# Implementation of Donald Norman's Usability Principles to improve the UI of Kathmandu University E-Learning Forum

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***Abstract* --- This paper discusses the implementation of usability principles in the user interface of Kathmandu University E-Learning Forum (KUELF). The poor usability of KUELF wasted users' time and increased their frustration. This paper explains how usability and HCI principles were implemented in the new design to reduce user frustration and to improve website capabilities. Intensive study was done to find the problems present in the current systems through survey, and discussion with other peers working on the same applications. Keeping in mind the intention of the current system and user requirements, Donald Norman's Usability Principles were implemented so as to increase the usability of the system. Final Usability Survey, Heuristic Evaluation and cognitive walkthrough was done to ensure that the final system meets the user requirements and works flawlessly.**

***Keywords* --- HCI, KUELF, Usability, Good Design, UI/UX**

## I. INTRODUCTION

"E-Learning – education conveyed via electronic means"

E-Learning is so ubiquitous and vast that it is difficult to articulate its concise outline. eLearning is imparting and facilitating knowledge via electronic media channels like the internet, CD-ROMs, DVDs, streaming media etc. Unlike conventional chalk and board style of schooling, eLearning makes giving and receiving simpler, prolific and productive.

Kathmandu University E-Learning Forum (KUELF) is an online learning platform made for Kathmandu University students. This platform helps teachers express and deliver quality content through its website and mobile app. These online learning platforms are more useful in the current scenario, when in-person schooling is not possible, and teachers have to deliver the lectures through online medium.

Online learning platforms like KUELF are only useful if teachers can deliver quality content and the system can be run flawlessly. Since these platforms are used by students daily, there must not be any design flaws and bugs that hamper the circulation of knowledge.

We have been using KUELF for almost 2 years now, and we found that most of us are not satisfied with the flow and design of the system. The problems found while using the system are listed below:

a. *Problem with Texts*

The texts are very small for a system that is used daily and by all kinds of users. Since, this is a learning platform, students prefer large and clear text so that the reading can be effective. But the fonts in the system are very small. Some users with difficulty in seeing cannot even see the content without zooming on the website. Also, the hierarchy is not maintained perfectly, heading fonts are a lot bigger as compared to paragraph fonts, which makes the visibility of the system inconsistent.

b. *Problem with Consistency*

The pages are not maintained in the same design. Some pages are good like quiz submission page, Assignment submission page, but some pages are not designed properly like forms page, Advanced search page, which is making the system very inconsistent in terms of design. Navigating to different pages through the site seems to be switching between different web pages, some have old design, and some are new. This inconsistency makes it difficult for the users to interact with the system.

c. *Visibility*

The system has many issues related to visibility. The Search field in the home page is placed at the bottom of the

page, so the user does not know until he scrolls down to the page that search feature is present. Also, the dashboard has a left and right menu bar, which looks congested. And consists of items that are not important at all like Online Users, Private files. There are overall three menus present in a single page, which is confusing, since you have to search for three menus to navigate to a single page.

d. *No Proper Feedback*

The system does not provide the feedback as required. When you complete certain video or reading material, you can not see if that is completed or not, there is no option to check that as completed manually too. So, it becomes difficult to see whether certain items have already been finished or are still in progress.

## II. METHODS & MATERIALS

The idea of e-learning is to empower learners to absorb personal accomplishment, basic schooling or to obtain a degree certificate, without actually attending the school or university or any other academic institute.

Another idea is to apply E-learning to all levels of schooling to ensure students grasp the lessons adequately.

Psychologists believe that audio-visual method of teaching creates a disciplined learning environment and fosters effective student engagement in the class.[1]

The key focus of the design modification of the system is to improve the usability aspect of the Human Computer Interaction. The old system was designed many years ago, without caring much about the usability of the system. But due to the improper design of the system the usability of the system is hampered in today's modern design world. So, keeping in mind the sole purpose of the system we modified the system to improve the experience of the system.

