

Usability Evaluation of Web Portals in Fostering Social Learning

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ABSTRACT

In this paper, a social-academic platform has been evaluated as one of the vital services that foster collaborative learning and increase the usage of academic web portals. However, the absence of the social and academic aspects in the context of the platforms available to the institutions in the study has resulted in usability concerns and reduced usage for interactions between their vital stakeholders - tutors and students. The importance of an institution's web portal for alternative learning outside physical classrooms or lecture halls has been signalled by the impact of the coronavirus pandemic. In this study a platform has been evaluated via a standard post-task usability assessment scaling metric – System Usability Scale (SUS), to examine the portals' usability and to validate the construct of perceived social learning and sharing of knowledge by random evaluators via the post-system usability assessment tool. The outcome of the post-system evaluation noted empirically that, the system perceived learnability was 70.9% and the usability scale score was 83.9% with excellent usability at the 90th-95th percentile range. Consequently, the study outcome suggests that the social academic web portal platform in the era of the pandemic is adaptable, usable, and can be used to foster social academic interactions between lecturers and students in learning institutions, and therefore increase the web portal's usage.

Keywords: *collaborative learning; web portal usability; social academic platform; academic web portals.*

INTRODUCTION

The outbreak of the current deadly coronavirus (COVID-19) has plagued all aspects of daily activities. Over time, several activities have resumed partially in most sectors with measures to avoid physical contact amid others. Learning institutions are finding it difficult to find their resumption ground, even on a partial basis. The traditional mode of learning has been partially halted with the pandemic, as learning in the physical classroom or lecture theatres without proper preventive measures may increase virus transmission. An alternative mode of learning has been long emphasized in studies – online, virtual, or distance learning, but their modalities are yet to gain ground in most academic web portals in Nigerian universities (Adeoye et al., 2020; Adeyeye et al., 2014; Anene et al., 2014; Kyari et al., 2018). On a national level, these web portals are most times used for managerial activities and do not facilitate interactions or foster a social construct of learning between its users (Oliha, 2014). However, developed countries are used to this trend already but not much has been noted in some universities within a developing country like Nigeria.

Online or distance learning has exposed the fact that learning can occur without the physical classroom, between any two or more parties irrespective of their locations. Academic institutions offering these services have demonstrated that there is more to the potential of web technologies in learning institutions than the normal student record management services they offer. There are services academic web portals should offer, but the core of them is the social and academic construct alongside managerial (Farooq and Mir, 2010; Kandler, 2010; Oluwatobi et al., 2014). However, learning opportunities are reduced as a result of defects in either the social or academic aspects. Both constructs engage users with informative discussions like they do on social forums in one or more interactions between instructor and students via the web portal. This aids collaborative interaction and promotes platform usage.

The construct of learning has not been fostered via web portals in most learning institutions, except for information and management of student records, that is, mostly for managerial services in some

Nigerian universities (Abdulhamid et al., 2010; Alam et al., 2017; Azeta et al., 2008; Ofoegbu et al., 2014; Oliha, 2014; Oluwatobi et al., 2014). This is a limitation on the possibilities for fully utilizing and reaping the impact of web technologies in learning institutions. Consequently, most experience low usage resulting from usability challenges and the absence of the technology's core services – subjecting the portal usage to payment of fees and registration purposes only. With the dawn of the COVID-19 pandemic, learning over the web is now more vital in academic institutions than ever, and in the context of Nigerian universities, this work proposes a social-academic learning platform to assist with developing and cushioning interactivity in the learning aspects of academic web portals in accordance with the research design shown in Figure 1 below.

