**FINAL PROJECT PHASE 2**

**HUMAN COMPUTER INTERACTION**

**SUBMITTED BY**

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# **A STUDY OF USABILITY OF E-LEARNING**

# **APPLICATIONS**

# **ABSTRACT:**

User interface (UI) is a source of interaction between user and computer software. Feasibility of using software, easy use, and learning are issues influenced by UID. E-learning does not function accurately if the system is not per user requirements. The UI is important in designing educational software (e-Learning). To study user behavior in the e-learning context, an empirical usability study on a specific e-learning tool is conducted. The analysis is performed using usability evaluation questionnaires collected from three different groups of actual platform users; one group is primary and pre-primary, the second is college and university students, and the other is disabled people. We show how to use UI to improve learning and motivate the learners and improve the time efficiency of using e-learning software.

# **INTRODUCTION:**

Kids and adults are becoming more and more techno-savvy, especially the kids who are used to all kinds of gadgets from a very young age. eLearning is a learning process with the combination of content delivered digitally and through face-to-face learning. Suited for all levels of education, from grade school to graduate degrees, e-learning is versatile enough to support all learning techniques. E-learning has personalized for students, focused on students, and is directly controlled by themselves. E-learning devices should be developed based on the psychology of learners. One of the psychological matters that should be considered is User Interface (UI) in e-learning because User Interface is the point of interaction between the user and the educational body.

For this reason, the main issues in successful correlations, which should be considered in User Interface Design for E-Learning (UIDEL), are the focal point of this study. Good usability in e-learning tools ensures successful and enjoyable learning. If usability issues are not adequately considered in an e-learning environment, it will become an obstacle for pupils.

To analyze the design of the user interface of an e-learning application, as it suits students' personality, an empirical usability study on a specific eLearning tool is conducted to explore the personality of E-learning with user interface design. It helps to explore each student’s personality connection with the user interface design of an E-learning that already exists. The findings of existing rules which were analyzed in phase 1, then used a reference in making an improved version of the application that will be tested on the same students and analyzed the results in order to determine the level of student satisfaction in the use of E-Learning and increase students' ability in understanding the content of its E-Learning.

# **LITERATURE REVIEW:**

# A primary goal of HCI is to improve the interaction between users and computers by making computers more user-friendly and receptive to users’ needs with appropriate functions and capabilities. UID and HCI are closely related as the former will facilitate the latter as the interaction between users and computers occurs at the user interface.

The impact of a poor interface design in education is more severe than in business. It impairs the student’s overall motivation and their learning performance and has severe moral and ethical implications. The problems of poorly designed interfaces are also reflected in recent statistics that only 30% of users could complete an e-learning course. No matter how capable a system is, it may not be helpful if the intended users cannot access its functionality through the user interface. Poorly depicted buttons and icons can create confusion and misunderstanding.

If the learners could not figure out how the contents should be connected, they would not understand the meaning of the information presented to them. For self-paced e-learning tools, an exemplary user interface can increase learners' motivation to learn by providing them with controls, displays, and information elements that keep them interested.

To improve the current interface of Khan Academy, the Khan Academy’s app is examined via laboratory testing and self-learning. The other successful apps such as Coursera and EDX were also studied to get the more insightful results. The problems in the current app has been highlighted in this report along with the proposed solution.

# **PROBLEMS IN EXISTING DESIGN:**

A user study is conducted prior based on the 2 factors

* User Journey while achieving the right effect
* The design of application

All the problems are identified in Gestalt perception and visual theories, interaction design, and observational methods.

According to the response we have received, users are satisfied with the attractiveness of the application. But there are some problems they have faced while using the application which are as follow.