What will be the best way to evaluate any system other than asking the targeted users about the system? They are the most experienced one with the system and they know every part of the system, the problem, the best aspects and so on. So, it was the best possible option for us to know whether users are satisfied with the system or not. The COVID-19 pandemic did not let us conduct in-person observations, so we decided to conduct the online survey to know what problems users are facing as a user. We were also one of the users of that system, so we too had many problems. We took these problems and made a questionnaire about the system and presented it to our targeted users (Students of different departments of Kathmandu University).

The survey was conducted to know whether the users are facing similar problems or not. The survey was conducted through google forms and users were asked the questions related to the usability of the system.

Usability refers to the quality of a user's experience when interacting with products or systems, including websites, software, devices, or applications. Usability is about effectiveness, efficiency and the overall satisfaction of the user.[2]

There are many principles of design, but when it comes to web and interactive design Donald Norman's Principles are considered as the best of all. Donald Norman is one of the greats of computer human interaction and user-centered design.

Norman's main idea is that devices, things, computers, and interfaces should be functional, easy to use, and intuitive. His idea is that there are two gulfs to avoid: the gulf of execution and the gulf of evaluation.

What best suits to improve the usability of the system than to use the usability principles?

Norman's principles can be interpreted in the following manner: [3]

a. *Visibility* dictates that the most important elements of the interface must also be the most obvious and stand out immediately.

b. *Feedback* instructs that every conceivable action that a user can perform should have a unique and perceptible feedback and no action should go unacknowledged through the system.

c. *Affordance* simply implies that simple things must be doable simply. Every feature of an interface must be easy to recognize and every action easy to perform.

d. *Mapping* states that each action must be appropriately mapped to a UI element. Moreover, the element associated with an action must be indicative of the action it is responsible for.

e. *Constraints* must be enforced upon the system to protect the user from his own actions. Actions which lead to users getting themselves stranded in an

unrecoverable situation must be hidden from the users altogether.

*f.* *Consistency* finally recommends that the interface be consistent within itself in both macro as well as the micro design scale.

## III. RESULTS

### *a. Dashboard*

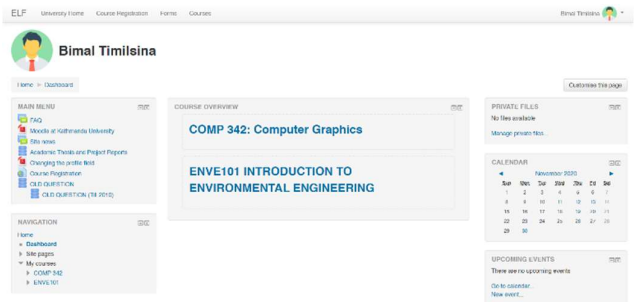


Fig 1a: Dashboard of current system

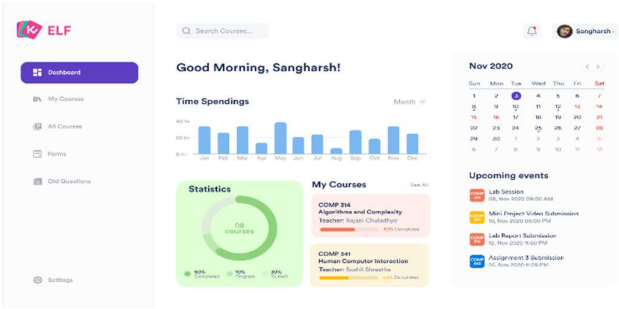


Fig.1b: Newly designed Dashboard

### *b. Course Contents*

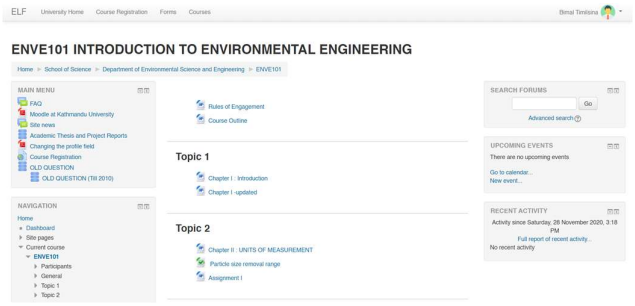


Fig.2a: Course Contents Page (current system)

