Measuring Young Adult Cognitive Performance on Varying Level of UI and UX

How and when should we compromise between UI design before we kill UX?

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***Abstract*—This paper aims to do a comparison of varying levels of UI/UX design and how it can influence the efficiency of user navigation by monitoring the user's behavior while doing multiple tasks.**

***Index Terms*—UI design, UX design, cognitive performance, UMUX**

I. Introduction

It is a fact that we use digital technologies for our daily life. From checking your phone when waking up in the morning, until midnight before going to bed, we are constantly using technology. There can be no doubt that we are tied to it. The first thing that we see in using technologies is the user interface (UI). The interface is what the users use to add inputs and receive outputs, these may be in the form of texts, images, buttons, or videos [1]. The next thing that the users feel is user experience (UX). It is crucial because user experience is how the users feel when they are using the interface [1]. With this, the push of having both a good user interface and user experience is very pivotal, since they are the first things that users interact with. A study has shown that a good user interface alone will make the users more comfortable using the software, so does a good user experience [2]. A combination of both will be the finest [2].

Creating a good User Interfaces and User Experience comes with many challenges, an easily recognizable problem is when a digital application has a bad user interface, creating navigation problems. On a website, its color arrangement may cause partially sighted people to struggle to comprehend. In addition, their content hierarchy, which follows menu placement, may be difficult to locate. Another challenge with a website is to have a good user experience. Users who are familiar with a certain style of layout will have better navigation compared to those who have never seen this style or are not so tech-savvy. Issues in designing, implementing, managing, maintaining, training, evaluating and refining user interface of interactive systems is very prominent in this stage [3].

To measure the level of user experience of a system, a technique called SUS is commonly used. System Usability Scale (SUS) is a widely used standardized questionnaire for assessing perceived usability [4]. SUS has accounted for 43% of the post-study questionnaires in industrial usability studies [4]. On March 13, 2018, Google Scholar citations for the paper that introduced the SUS showed 5,664 citations [4].

In this paper we are aiming to answers these research questions:

1) Assessing the effect of improving User Interface design and improving User Experience level in terms of the user's efficiency in navigating a sample application
2) Observing user's efficiency difference in navigating sample websites
3) Examining the shift in user's efficiency metrics against improvements in the sample website's design and usability
4) Analyzing user's Usability Metric for User Experience (UMUX) for the different websites

We chose to use UMUX, dubbed the metric to be measured when SUS takes too much time [5]. UMUX is a relatively new standardized usability questionnaire designed to get a measurement of perceived usability consistent with the SUS [6], [7], but using fewer items that more closely conformed to the ISO definition of usability (effective, efficient, satisfying). Similarly to SUS, it does not matter whether the UMUX is unidimensional or tone-based bidimensional [8]. In either case, practitioners should treat the UMUX as a unidimensional measure of perceived usability [8].

II. Literature Review

With rapid technological evolution toward intelligence and interactive technologies, it is required for us to balance everything. The 7 most outstanding challenges of humanity include Ethics, Well-being, Privacy and Security, Human-Environment Interactions and Accessibility including Universal Access [9]. Human-Environment Interaction along with Accessibility is one of the points mentioned that we need to consider in our research. It has been proven that improving the UX design of real-life space may be positively influential to the accessibility of elderly people [10], from which, we may ask whether

improving a virtual program or application may reap positive benefits.

A user interface (UI) refers to a system and a user interacting with each other through commands or techniques to operate the system, input data, and use the contents [11]. UI is the interface that is a tool that users can use to manipulate things [12] and can be found in systems such as computers, mobile devices, and games [11]. On the other hand, UX refers to the overall experience related to the perception (emotion and thought), reaction, and behavior that a user feels and thinks through his or her direct or indirect use of a system [11]. It is essentially the interaction between the user and a digital object, this is what humans experience [12].

There are a variety of challenges associated with a good user interface. One of them is aesthetics, [13] stated that for several years, HCI research has highlighted the positive impact of website aesthetics on constructs such as the overall impression, website utility, trust and credibility, perceived information quality, and, possibly, perceived usability. [14] elaborated that in most cases aesthetics has a positive influence on actual performance when users must perform tasks with a user interface.

The effects of good or bad UI/UX can be seen in our daily lives. One of the important features of e-learning design is to have an attractive UI and a good UX [15]. In digital shopping, UI and UX have an inverse correlation on the effect of purchase intention [2]. A good UX will bring a significant positive effect on purchase intention, while the reverse is true for UI [2]. In gaming, users interact with the interface for as long as the users play. Bad UI/UX can cause confusion to players which will make them leave the game [16].

When designing UI/UX, considerations which might include the target user's age and the availability of the product (i.e, platforms, target market section, etc) must be made. Older aged users have a tougher time seeing small things and accessing different gestures like drag & drop and tap & hold [17]. Not only that, different platforms introduce different constraints. A personal computer (PC) will allow navigation using a mouse pointer and a physical keyboard, while in contrast, a mobile device will need to use a touchscreen for both mouse pointer and keyboard input. Constraints for PCs may or may not work with mobile devices and vice versa due to differences like size and resolution [18]. Developers can use tools like Data Flow Diagram to help make clear UI/UX that will increase usability and avoid confusion [19].

To measure the level of user satisfaction on UX design, there are quite some indicators that are mainly used, primarily in the form of questions. The usual way of evaluating usability is to let a subset of users use the interface and analyze their satisfaction along with the ability to perform selected tasks [20]. While usability is commonly perceived as user experience, there is a subtle difference among them. 'Usability' refers to the user's ability to use something to do a task, while 'User Experience' takes a broader approach; looking at the individual's interaction with the object, as well as the thoughts, feelings, and perceptions generated [21].

The System Usability Scale is one old indicator that is dubbed 'Quick and Dirty' [22]. Created in 1996, it is a widely used standardized questionnaire for the assessment of perceived usability [4]. Though, SUS is very reliable to this point with score conversion and comparison to other indicators available [8], [23]. A positively worded System Usability Scale yields results that are like those generated using the standard System Usability Scale [24]; either version of the scale can be used, although the positively worded scale may yield fewer errors in responding and scoring [24]. Other approaches of evaluation are mainly a derivative of SUS. Research stated that compared to other models, the SUS metric achieved the highest accuracy level with the smallest number of samples [25]. An improvement of the said metric has been suggested which includes text-field input for future system improvements suggestion [26].The higher the SUS score the better as it means that the evaluator likes it and is more likely to recommend it to other users [1], [27].

An adaptation of SUS is the UMUX and the UMUX-LITE metric. It itself has been adapted into a possible product quality metric for healthcare technologies [28] as well as spun off into an Artificial Intelligent based conversational agent diagnostic tool [29]. While these metric were developed independently and seemingly asks of a different question, these metric has been proven again and again to measure the perceived level of usability [6]–[8].

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