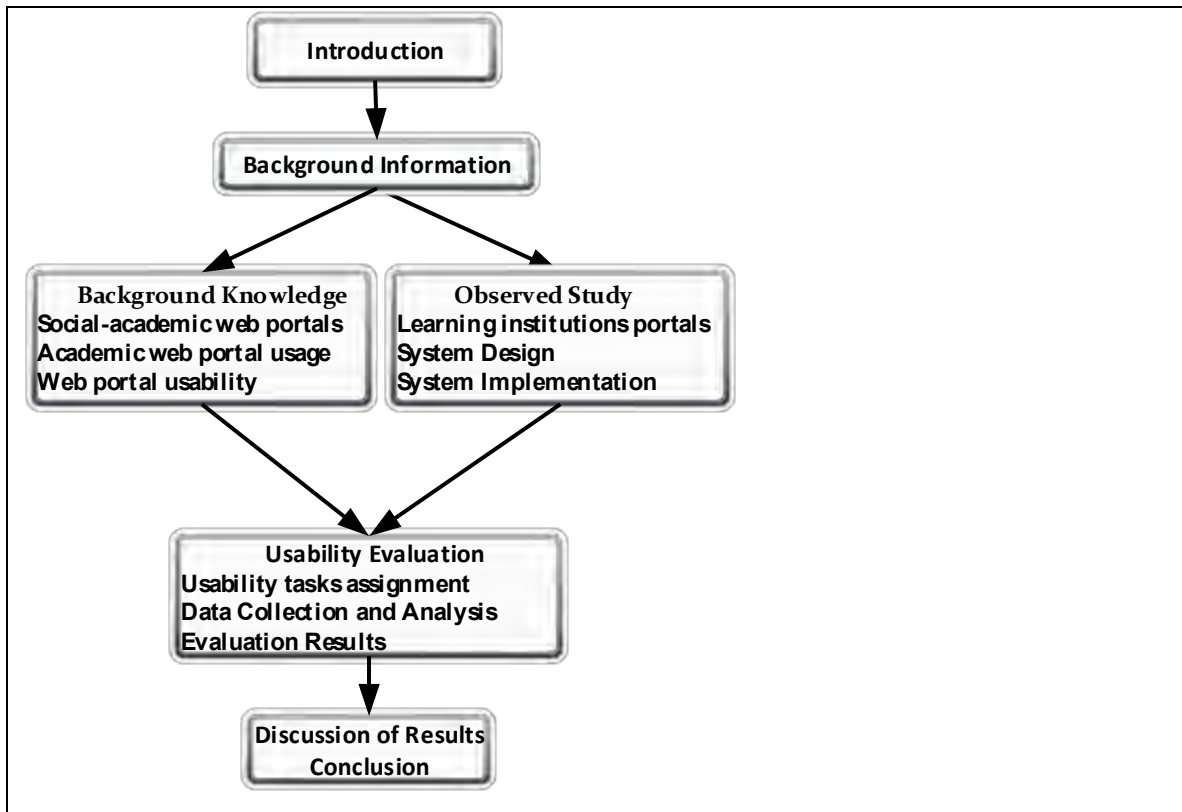


Figure 1: Research Design

BACKGROUND

Social-Academic Learning and Web Portals

Social learning involves the use of academic web portals for the social construct of knowledge in an academic context. With the social web of learning, the way we interact affects our learning ability in terms of collaboration, negotiation, debate, peer review, and mentoring. The common view regarding this platform is that it is a virtual learning environment that stimulates interactions and sharing of ideas (Aichner & Jacob, 2015; Kietzmann et al., 2011; Premagowrie et al., 2014; Vonderwell, 2003), which plays an important part in the learning process and can have a significant impact on learning outcomes.

Academic web portals have been effective in the management of student records (Abdulhamid et al., 2010; Alam et al., 2017; Oliha, 2014), but from a Nigerian context, some of these web portals do not provide the construct for lecturers to engage students in learning opportunities with an online presence. Learning is facilitated when instructors and learners collaboratively construct knowledge in a learning environment, either social (forums) or academic (virtual classrooms), with any technological device.

Mobile devices and interconnected networks allow students to learn from anywhere and have been emphasized in ways to promote interactions between lecturers and students as shown in recent studies (Gan & Balakrishnan, 2017; Tita & Moki, 2017). Promoting social interaction in an academic context can facilitate an increase in student engagement but more importantly can be used for fostering critical analysis, reflection, and the social construction of knowledge. The construct of learning also involves academic activities where a task by a lecturer can be effectively completed by a student while using an institution's web portal represents the academic aspect of a web portal's core services.