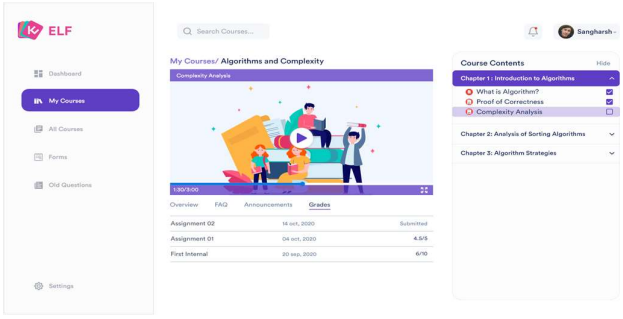


Fig 2b: Course Content Page (Newly Designed)

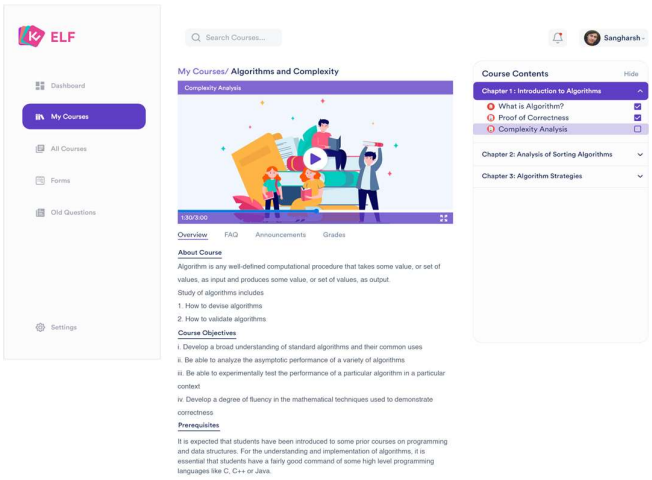


Fig 2c: Course OverviewPage (Newly Designed)

### *c. All Courses Page*

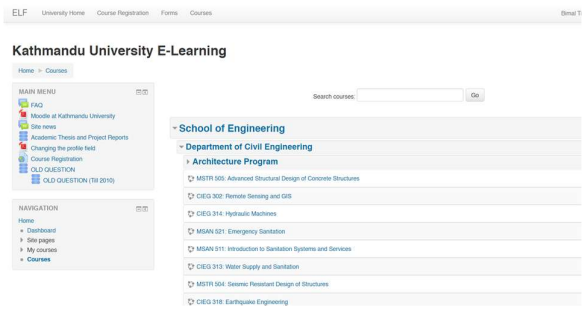


Fig. 3a: All Course Page (Current System)

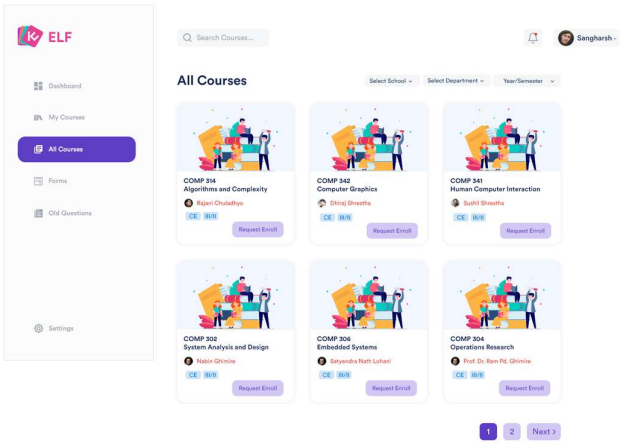


Fig. 3b: All Courses Page (Newly Designed)

