

Taxonomy of Prioritized Factors Affected the Success of E-Learning of Underprivileged Users and Identifying of Suitable E-Learning Platforms for them

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Abstract:- e-learning is a popular learning mode that involves the delivery of learning and training through digital resources. Due to its flexibility and affordability e-learning has become continuously popular. Besides, it has many benefits compared to other modes of learning. However, rather than other modes of learning, e-learning is challenging among underprivileged users. Therefore, we conducted a field survey on prioritizing factors that enhance the successful utilization of e-learning among underprivileged users, and a taxonomy of essential factors was developed. Finally, we conducted a web survey to identify how the popular e-learning platforms meet the features. Our results show that Moodle and Google Classroom meet the expected features among the considered e-learning platforms. Further, Moodle shows the least utilization of internet bandwidth among the others.

Keywords:- e-learning, e-learning platform, low privileged user, taxonomy of e-learning,

I. INTRODUCTION

There is an increasing dependency on e-learning through the Internet for education at diversified levels and around the world. In fact, Moodle recorded 200 million users from 242 countries in the year 2022 [1] while Google Classroom recorded approximately 150 million users in the year 2021 [2]. This dependency was accelerated due to the COVID pandemic since face-to-face communications were restricted and travel was also banned.

e-learning is a learning environment that uses information and communication technologies (ICT's) as a platform for teaching and learning activities [3]. It has a history since 1999 and the term e-learning was first used by Elliot Maise [4]. E-learning has been geared by the enhancement of internet technology, increasing utilization and availability of affordable devices, advancements of content development technologies, and development of Learning Management Systems.

There are two main types of e-learning based on the interactions between the learner and the teacher: asynchronous, and synchronous learning [5]. In this paper, we focus on asynchronous online learning because of the social, financial cultural barriers to be minimized as well as the availability of time of the targeted users.

e-learning acquires number of advantages [6] such as flexibility, economic, achieve balance between personal and other commitments, deeper sense of self fulfilment. E-learning is a flexible method there are no strict disciplines to be followed and it is more cost beneficial both for the teacher and for the learner. E-learning can be done at a desired time and especially it saves much time and hence e-learning supports to achieve good balance between other commitments and learning.

One issue with e-learning is that it requires users an ability to involve with the learning. For example, the user needs to have knowledge on how to operate the device, how to connect to the internet, how to access the course, and how to progress through the activities in the course. In short, the user is expected to have some kind of computer literacy, or the user should have someone to help him/her if has no such knowledge. Further, for asynchronous e-learning, the users' other commitments and priorities are also matters such as the motivation for learning, education level, etc.

It is not possible to assume that a user will always conduct e-learning because the users are not all at the same level. The issues in succeeding the e-learning are much more for the underprivileged users. The term underprivileged user is used to mean a user having poor literacy and is economically unsafe. Particularly, the separation of underprivileged users from others is a sensitive matter. Therefore, we selected small-scale farmers to avoid potential discrimination while selecting them. Besides, It is challenging to make e-learning popular among such groups. As such, in this paper, we study the factors that contribute significantly to the success of e-learning among underprivileged users and factors that contribute less to that. At the same time, we intend to identify more suitable existing e-learning platforms for the said purposes. As such, the following are our novel contributions to this paper.

- A taxonomy of prioritized factors affecting to successful e-learning for underprivileged users
- An identification of more suitable existing e-learning platforms for the selected user category

The rest of the paper is organized as background information, the methodology section containing the field survey for prioritizing the factors, and the categorization of factors, and then the results section containing the findings of the factor prioritizing survey, the derived taxonomy, and the findings of inclusiveness of such factors in the selected e-learning platforms. Finally, the discussion and conclusion

section contains the findings and the interpretation of the results.

II. BACKGROUND

In this section, we first discuss the types of e-learning users and then we explore the factors affecting to acceptance of e-learning by under privileged users. Then we present the existing categorization of factor prioritization on underprivileged e-learning users. Finally, we explore the popular e-learning platforms.

Much literature discusses factors for the acceptance of e-learning depending on both the type of users and the type of e-learning technology [7-10]. The user type in information systems is mainly defined based on the access privileges for example, administrative users, manager users, and operator users are not regarded here. We consider only one category of e-learning users to be exact, the learners (students) and we try to characterize the types of learners because success depends on the characteristics of the learner in achieving our objective.

Much literature categorizes the learners based on their behaviors, learning styles, attitudes, and aptitudes [8-11]. However, we couldn't find studies, particularly on underprivileged users in e-learning. It is important because e-learning totally be unacceptable to some underprivileged users based on facts such as no device and internet connectivity, no literacy, no desire to learn, and some cultural facts like hesitation. Therefore, a study is important for the underprivileged users of e-learning.