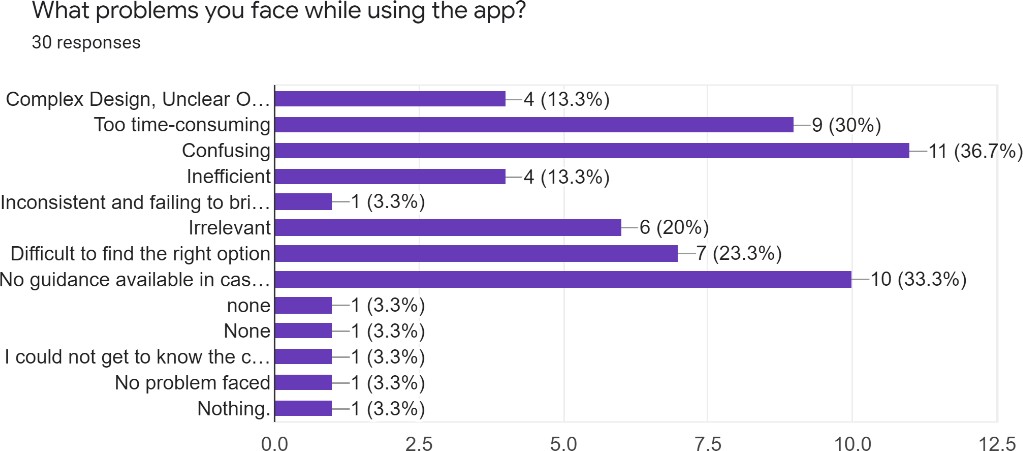
* Time-consuming
* Difficult to find the right option
* No guidance available
* Complex Design
* Unclear Options
* Confusing
* Inefficient

Figure Problems in an E-learning App

We analyzed the application as:

## **ANALYSIS OF PROBLEM:**

* The alignment of objects like buttons, text, icons does not seem like a group that diverts the user's attention, which is the Gestalt principle of proximity.
* The text box alignment, page setup does not follow the principle of Similarity, which says that the Objects that look similar appear grouped, which helps the user create a consistent flow while navigating to different pages.
* The other rules like Foreground/Background and Combined principles seem scattered throughout the user journey.
* The other significant problem that we encounter through our experiment is Consistency. The Consistency of applications says that the user should experience the journey while using it should remain the same, so the user does not have to recall but recognize the steps.

The inadequacy of affordance and accessibility of app design makes it difficult for users to navigate between features.

# **SOLUTION:**

We have designed a new application to fill the user experience gap of handling the interface to solve all the encountered problems. The redesign is kept Universal so that all the targeted groups are covered under one umbrella. Our new proposed model works as:

Diagram

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To achieve the proper effect, the Gestalt Principles and Interaction design methodologies are encompassed to accomplish the universal design; universal design means creating products accessible to as many people as possible. For the user diversity and the original design, our proposed models contain the Usability Heuristics such as visibility of system status, Match between the system and real-world, user control, ad freedom as the design of applications does not follow the standards. The new interface has a minimalist design so that the irrelevant information does not create chaos.

# **Designing Interface:**

### The improved version is comprised of Gestalt’s principle, the design laws such as Affordance, Hick’s law, golden ratio, etc, Shneiderman’s 8 Golden Rules like strive for consistency and permit easy reversal of actions. We tried to keep the minimalistic design for the app to achieve the user’s affordance and a universal approach to cover a large group of users across the globe.

### The new version of the app consists of courser and edx features to maintain the standard design rules. The following features are implemented:

### A user Course Journey: Exploring the Course till completing the course à Motivation from the Courser’s Design Interface

### Visiting the app without making an account: à Motivation form Coursera

### Universal design🡪 Ideas form several other platforms to cover the other cases.

### Script Download and Resources Management such as the Glossary of a particular Course, Hands-on Practice and progress🡪 Motivation from Courser’s app.

### Moving back and forth and permit easy reversal of actions🡪 Ideas from Literature Review

### Offer Informative Feedback-> Literature Review.

### The new design is evaluated based on user experience, and the result showed a fine difference between the previous version and the improved version.

### **Limitations:**

* The current Design does not redirect the Users to the previous screen in some cases, such as reverse action, because of software available features.
* Only Limited languages are accessible to the Users.
* The unauthorized users can’t enroll in any course, hence the progress can’t be measured.
* The course’s videos are only applicable when connected to the internet, however, the user can download the video to watch it online.
* The app does not keep track of the user who didn’t perform certain actions such as Mark as a Completed button, adding a payment method, and saving other actions.
* Authorized users Can’t View the recent advancement in the app in an offline mode.
* The user must know the basic mobile features.