*d. My Courses Page*

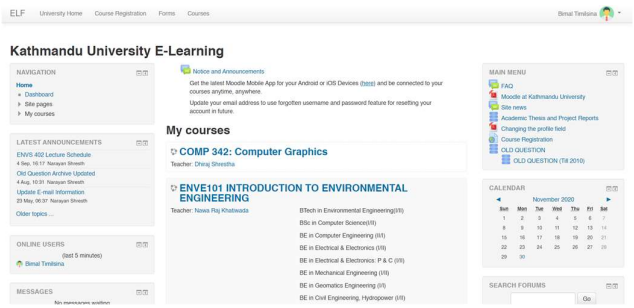


Fig. 4a: My Courses Page (Current System)

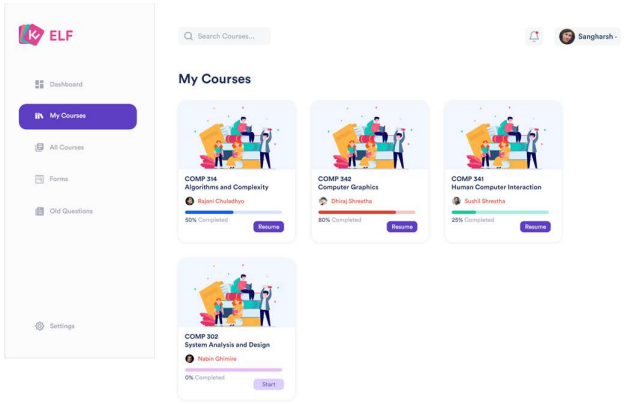


Fig. 4b: My Courses Page (Newly Designed)

*e. Forms Page*


Fig. 5a: Forms Page (Current System)

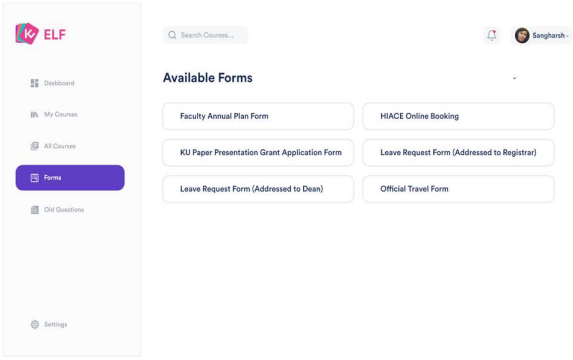


Fig. 5b: Forms page (newly Designed)

## IV. DISCUSSION

This primary goal of this mini project is to help users have a smoother experience with the site, hence receiving a significant boost in productivity. To this end, we performed the following major improvements to the system in each of the six categories.

*a. Visibility*

The newly designed interface of KUELF has simple design which provides only the primary functionalities eradicating all secondary functions, this makes all the resources visible and users can see the resources easily.

*b. Feedback*

Users get the feedback of clicking on the navigation links through change in colour of the box. Also, the system directs them directly to the page that they have intended to follow.

c. *Affordance*

Affordance is the link between how things look and how they're used. For digital products the design should be intuitive enough that the users know how to access information just by looking at the interface.

d. *Mapping*

As all the navigation links are kept at the left column of the dashboard, so users don't have to look out for embedded links rather he/she can follow the links from the navigation bar and navigate to further pages. Also, from the nested pages too, he/she can easily navigate to other pages.

e. *Constraints*

The user is not allowed to get enrolled in any course themselves. This is only the constraint that this system provides otherwise he/she is free to explore the course materials that they are enrolled in.

f. *Consistency*

Use of modern design with similar fonts, buttons and icons along with similar colour combination throughout the pages make the UI consistent. In addition to this, consistency makes the design intuitive, so that users can easily interact with the system through past experiences.