We found several studies on factor identification for e-learning success. A famous model referred to by most researchers is the D&M IS model [12]. However, it is not specifically done for e-learning. Yet another famous model specifically done for e-learning is found [13]. However, it focuses on university students. The success factors for university students are not strictly relevant to underprivileged users. Many of the other studies on factor analysis were also found for university students [14-17]. Besides, studies found in the literature focus on farmers.

The Technology Acceptance Model (TAM) is a famous model done in the context of farmers [18]. It has two external factors and two internal factors and internal factors reside with the user such as perceived usefulness and perceived ease of use whereas attitudes towards using and behavioral intention to use are two internal factors. TAM intends to elaborate on the readiness of the farmer to accept the technology while varying the external factors. The said model was tested by the authors [19], and it was found to be applicable in the context of Sri Lanka. However, such models only consider limited features. Therefore, we intended to do a field study to find the priority of factors applicable to success in e-learning. To the best of our knowledge, the prioritizing of factors has not been done in the literature previously. We obviously know that all the factors are not equally contributed to the success. Among the factors, some should be essentially important whereas some factors are not essential. Therefore, we marked the priority felt by the participants in the survey.

In literature, the factors affecting to success of e-learning have been categorized in many ways. Some literature considers categories like teacher, learner, Information Technology, and institutional support [13]. Another study focuses on six categories such as ease of access, interface design, level of interaction, system quality, service quality, and internet quality [17]. In [20], authors categorized the important features of an LMS into 6 factors; Pedagogical Factor, Learner Environment, Instructor Tools, Course and Curriculum Design, Administrator Tools, and Technical Specification. Further, 52 features are analyzed under these factors. However, our study is focused on underprivileged users, and the factors found through the field study are categorized based on their nature and the priority.

Similarly, we conducted a search on existing e-learning platforms to be tested for suitability for underprivileged users. We used gray literature as well because we did not find studies directly in the area of our focus. After going through many web searches we selected Matrix [21], Moodle [22], Docebo [23], Blackboard [24], Canvas [25], iSpring [26], Brightspace [27], Absorb [28], Google Classroom [29], and Talent [30].

The following section describes the methodology we adopted for obtaining the results.

III. METHODOLOGY

In this section, we discuss the method adopted for the field study, and then the categorization of factors.

A. Field Study

First, we conducted a field study to identify the factors. We selected farmers considering the followings;

- Area of the cultivated Land (maximum of 2 acres as per farmer)
- Age range (preferable for all age groups such as young, middle-aged, elderly)
- Geographical region

All the farmers are small-scale farmers within the minimum income range because our objective is to study the underprivileged users. We happened to select farmers in the mid to old age range due to the unavailability of small-scale farmers at young ages. Due to the unavailability of finance and time, we selected paddy as the crop and four districts such as Ampara, Anuradhapura, Hambantota, and Polonnaruwa. They recorded the highest yield in the 2022 Yala season [31].

We disregarded the farmer's level of technology capacity since it is difficult to measure. A discussion was conducted with the focus of obtaining the following details,

- Potential e-learning system features
- Farmer Readiness of utilization of e-learning platform
- Availability of access to the e-learning platform

Following are the details of the factors considered in each category.

B. Potential e-learning system features

The main emphasis in this study was on the system. The ideal LMS should make all farmers experts for utilization of LMS. To become experts, they should use it frequently. To utilize frequently, the system should be easy to use. Based on this argument, we explored the factors that affect the easy-to-use system.

We consider factors in the platform and the factors in the contents separately. The platform factors include UI simple, internet bandwidth low utilization, use experience no fail, enough guidance, involved thoughts can be shared, networking, choosing of media as user preference, and availability in all 3 media (audio/video and text), has native language, language is friendly, communications are familiar, pleasant color usage, and pages are not big in sizes,

The factors considered are contents are not lengthy, audio contents, materials are attractive, accurate, enough, not lengthy, good presentation, motivated, involved, available in all 3 media, has native language, language is friendly, communications are familiar, pleasant color usage, and pages are not big in sizes.

C. Farmer Readiness of utilization of e-learning platform

Even though the e-learning system is very smart, the factors with the farmer significantly affect the system's utilization. The factors considered are attitude toward e-learning, time availability, readiness to learn, literacy, and patience.

D. Availability of access to the e-learning platform

Even if the platform is smart and the farmer is ready, if the farmer has no access, then he/she cannot do e-learning. Therefore, we identified the factors that contributed to the access to the e-learning platform such as having a potential device and an affordable data connection. We do not intend such a peripheral to be owned by the farmer but he has access to such peripheral is important.