Both the social and academic constructs are vital to the creation and sharing of knowledge between learners and instructors, but some factors stand as limitations towards realizing the full utilization of institutional web portals.

Factors Affecting Lecturer/Students' Usage of Academic Web Portals

A study carried out by Alatawi et al., (2018) to investigate factors that help to encourage students to use university web portals revealed that interactions, efficiency, and accessibility were some of the critical factors that influence the end users' satisfaction level on its usage. El-Said (2018) noted that web portals are expensive to build and maintain, but if done without considering users or usability preferences, it is bound to have poor interactivity either with humans or other computing entities, which raises usability concerns. Other studies on the factors influencing student interactions or use of academic web portals revealed that: usefulness of content (Yanga et al., 2005), focus groups (Large et al., 2006; Blas et al., 2014), social and academic content (Farooq and Mir, 2010; Kandler, 2010), information content (Bringular et al. (2011), poor interactivity between lecturers and students (Oluwatobi et al., 2014), and usability were the most important (Munaiseche and Liando, 2016). These factors account for poor learner/instructor usage of academic web portals.

In a related study, Adeyeye et al. (2014), proposed virtual learning in Nigerian Universities as a panacea for enhanced academic standards. Their approach was centered on an intranet-based networked environment for learning with connected nodes or users. However, the usability of such a networked platform was not ascertained. In similar research work, e-learning in tertiary education in Nigeria was considered by Kyari et al., (2018) who examined the state of learning in Nigerian universities and exposed challenges impacting the potential for use of web portals for learning. In a study related to e-learning in the era of COVID-19, Adeoye et al., (2020), examined the Nigerian tertiary education system and the necessity of e-learning by identifying and discussing challenges to e-learning. However their approach was theoretical, and usability was not considered. Thus, usability remains a means to validate how easy it is to learn and use a web portal with expected benefits.

Academic Web Portal Usability

Usability is a construct in the development process of web portals – particularly for learning institutions. It serves as a yardstick to examine at the core, the effectiveness of the portal to gauge whether the portal is fulfilling its objectives and to measure whether planned improvements on the portal have their desired impacts (Aziz, 2015). Usability is key to the interactivity of any academic web portal for lecturers and students. By facilitating ease of interaction between lecturers and students it fosters continuous usage particularly if user interfaces are easy to learn and use. One way to evaluate these web portal interfaces is via usability testing (Munaiseche and Liando, 2016).

As noted by Adrain (2013) and Mifsud (2015) a deployed web portal usability evaluation can be achieved using standard post-task level measurement tools like: Software Usability Measurement Inventory (SUMI), Post-Study System Usability Questionnaire (PSSUQ), System Usability Scale (SUS), Questionnaire for User Interaction Satisfaction (QUIS) and the Computer System Usability Questionnaire (CSUQ).

Among the three learning institutions in this study: University of Benin (www.waeup.uniben.org), Ambrose Ali University (www.aaue.waeup.org), and Benson Idahosa University (www.biu.edu.ng), use of the portals was deficient and social interactions were not fostered by these portals. Thus, the motivation for a social-academic web portal system – a learning platform that integrates both social and academic activities and its development, is discussed in this paper.

THE STUDY DESIGN

Data Gathering

The data gathering process involved the investigation of important usability factors that will foster learning interactions. The views of participants - lecturers and students of the three learning institutions (Federal - University of Benin, State - Ambrose Ali University, and Private - Benson Idahosa University), were obtained via interviews. These views were used as constructs for development of the social learning platform. The web portal of the Federal University of Benin was used as the choice for observation of platform integration. Findings from the investigation were documented as vital inputs for the platform design.

Platform Design

For conciseness and focus, the notations for instructors and learners were only considered for review of the interactions and collaboration between instructors and learners. Using an object-oriented design tool – Unified Modeling Language, the interactive component of the social learning platform was modeled in the form of activities between the learner and the instructor as shown in Figure 2 and Figure 3 below.