After the initial prototype incorporating these revamps, we performed heuristic evaluations on the interface based on the heuristics provided by Jacob Nelson.[4] Specifically, we asked our peers to perform the evaluation for us. From this exercise, we received valuable feedback which we promptly implemented in our interface to make it even better.

We also performed cognitive walkthroughs [5] on our project. We created three personas for the job, a teacher, a student and an administrator. Our exercise, however, was more focused on the first two as the interface was geared more towards these groups rather than the latter. All the walkthrough exercises were conducted by the members of our team. From the student walkthrough, we got many interesting insights regarding tidying of the form-interface during login and course enrollments.

## V. CONCLUSION

After conducting a serious revamp of the interface of KUELF, we are quite satisfied with the results. Our version of the UI looks much more appealing right from the get-go and is equally functional. UI elements needing the immediate attention of users are placed squarely at the center of each page. Coursework is easier to find and enrolling into courses is self-explanatory. Although we have redone nearly every nuance of the interface, we have respected the elements the previous interface does right and, for such elements, have only tweaked their designs rather than replacing them completely.

Evaluations performed on the interface showed were encouraging with more users claiming they preferred the improved interface greatly over the existing one. Most of our self and peer evaluations concluded that our interface was well in tune with the six overarching guidelines we had strived to adhere to.

However, we could not quite get the project to a satisfying conclusion as the MVP could not be fully constructed. There were a few reasons for this.

First and foremost was the complexity of ELF in general. Although the interface was simple enough to program, the backend was quite challenging and required various security measures and validation routines. This task was not only unmanageable but also somewhat redundant as our goal was to improve the user interface of the system rather than to stabilize it. Doing the backend jobs would only serve to deter us from providing the best interface we could come up with.

Second was the limitation of time and the inconveniences caused by online only communication. We simply could not discuss as openly as we otherwise would have due to the situation of the world around us. So we were forced to really separate the wheat from the chaff while conducting this project.

We could also not conduct expert reviews and professional evaluations of our project due to the resource constrained environment of online connectivity. However, the peer evaluations we did perform were designed to cover all important evaluation criteria. Although this does negate the lack of expert opinions to some extent, we still wish to get our interface evaluated by HCI experts in the near future.

But despite all the hindrances and obstacles, we are quite satisfied with the work we have delivered and are quite eager to improve upon it in future iterations.

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## REFERENCES

[1] "Why Visual Learning is More Helpful than Traditional Learning | Edsys," Edsys, Jan. 16, 2018. https://www.edsys.in/visual-learning-helpful-than-traditional-learning/ (accessed Nov. 28, 2020).

[2] "Usability Evaluation Basics | Usability.gov," *Usability.gov*,2020. https://www.usability.gov/what-and-why/usability-evaluation.html#:~:text=Usability%20refers%20to%20the%20quality,overall%20satisfaction%20of%20the%20user.&text=Subjective%20satisfaction%3A%20If%20the%20user%20likes%20using%20the%20system (accessed Nov. 28, 2020).

[3] Preece, J., Rogers, Y., Sharp, H. (2002), Interaction Design: Beyond Human-Computer Interaction, New York: Wiley, p.21

[4] "Heuristic Evaluation" Nielsen and Molich, 1990; Nielsen 1994.

[4] "Cognitive Walkthrough | Usability Body of Knowledge," *Usabilitybok.org*,2011. https://www.usabilitybok.org/cognitive-walkthrough#:~:text=The%20cognitive%20walkthrough%20is%20a,for%20new%20or%20infrequent%20users. (accessed Nov. 30, 2020).

[5] "How to Conduct a Cognitive Walkthrough," *The Interaction Design Foundation*, Aug. 21, 2020. https://www.interaction-design.org/literature/article/how-to-conduct-a-cognitive-walkthrough (accessed Nov. 30, 2020).