User Experience Factors that Influence Users' Satisfaction of Using Digital Library

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Abstract

Digital library is one of the services that is provided by academic institutions. In any product, service or application, user experience (UX) is an important indicator of the service quality which relates to user satisfaction. The aim of this paper is to propose the UX factors that influence users' satisfaction of using digital library. Literature review has been used to identify the factors and the research model had been developed. For this study, factors that has been identified through literature review were selected as the factors that influence users' experience of using digital library which are attractiveness, efficiency, dependability, stimulation, and novelty.

Keywords: *user experience; digital library; user satisfaction*

1. Introduction

In academic institutions, many libraries are actively involved in building institutional repositories of the institution's books, papers, theses, and other work that can be digitized. These academic repositories known as digital libraries are made available for students and staff as one of the services provided by the institution. Digital libraries are quickly becoming the norm at colleges and universities since they combine technology and information resources to allow remote access to educational materials and breaking down the physical barriers. A digital library is an information service where all information sources are available and processed in computers and the functions of acquisition or retrieval, storage, retrieval, access, and display using digital technology [1]. More specifically, digital libraries offer "online catalogues, databases, multimedia, online journals, digital repositories, electronic books, electronic archives and online electronic services". The increasing availability of digitized resources allows educational institutions to provide students with varied, increasingly accessible, and richer academic materials than ever before [14]. In any product, services or application, user experience, known as UX is an important indicator of the service quality. UX can be considered as the experience any user has after using a product, service, or application. UX is a critical factor of a quality software product and is responsible for a defensible strategic advantage for businesses or services. The introduction of UX research to digital library will sublime the goal of digital library from "providing more

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services" to "providing better services" [2]. UX closely relates with user satisfaction since the evaluation of performance is the key to satisfaction. The aim of this paper is to propose the UX factors that influence users' satisfaction of using digital library. This paper consists of related work and proposed model for the effect of user experience on user satisfaction of using digital library.

2. Related Works

2.1. Digital Libraries

The beginning of digital libraries started in the 1990s, which was later introduced to better innovation and development by technology. A digital library as opposed to a traditional library, is a collection of digital content that could be anything of text, audio, or video stored in electronic format [3]. Digital libraries are able to store, organise, and retrieve such contents. For centuries, libraries have been the distributors and keepers of journals, books, articles, and other materials [14]. With so much of materials, a digital library serves a purpose mainly in the development of collecting, storing, and organizing materials in digital form [4]. Some of the advantages of digital libraries are that there are no physical limits to information storage, materials can be accessed around the clock by multiple users, and they feature efficient information retrieval mechanisms [12].

Moreover, a digital library has many advantages starting with no physical boundaries. The user would be able to access any materials from anywhere on the world without even having to be present physically, all with a simple internet connection. Digital libraries have no time restrictions as well, which allows user to access it any hour of the day, and at any day of the week [16]. Furthermore, information retrieval on a digital library is so easy [16]. All it requires is a keyword or phrase and the user would be able to retrieve all related materials compared to the traditional way of searching something through shelves which is very time consuming. In comparison to a traditional library which rather is a physical library with a location and has a collection of books, journals and manuscripts organized based on indexes in shelves [17], a digital library carries a greater advantage. In a time where environmental care is delicate, and a growing trend of "Go Green", the digital library has all resources in a digital form which avoids the need to print materials requiring paper resource, whereas in a traditional library, the collection will need to be printed. This is due to the content being stored locally [4]. Moreover, a traditional library has limited access, restricted to only what is held by the library whereas a digital library has unlimited access to many websites with many materials available.

2.2. User Experience

User experience (UX) can be considered as the experience any user has after using a product, service, or application of some company. It involves all the aspects where the user interacts with the company to avail the product or service to when the user uses the product or takes benefit of that service. UX may also be defined as the art of meeting the exact needs of the customer [5]. The basic model of UX can be demonstrated as illustrated below, in Figure 1. Here, UX is not a result of the

design object. It's a result of the user interacting with an artifact or object. UX is user's own subjective experience, emotions, and reactions as a result of the interaction with an artifact.