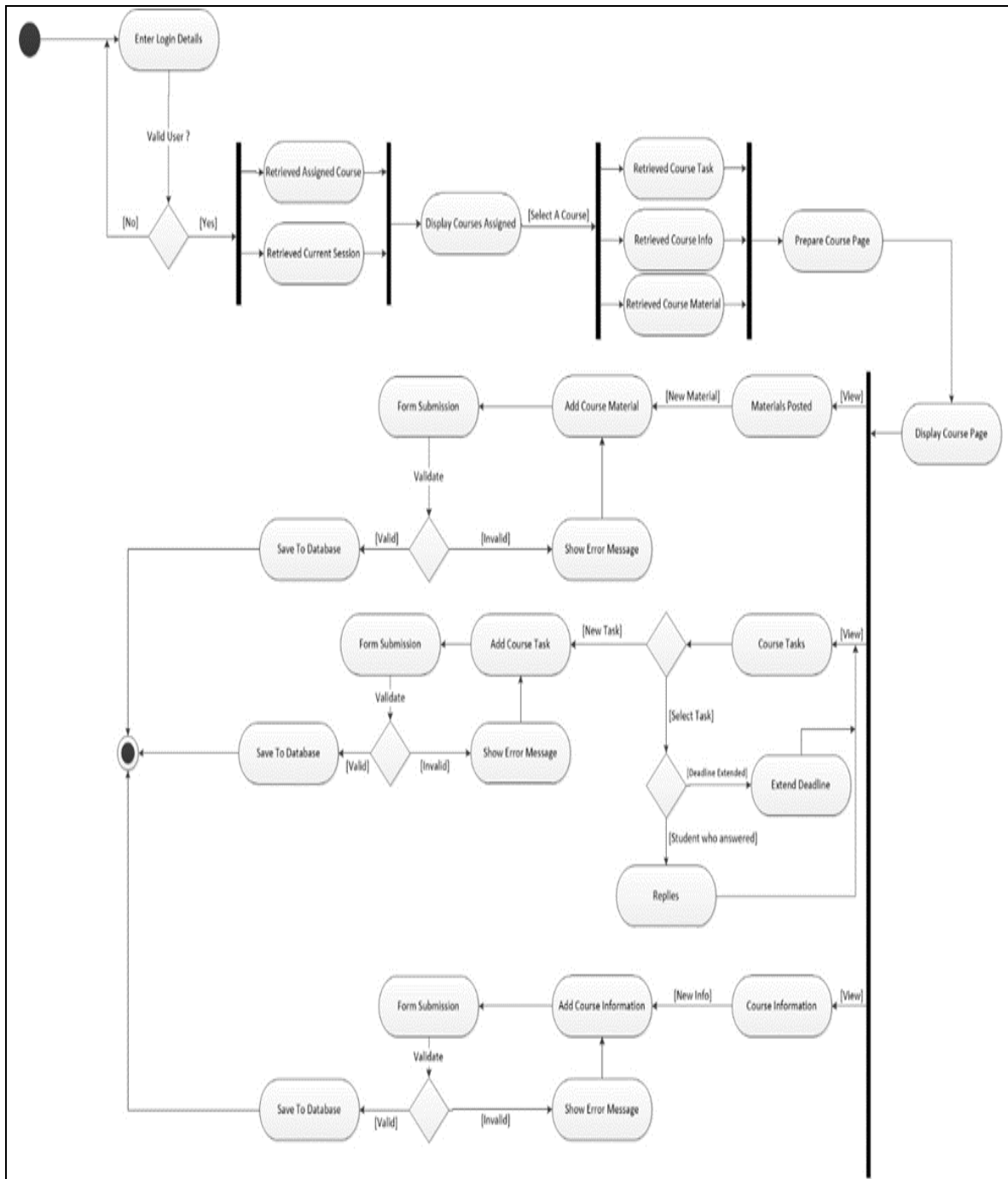


Figure 2: Instructor's (Lecturer's) Activity Diagram

The information in Figure 2 illustrates the instructor's activities, in particular his engagement in the social academic learning system. Graphical representations of workflows of stepwise activities and actions with support for choice, iteration, and concurrency are shown. In a similar representation, Figure 3. illustrates activities that engage students in the process of learning on the platform.