For finding the priority of features, we asked farmers to mark the priority of factors 1-5 such as one is very essential and five means least essential.

After that, we developed a taxonomy of factors and factors of the system to have an easy understanding of the useful factors of an e-learning system.

Finally, we compile the factors against the existing e-learning platforms to understand easily how suitable they are in the context of underprivileged users.

IV. RESULTS

In this section, we present the results such as the results of the priority identification of factors, the taxonomy of the important factors, and the results of the Accessible LMS e-learning platform meeting the prioritized factors.

A. Identification of the priority of factors

We gathered the priority as per the view of each farmer regarding the essentialness of having such a feature to succeed the e-learning. We counted the number of preferences received from farmers against each priority level and obtained the mode of the preferences against each factor as the priority of the factor. Such analysis results are tabulated in the following table.

Table 1: Mode of the priority marked by the farmers for the factors related to the e-learning platform

Platform	Priority
UI simple	1
Internet bandwidth low utilization	1
User experience no fail	2
Has enough guidance	4
Involved	4
Thoughts can be shared	3
Can do networking	5
Choosing media as a user preference	3
Available in all 3 media	2
Has native language	1
Language is friendly	3
Communications are familiar	3
Pleasant color usage	5
Pages are not big in sizes	5

Table 2: Mode of the priority marked by the farmers for the factors related to e-learning contents

Content	Priority
Contents are not lengthy	2
Materials are attractive	1
Accurate	1
Enough	2
Good presentation	1
Motivated	2
Involved	3
Available in all 3 media	1
Has native language	1
Language is friendly	1
Communications are familiar	1
Pleasant color usage	3
Pages are not big in sizes	3

Table 3: Mode of the priority marked by the farmers for the factors related to rediness of farmer for e-learning

Farmer	Priority
Attitude towards e-learning	1
Time availability	1
Readiness to learn	1
Literacy	2
Patience while learning	2

Table 4: Mode of the priority marked by the farmers for the factors related to access to the e-learning system

Access	Priority
Has an access to a potential device	1
Has an affordable data connection	1

B. Taxonomy of factors to successful e-learning

Based on the above results, we derived a taxonomy of the factors affecting the better utilization of e-learning by the farmers. we omitted priority 4 and 5 factors because

those don't have much impact on the successful utilization of the system. We use different colors to show the impact on each such factor. The following figure depicts the taxonomy.