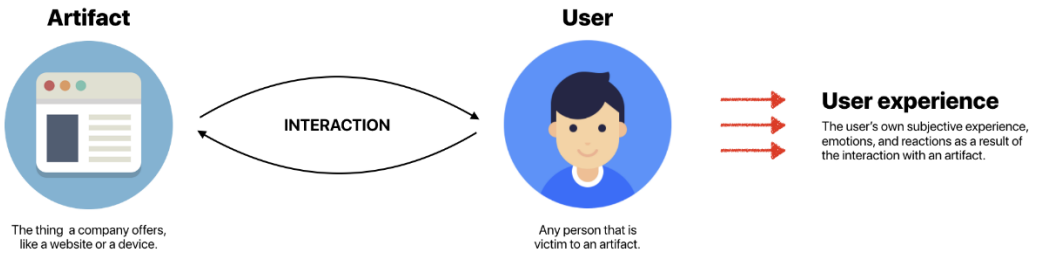


Figure 1. User Experience [5]

User Interface (UI) is basically the digital screen or interface that comes in view of the user whenever any software, website, system, or application is accessed by a user to avail any service. UI and UX can be used interchangeably as both are interrelated and mean the same thing. This is because a better and well-managed UI will guarantee a better UX. When it comes to UI, it must be known that it is the UI that will determine the success or failure of any product or service. If the UI of a service is attractive, unique, and stimulating, it will prove to be fruitful for the brand or business in terms of UX. UX and usability are terms that are often mistaken as being similar. Usability may be defined as an attribute or a part of UX. Usability is the phenomenon which covers whether the system is easy to learn, efficient to use and pleasant [5]. UX is important because it tries to fulfil the user's needs. It aims to provide positive experiences that keep a user loyal to the product or brand.

According to the definition of ISO 9241-210, UX is a cognitive impression and response to a product, system, or service used or expected to be used. The definition is supplemented with the following explanation: UX refers to all the feelings of users before, during, and after using a product or system, including emotions, beliefs, preferences, cognitive impressions, physical and psychological reactions, behaviours, achievements, etc. UX is the result of a system, product, or service's brand image, manifestation, function, system performance, interactive behaviour, and auxiliary capability. The UX also stems from the user's internal and physical state, which comes from the user's previous experience, attitude, skill, ability, and personality, as well as the use environment. User satisfaction refers to the feeling of a state of pleasure or disappointment formed by comparing the perceived effect of a product with his/her expected value. The results of service quality and interaction quality significantly affect customer satisfaction which affects customer loyalty [6].

Leah Buley on the other hand defined that UX is a 'famously messy thing to describe'. This is because UX may simply be referred to as the experience or emotions of a user as they use a service or product [19]. This definition is basic, yet it covers most of what UX is. All the aspects that are discussed under the title of UX are directly or indirectly related to the way a user feels and the user's experience while using any product or service. Under the title of UX, UX research which is an even broader topic than UX itself is also discussed. UX research may be referred to

as the process of understanding the user and the users' experience through collected data and research [19].

2.3. Factors To Measure User Experience

UX is different for everyone. UX is a 'famously messy thing to describe'. This is because UX may simply be referred to as the experience or emotions of a user as they use a service or product. Among the factors that influence that users' experience of using digital library is attractiveness. Attractiveness is undoubtedly the most basic and fundamental factor that shape the UX of any product, service, or application. It means that the more attractive a product or service, the better the UX. In digital libraries, users may come to realize that the more attractive, friendly, and pleasing the interface of the application, the better UX it will have [7],[8],[6],[9]. Efficiency may be defined as the characteristic of any product or service or application to work fast and swiftly. For the digital library application, the user interface should be minimalized and smooth so that the user can access the application swiftly and search for the content desired in reasonable time [10], [8],[15],[6],[9].