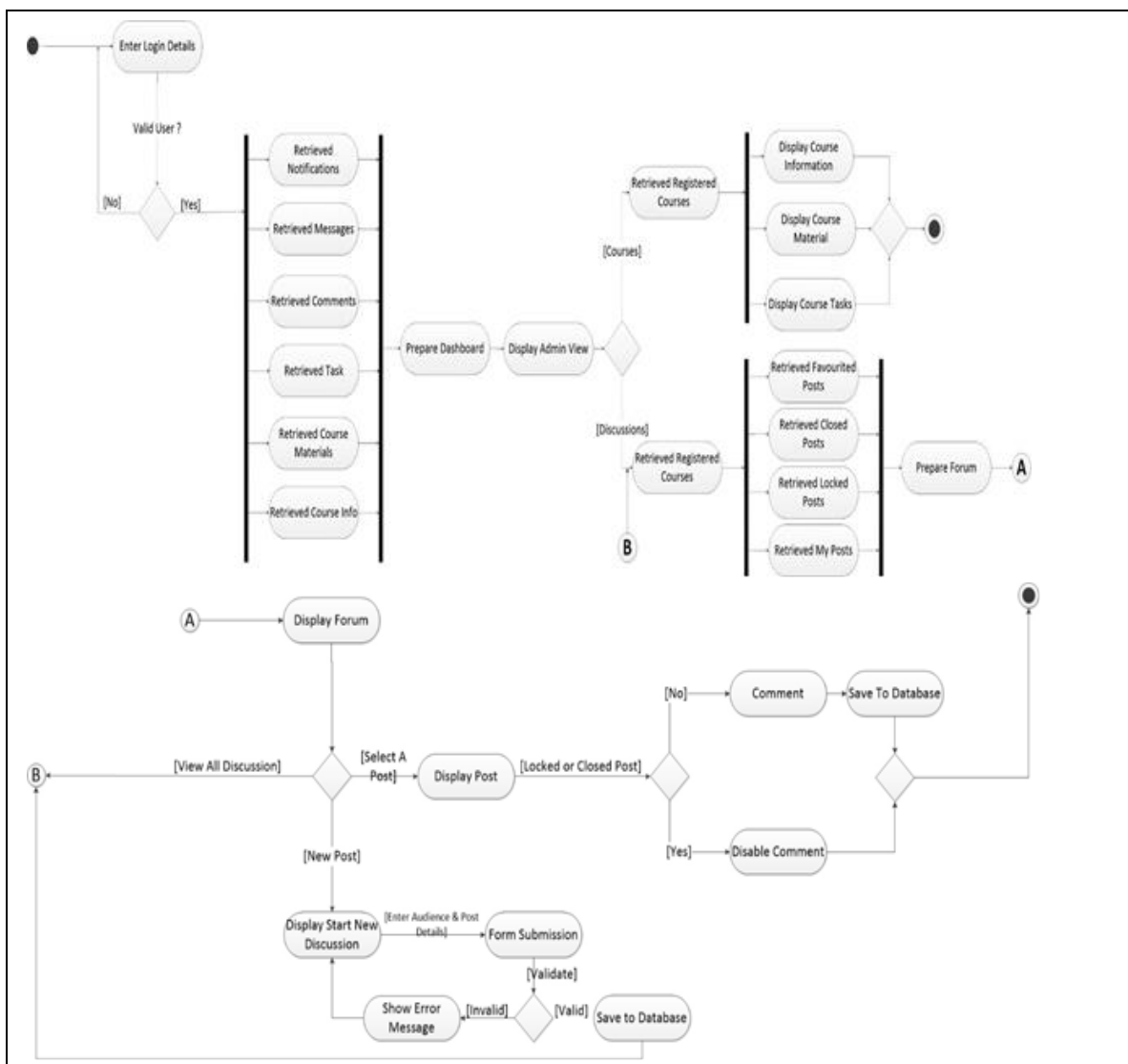


Figure 3: Learners (Students) Activity Diagram

The social construct is that where knowledge is shared via the forum module, it increases students' online presence with the academic web portal. The course-related activities involving course tasks and discussions with the feedback channel for replies and posts, foster collaborative learning in a social context.