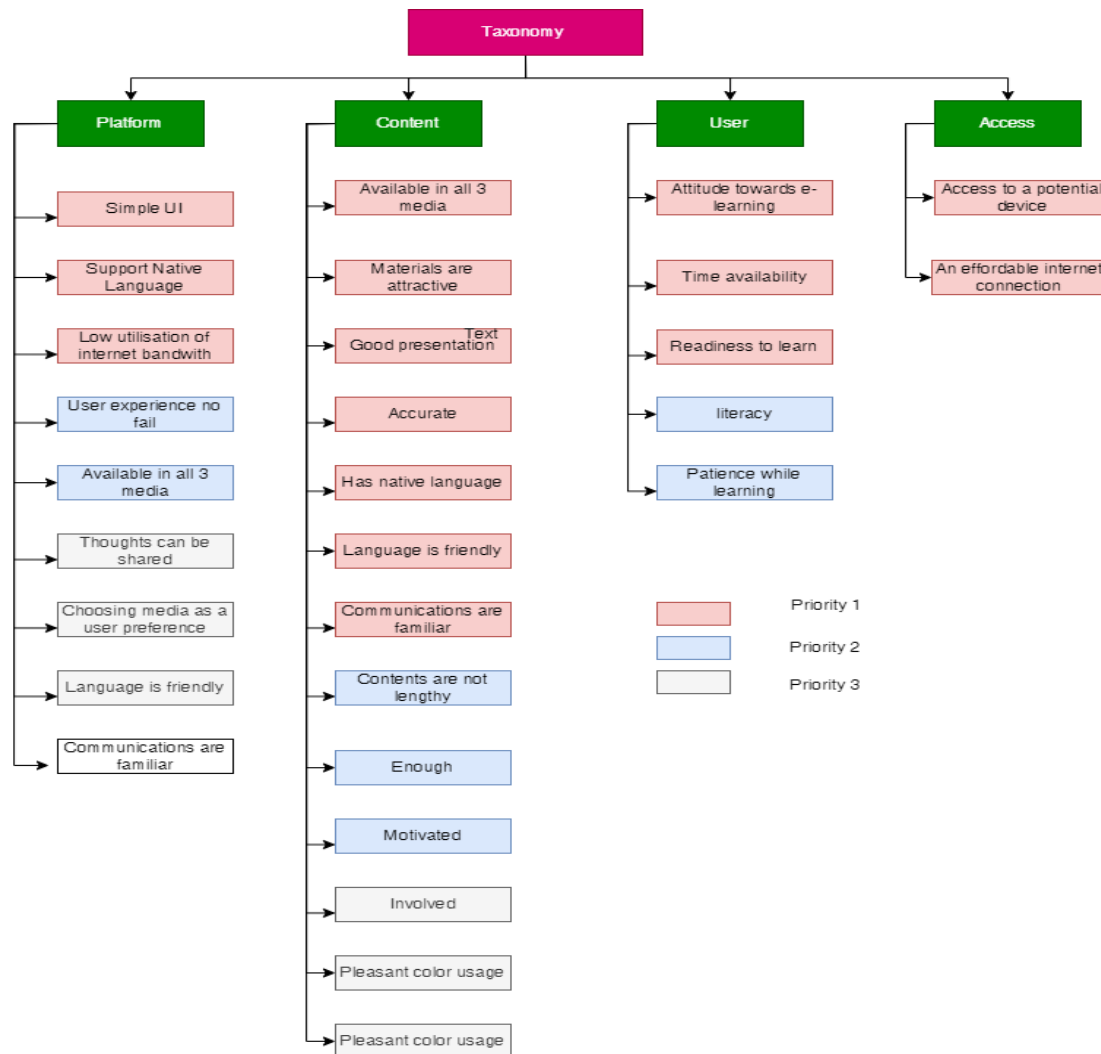


Fig. 1: The taxonomy derived through the survey for successful utilisation of e-learning by underprivileged users (farmers)

C. Presence of prioritized factors in existing e-learning platforms

We then analyzed important platform factors identified during this study, against popular 10 e-learning platforms

such as Hurix, Moodle, Edredo, Blackboard, Canvas, Schoology, Brightspace, Absorb, Google Classroom, and Talent. The following table summarizes the finding of such analysis.

Table 5: Analysis of factor in the selected e-learning platforms

Priority	Sub Factor	Matrix	Moodle	Docebo	Blackboard	Canvas	iSpring	Brightspace	Absorb	Google Classroom	Talent
1	UI simple	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
1	Internet bandwidth usage	3.18s/991.7 KB	1.2s/4 MB	3.68s/3.5MB	2.2s/2.2 MB	865ms/3.3MB	3.71s/3.1MB	3.5S/2.4 MB	1.8S/1.6 MB	920ms/590.1KB	1.02s/1.8MB
1	Has native language	N	Y	N	N	N	N	N	N	Y	N
2	Use experience no fail	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Available in all 3 media	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Thoughts can be shared	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Choosing of media as user preference	N	Y	N	N	N	N	N	N	Y	N
3	Language is friendly	N	Y	N	N	N	N	N	N	Y	N
3	Communications are familiar	N	Y	N	N	N	N	N	N	Y	N

As per the results, both Moodle and Google Classroom are acceptable to be utilized for underprivileged users. Moodle showed to be the lowest utilization of the bandwidth.

V. DISCUSSION AND CONCLUSION

In this paper, we identified the essential factors for a potential e-learning platform to be used by underprivileged users. We selected small-scale farmers as the underprivileged users since all small-scale farmers can be regarded as underprivileged users. We conducted a literature review to identify the essential features of the e-learning platform. Through expert judgments, we improved the list of such features. We could categorize the factors to four categories and then the field survey was carried out. The most important factors of an e-learning platform are Simple User Interfaces, Low utilization of Internet bandwidth, and Has the native language in the platform. The most important factors of the content are available in all three media (such as audio, text, and video), Has attractive materials, Content is accurate, Has a good presentation, Has a native language, Language is friendly and communication is familiar. The essential factors of the user are Attitude towards e-learning, Time available for e-learning, and Readiness to learn. However, the basic requirement is to have access to the e-learning to the user and the factors identified on it are access to a potential device and an affordable data connection.

The taxonomy derived through the field survey has color utilization which emphasizes the essentialness of such factor to the main factor. It helps to refer easily to any reader who is interested in this subject area.

Finally, we conducted a web survey on meeting the factors of the popular e-learning platforms and a test for bandwidth utilization. Both Moodle and Google Classroom were found to be compatible with e-learning for the low privileged users. The lowest bandwidth utilization is found to be of the Moodle e-learning platform.

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DATA AVAILABILITY

Authors have no right to publish the data collected during the field survey.

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