful intelligence key elements to improve successful intelligence quotient. Finally, the author puts down a statement that there is no fundamental difference between mathematical and other kinds of thinking. This case study postulated that the
varying traditional methods of admission to higher education and teaching toward successful intelligence.

According to Gardner, intelligence is as “an ability or set of abilities that allowed a person to solve a problem or fashion a product that is valued in one or more cultures”. By relating the problem solving abilities to the cognitive aspects, he discovered that IQ affects learning [Ala, 88].

David A. Guralnick [Dav, 00] suggested that user interface is a crucial part of a user experience affected by various human factors. In his view, E-learning interface design is characterised, when it satisfied two factors: effectiveness and interface design. He concluded that an effective user interface design is developed when the human factors are considered.

Albert Zieglu and Heidrun Stoeger [Alb, 08] suggested in giftedness research, Intelligence Quotient is the best predictor of high achievement levels. They had proposed a model for giftedness. The first result was achieved by conducting the experiment and the correlation amounted to $r = 0.29$. This was the correlation between subjective action space and intelligence. According to second result, more highly learning people were found to have both high intelligence quotient as well as subjective intelligence space. Then, the third result showed that the learning orientation of the subject action space and IQ would be able to predict future educational attainment.
2.6 Motivation

Based on the review of the literatures, it is found that the cognition in UID design is a potential area of research. There is a need to improve UID based on users’ Personality, EQ and IQ. This necessitates proposing an overall framework for designing UID based on cognitive and human factors.

2.7 Chapter Summary

In the field of User Interface Design, human factors have become an important aspect. In this chapter, the basic concepts of the research work namely human factors, cognitive factors, and UI are presented. A detailed survey on E-learning, relationship between the human and cognition is presented. Detailed review of relationship among Personality, Emotional Quotient, Intelligent Quotient and E-learning is explicated.

Ultimately, this literature survey has motivated to propose procedures and a framework to design UID based on Cognition. This research work concentrates on cognitive factors (i.e. recollection and retention) and human factors such as Personality, EQ, and IQ. The following chapter proposes a procedure to identify the relation between Personality of the learners and the cognitive skills.