Design Implementation, System Deployment, and Testing

The platform designs were implemented as modules and interfaces to create a usable platform for interaction. Platform interfaces were created using a cross-platform python-based text and source code editor – Sublime Text. Files and scripts were created for each module interface using the server-side scripting language – PHP, and library of style sheets and cascading – bootstrap for creating the interface look and layout. At the back end, schema objects were created in the database as tables to store users' data using MySQL as a custom storage engine. The database

was fully accessed using PHP connection from the Application Programming Interface (API) to the backend provided by the phpMyadmin component of MySQL Server. XAMPP, a cross-platform server technology, was used as a local server to deploy the system's services across several nodes that were connected.

Testing was conducted to evaluate the system's compliance with its specified requirements and functionalities. Access was granted for the set of correct input data. Errors were flagged in the case of wrong inputs and missing links and were debugged. The specific modules were those of the lecturer and student, tested with live data exposing their interactivity links and charts. These are shown in Figure 4, Figure 5, and Figure 6 below.

The screenshot displays the 'Social-Academic Web Portal' interface. The main heading is 'Programming Concepts -- CSC 422 Course Page'. Below this, there are three main sections:

- Materials Posted:** A table with columns: #, Material, Description, Size, Date, Type, and Action. It shows one entry with material ID 1070045097_1456642701_spacgray-master.zip, a description to unzip and read pages 23 to 24, a size of 538565, and a date of July 11, 2015. There is a 'Delete' button in the Action column.
- Course Tasks (Assignment):** A table with columns: SN, Task, Date Added, Deadline, and Action. It lists two tasks: 'Fibonacci' (deadline July 31, 2015) and 'Functional Programming' (deadline July 22, 2015). Each task has buttons for 'View', 'Replies', 'Extend Deadline', and 'Delete'.
- Course Information:** A table with columns: #, Head, Body, Date Added, and Action. It lists three items: 'Class Schedule', 'Class Date', and 'class assignment', each with a 'Delete' button.

Figure 4: Lecturer's Academic Dashboard

This module is a submodule on the instructors' dashboard, representing and reflecting the academic tasks or duties on the portal. Owing to the academic aspect of these web portals, Figure 4 highlighted academic constructs such as course tasks, information, materials, and the ability to upload course materials, assignments, and set deadlines for submission activities and assignments amongst other services, for different course levels and academic sessions. It provides for fluid management of tasks and duties as well as the opportunity to monitor them.

Figure 5 and Figure 6 shows the platform features that project the student's dashboard for both the social and academic constructs involving: *Live Feeds* (forum, tasks deadlines, information, and material) for students; *Notification Centre*, where any updates from lecturers regarding students' coursework/materials can be viewed; *Forum* chart activity and involvement chart on student's academic/activity progress rate for usage of the portal for intended activities.