Another important factor to measure UX is dependability. Dependability generally is the measure of how often something can be relied upon. It is the level of trust that a user puts into a product, service, or application. If a user feels in control of the interaction with application and the interaction is secure and predictable, this ensures a high dependability. In digital libraries, the user must trust the interface to be supportive and secure. The user must have the confidence that the library meets the expectations and that it can be relied upon, where the interface is proper and provide the reliable materials [10], [6], [9]. One of the least catered to yet highly effective factor in UX is stimulation. Stimulation is the measure of how exciting and interesting any product, service, or application is. It is the characteristic or property of any product, service, or application that motivates and attracts a user to further use that product, service, or application. For a digital library, the interface designers should make sure that the content and the interface itself is not demotivating or boring. It should instead be valuable and motivating so that the user comes back for more resulting in a great UX. The designers tend to build such an interface with unique and exciting layout so that users keep coming back for more [15],[8],[13], [9] [6]. Novel also important factor to measure UX which refer to the quality of any product, service or application which makes it innovative and creative. The better the design and creativity of application, the more novelty it will have [15]. In digital libraries, the graphic designers who create the UI of the library must make sure it is unique and creative. Novelty of the UI must be kept in mind when designing the digital library to ensure a great UX [8],[15],[13], [9].

Another important factor to measure UX is novelty which refer to the quality of any product, service or application which makes it innovative and creative [15]. Novelty is basically a measure of how often a product, service, or application grabs the attention of the user and customers. The better the design and creativity of any product, service, or application, the more novelty it will have [15]. In digital libraries, the graphic designers who create the UI of the library must make sure it is

unique and creative. Any interface which has a lot of work and attention put into it will look unique and leading edge. All those dull and conventional interfaces will never give the library any novelty and the library will fail to grab the user's attention [15]. Novelty of the UI must be kept in mind when designing the digital library to ensure a great UX [15]. [18], [8], [15], [13], [9].

2.4. User Satisfaction

In Information System (IS) research, user satisfaction can be defined from the perspective of process-oriented and outcome-oriented. Process-oriented approach focuses on how satisfaction is formed in people. This approach defines key mechanisms by which the antecedents interact to form satisfaction. Hence, the major focus is on the evaluative (appraisal) process that underpins satisfaction formation. Emphasizing the cognitive processes involved in satisfaction, studies in this stream highlight the perceptual, evaluative, and psychological processes that contribute to satisfaction formation. Outcome-oriented approach describes the satisfaction in terms of the result of the evaluative process; that is, the satisfaction (or summary judgment) that derives from a consumption or use experience. Hence, the second approach views satisfaction primarily as an outcome of a consumption process and focuses more on its effect on other constructs of interest and less on explaining the processes involved in satisfaction formation. Hence, most definitions will centre on "experience" and the evaluation of performance as key to satisfaction. The most studied consequence of user satisfaction has been system usage at the individual level. System usage as a concept has many manifestations in the IS literature; for example, as continuance intentions or continued use, extended use, intention to use, and frequency of use or duration of use [11]. Several studies have conducted research on user experience with satisfaction such as the impact of software user experience on customer satisfaction of smartphones in Jordan [2]. [2] investigates the impact of user experience based on utility, aesthetics, usability, value, and identification on customer satisfaction of smartphones in Jordan. The model of user experience impact on customer satisfaction is shown in Figure 2 below. The hypothesis discussed was how significantly customer satisfaction impacts user experience. In an initial assumption, the author suggests that there is negative statistically significant impact and negative statistically changes in the impact of user experience on customer satisfaction. However, it was later learnt in the results that there is an impact on customer satisfaction from user experience.