# **EVALUATION:**

Various usability evaluation techniques exist and choosing among them is a trade-off between cost and effectiveness. It is no insignificant issue to understand how such evaluation techniques could be adjusted to better consider circumstances without missing the benefits inherent in those methods.

Usability testing needs extra attention in the light of the web-based learning situations, such as learner satisfaction with the learning content, learner perception of the applicability of the content, learner enjoyment of the learning experience, and actual learning, measured via tests.

For evaluating the usability of e-learning systems, the authors consider the following factors: e-learning system feedback, consistency, error prevention, performance/efficiency, user’s like/dislike, error recovery, cognitive load, internationalization, privacy, and online help. Some of the evaluation techniques are:

1. Heuristics Evaluation
2. Cognitive Walkthrough
3. Think a loud Protocol
4. Usability Testing Questionnare

## **EVALUATION TECHNIQUES FOR DEFINED USERS:**

### **Participants:**

One of the primary concerns for conducting this study is understanding target participants, as it is an important tenet. For the evaluation of our design, we selected two groups: The two group are targeted during the evaluation are:

**Group A:** Students (Pre-Primary & Primary, college and university students)

* Users are already experienced OR already using it.
* The data was collected from 20 users.

**Group B:** The Disabled people.

* Users were Deaf and Mute(Dumb)
* The two users were selected for this experiment.

### **Evaluation Phase:**

**Group A: Students (Pre-Primary & Primary, college and university students):**

For group A, we have used “**Usability Testing Questionnaire**” along with “**Think Aloud**” as an evaluation technique. Think Aloud was merged to cater students of primary and pre-primary. To design a good user experience, we need to understand who our users are, what they need, and why. Usability testing questionnaires are used to understand how actual end-users use your site and their opinions on various features of it. Usability testing questionnaires help in recognizing data or specific audience requirements.

Since Students are the main stakeholder of E-learning application, the feedback, and insights which we can get from them are the most valuable ones. They can respond effectively through questionnaire.

**Process:**

The mode of experiment was laboratory study for primary, pre-primary and college students and field study for university students. The students were given the new design and they were asked to explore it themselves. These students are mostly from college and universities. After they were done with exploration, we provided them a usability testing questionnaire and they filled it according to their experience. The questionnaire consisted of 20 questions, including multiple choices, checkboxes, linear scale, and multiple-choice grid. In total, we received 20 responses.

**Group B: The Disabled people**

For group B, we have used “**Cognitive Walkthrough**” as an evaluation technique. Cognitive Walkthrough (CW) is a usability evaluation technique that connects the interface walkthrough to a cognitive model. During our evaluation, it helps to take on our disabled user's perspective and identify some of the difficulties that might arise in interactions with the system. It focuses on the basic principles of usability. Furthermore, CW also focuses on the cognitive activities of users, especially on their goals and knowledge when performing a specific task which is the crucial part of our evaluation. The main reason to use Cognitive Walkthrough for disabled people is it allows the evaluation of the ease with which a user completes a task with minimal system knowledge and the ease of interface exploration/learning.

**Process:**

The mode of experiment was field study that means the experiment was conducted via zoom. We selected two disabled person for our group of study, the student had a deaf impairment, The evaluation was conducted in a separate room. Users were provided with our new design. They were asked to do some primary tasks that include reaching their desired videos, Downloading, or saving videos for offline learning, navigating back and forth, and accessing various options. Then they were asked some questions.

Table

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Figure Task list for Cognitive Walkthrough Figure Questions List for Cognitive Walkthrough

## **ANALYSIS:**

To assess the usability of chosen applications, we investigated the recorded recordings for each assignment. The members finished practically all the mentioned tasks in any case if those tasks finished accurately or not.

The parameters which are under study are as follow:

• Efficiency

• Memorability

• Usability

• Simplicity

• Effortless

• Visibility

• Affordance

• Accessibility

Through our perceptions, there were a few problems that have been frequently occurred identified by the participants.

Almost all the participants have mentioned that the current directory is absent. Which makes it hard to go back and forth, and a kind of accomplishment is not there. In the original design, participants faced visibility issues like they could not find the "start the course" option, the navigation was not visible. Due to lack of visibility, the cognitive load increases, and hence it demands more effort by the user to memorize or perform any task. Conclusively there was a lack of visibility, efficiency, and affordance in the existing applications.