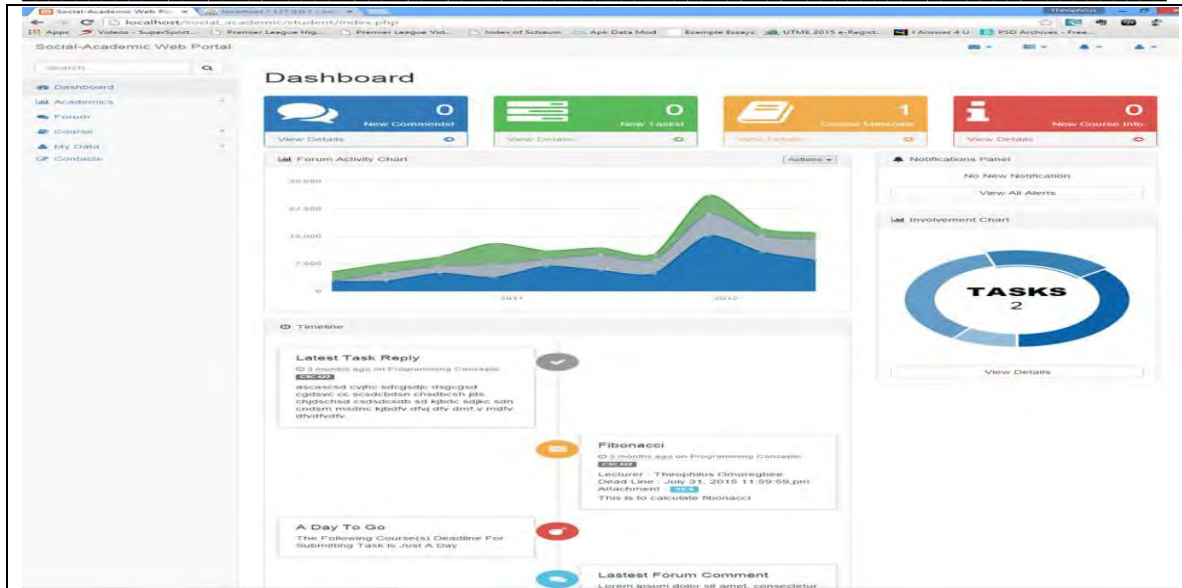


Figure 5: Student's Dashboard

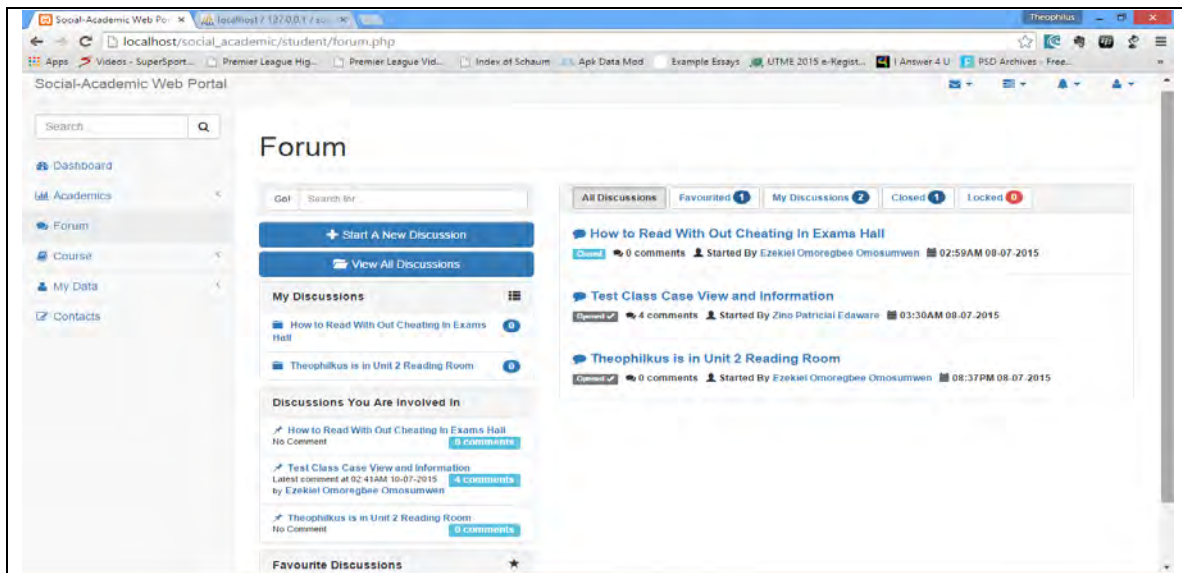


Figure 6: A Social Academic Learning Forum

The social learning construct for collaboration between the learners and instructors on the web portal is represented in Figure 6. The forum allows students to socially create, read, and comment on their favourite topics or related posts – a collaborative construct of knowledge.

USABILITY EVALUATION, RESULTS, AND DISCUSSION

The usability evaluation was conducted to assess the ease with which the social academic web portal can be used in the context of interaction with designated participants.

Participants and Tasks

The evaluation experiment consisted of 3 lecturers and 5 students from each learning institution, for a total of 24 participants. The goal was to examine the system's usability and the number of participants (evaluators) was quite adequate in range regarding software usability evaluation (Macfield, 2009; Six & Macfield, 2016).