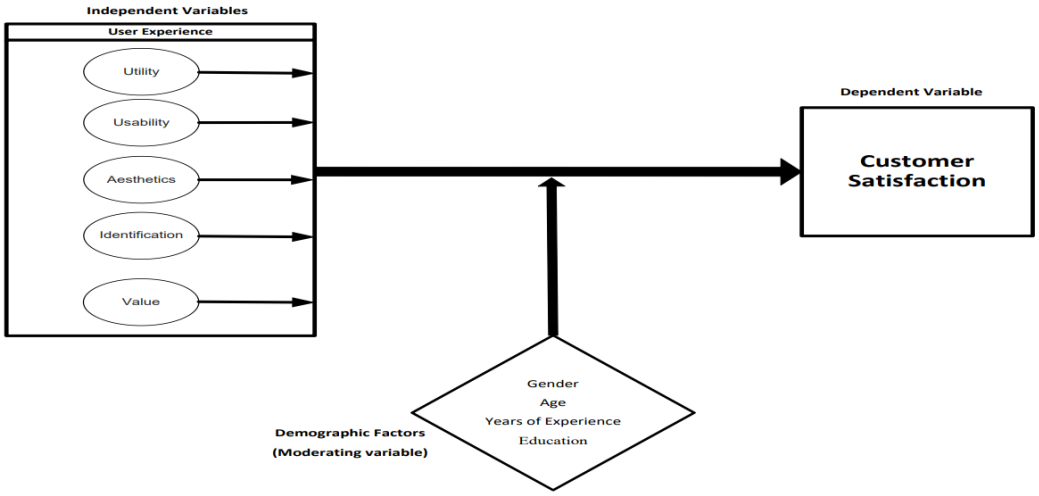


Figure 2. Model of UX impact on customer satisfaction [2]

The below model in Figure 3 was used in a study by [21] which was set out to explore the factors that impact user satisfaction in smart or digital government initiatives in the UAE. The authors collected responses from government sector employees who use e-government applications regularly and evaluated the answers to test a proposed hypothesis. The results showed that the quality of service significantly influences user satisfaction and performance impact [21]. It was also found that user satisfaction led to better performance impact as employees were able to perform tasks more efficiently and make better decisions [21].

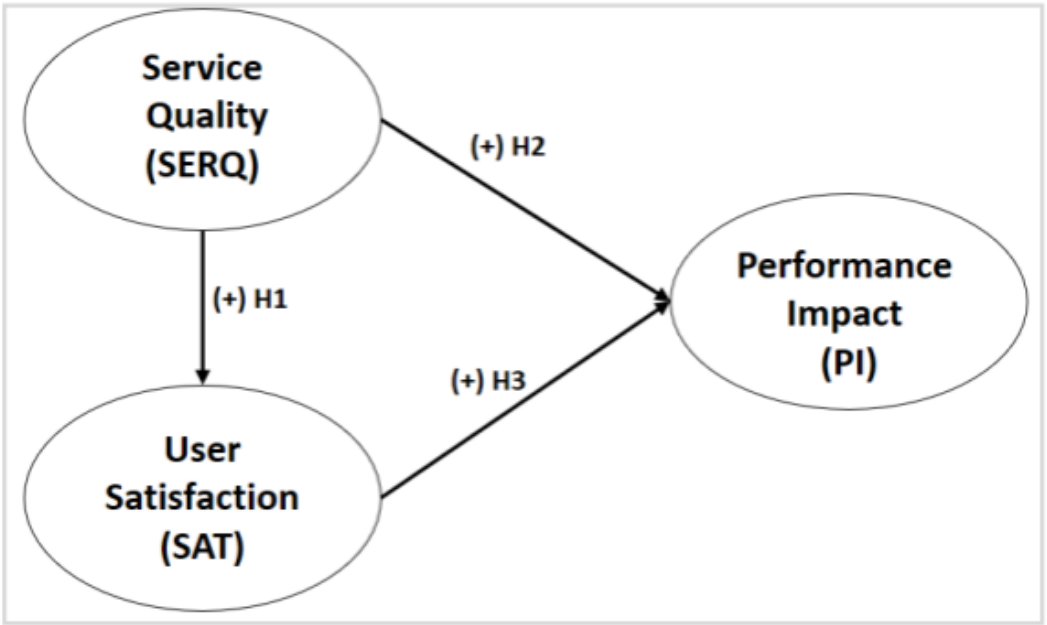


Figure 3. Delone and McLean Information System Success Model [20], [21]