After gathering and analyzing every single issue, we create our new design to resolve the problems users are facing. While designing we focus on “**Schneiderman’s 8 Golden Rules**”.

While performing any task in an E-learning application, consistency is crucial. Since users study there, there should be consistency in the entire design so that it does not require a struggle to remember anything. So, we used "Strive for consistency" and for this, we used consistent graphics such as fonts, color, shapes, etc. And make sure that they would do the same thing the same way they have been doing. In addition to this we took the help of “Hicks Law” and did not provide extra choices so that usability can be improved. This improves the simplicity, and after the advancement, we evaluate the design and receive a positive response. Now around 90% of users believe that the design is consistent and straightforward, 95% of them do not need extra tutorials or guidance to use the app, and 100% find it consistent.

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Figure Simplicity Figure Do not Need Tutorial Figure Consistency

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Figure Consistency and Simplicity with Cognitive Walkthrough

An e-learning application needs to be universal. Prior the design of Khan’s Academy was a bit complex, which is not in favor of even students of colleges and universities. Due to simplicity and additional features, the application can cater to a wide range of users, such as primary, pre-primary, and university students. Additionally, we have introduced the elements of script and notes below the lecture video, which cater to people who have a disability of deafness.

Informative feedback is essential, especially for students. Progress Bar is also one of the forms of feedback, and in our previous analysis, 86.7% of users want to have informative feedback. We have worked on that, and now our design provides the users' feedback, which tells them that they are proceeding in the right direction, decreasing the chances of errors and increasing efficiency and user experience. And now, 100% of users can quickly locate the progress bar, which is helping them to know their pace of learning, and 90% of our users found the feedback informative in our proposed design.

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Figure Informative Feedback Figure Informative Feedback increasing efficiency (Cognitive Walkthrough)

There are other design rules, which we implement in our design that are, through the implementation of simplicity, the short-term memory load gets decreased which in turn prevent errors. Since users are the main stakeholders, they should feel that they are in authority while using the application. We provide the help and feedback option, if in case user needs it, and design dialogues for closures to make user feel better. The feedback which we get from evaluation from both groups of users can easily be demonstrated from following visualizations.

Chart

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Figure Satisfaction from Design, process and structure Figure Satisfaction from integration of function

As it was mentioned before, to provide stimulus, speech interface, informal style, agents, learner control environment, colors and background music must be used in presentation. The working memory also has a crucial role in learning and it should not be saturated with unnecessary information. When using multimedia information, it's better to use both hearing and vision channels if possible

# **CONCLUSION:**

Today’s learners want relevant, mobile, self-paced, and personalized content. This need is satisfied with the online learning mode; here, students can learn at their convenience and requirement.

An e-learning UI plays a crucial role in achieving educational objectives—psychological issues in learning are new findings in e-learning, which influence the design of UI.

Usability is a primary concern to decide the success of any application. In this paper, we have conducted a usability evaluation for an e-learning application. In this study, we investigated some design issues on the researched applications. The experiments were conducted. Through the feedback, an improved design is made, and then through evaluation techniques: Cognitive Walkthrough and Usability testing questionnaire, the design is evaluated by different user groups.

As future work, the study will likewise be directed on various groups of users who have different backgrounds. Besides, a more upgraded version of the design would be made so that the user experience can be improved more

# **LINKS:**

[Usability Testing Questionnaire](https://docs.google.com/forms/d/e/1FAIpQLSdMhCUYoDzURDvFxhLAbxxfclZ6X6IVi453WdJOdbDwA2MnZg/viewform?usp=sf_link)

**Cognitive Walkthrough Results:**

[https://docs.google.com/spreadsheets/d/1fpRD1x8yA8pgzIbofq3Gvk6wYwRSAxRO9WW0-hwgCx4/edit#gid=1588967200](https://docs.google.com/spreadsheets/d/1fpRD1x8yA8pgzIbofq3Gvk6wYwRSAxRO9WW0-hwgCx4/edit#gid=1588967200 )

**Prototype:**

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