In contrast, [20] conducted a research to explore the relationship between user satisfaction and success in learning well before the pandemic back in 2017. The targeted audience were undergraduate students in Korea attending cyber universities, which are also universities that offer online courses. More specifically, the targeted audience were students who work in the hospitality industry because

based on the hours of work, the students would be studying only when time is available rather than make time. Hence, the authors assumed this set of demographics would use mobile applications more often compared to studying [20]. The authors distributed questionnaires which was modelled based on the Delone and McLean Information System Success Model (DMISM) to evaluate how quality of information, system quality, and service quality impacted user satisfaction. It was also evaluated how user satisfaction led to greater benefits of learning. In this paper the authors discussed a concept known as self-directed learning (SDL), which is a form of learning where the learner takes initiative to set the goals of learning and the outcome of it [20]. It contrasts with traditional learning where students are less autonomous, and the guidance of teachers or institutions drive goals. The authors test how SDL influences user satisfaction and three information system (IS) evaluation qualities. The results revealed that information quality, system quality, and service quality have positive effects on user satisfaction [20]. However, a difference in the level of SDL impacting how different system qualities impacted user satisfaction was noticed whereby a high SDL resulted in more autonomous students responding that information quality affects user satisfaction [20]. The authors claim it may be because one group is more critical about information quality than the other due to the differences in studying mechanisms. However, both groups agreed that system quality is more important than information or service quality to drive user satisfaction [20].

3. Results And Discussion

3.1. Proposed Model For The Effect of User Experience on User Satisfaction of Digital Library

For this study, factors that have been identified through literature review were selected as the factors influence users' experience of using digital library which are attractiveness, efficiency, dependability, stimulation, and novelty.

Attractiveness: the graphics, layout, color, theme, and user friendliness of the digital library user interface.

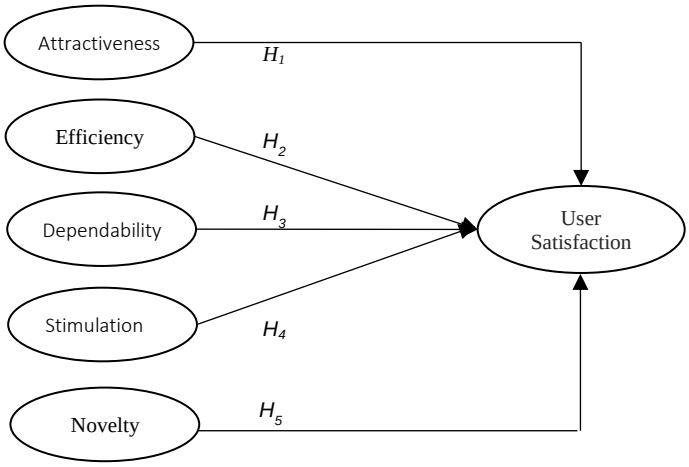
Efficiency: the speed and response rate of digital library.

Dependability: user's trust of digital library whether the system is reliable, supportive, and secure.

Stimulation: user feel motivated and excitement to further use digital library.

Novelty: the uniqueness, creativity, and innovation of the user interface and functions in digital library and how well it can capture the users' attention.

Figure 3 shows the proposed model for the effect of user experience on users' satisfaction of using digital library.



Hypotheses to be tested are:

H_1: There is a significant impact of attractiveness on user satisfaction.
H_2: There is a significant impact of efficiency on user satisfaction.
H_3: There is a significant impact of dependability on user satisfaction.
H_4: There is a significant impact of stimulation on user satisfaction.
H_5: There is a significant impact of novelty on user satisfaction.

Figure 3. Research Model

4. Conclusion

Digital library is one of the services that is provided by academic institutions. User experience (UX) is an important indicator of the service quality which relates to user satisfaction for any product, service, or application. For this study, factors that has been identified through literature review were selected as the factors that influence users' experience of using digital library. The research model that consists of factors and hypotheses had been develop which consist of factors attractiveness, efficiency, dependability, stimulation, and novelty.

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