Participants were briefed on the goal of the study and introduced to the social learning platform with guidelines on how to use it to complete a specific task. Thereafter, usernames and passwords were generated for access and registration of courses for participation in the usability exercise. Academic tasks were assigned by lecturers to be completed by students within a time frame. Students used their understanding of the platform to participate in tasks assigned to them by their lecturers. Thereafter, they were asked to participate in a group discussion via the forum to validate the construct of social learning and sharing of knowledge via the platform.

Usability Assessment Metric

The System Usability Scale (SUS), a standard post-task level measurement tool was adapted. It is a survey-based usability assessment metric scaling from 1 – 5 representing “Strongly Disagree” to “Strongly Agree” to capture the outcomes of usability experiments. It consisted of 10 usability questions where the 4th and 10th items measured the dimension of perceived learnability. Each of the participants were asked to complete the items on the SUS post system usability questionnaire shown in Table 1 below.

Table 1: SUS Usability Assessment Questionnaire Items

S N	SUS Questions	Strongly Disagree					Strongly Agree				
1	I think that I would like to use this learning portal frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	I found the social learning portal unnecessarily complex.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	I thought the social academic system was easy to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	I think that I would need the support of a technical person to be able to use the developed learning portal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	I found the various modules in this system to be well integrated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	I thought there was too much inconsistency in this system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	I would imagine that most people would learn to use this socila academic web portal very quickly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	I found the system very cumbersome to use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	I felt very confident using the system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	I needed to learn a lot of things before I could get going with this system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Adapted from: Sauro, 2018

Results

The assessment data were gathered, and the results of the evaluation are represented in Figure 7 and Figure 8 using the grading in Table 2 for each scored item. Values from each participant's responses were captured for all 10 questions and computed with SUS scores.

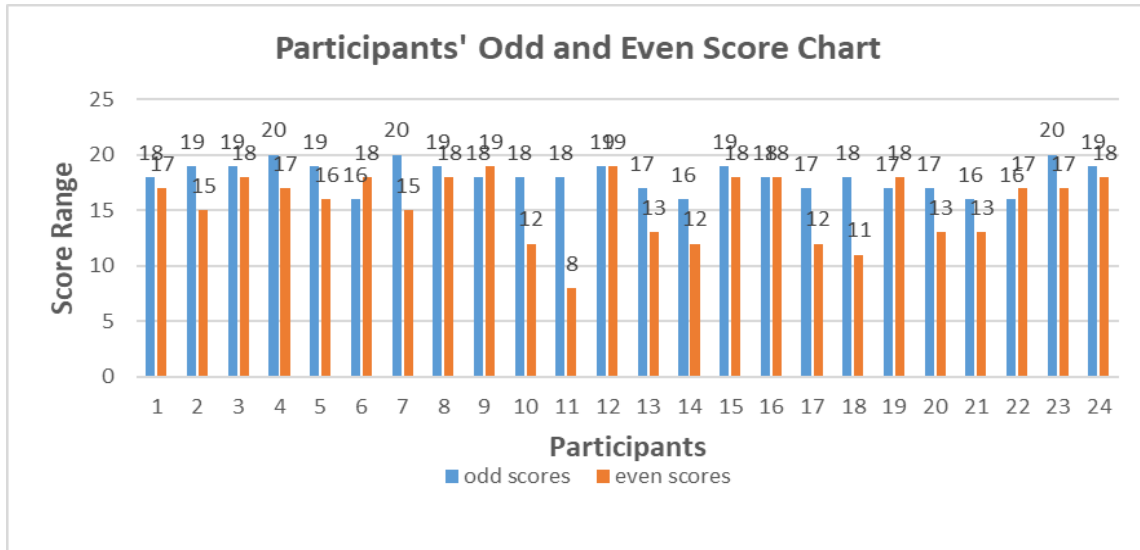


Figure 7: Participants Score Chart

These scores were required to compute the SUS score for each participant as seen in Figure 8.

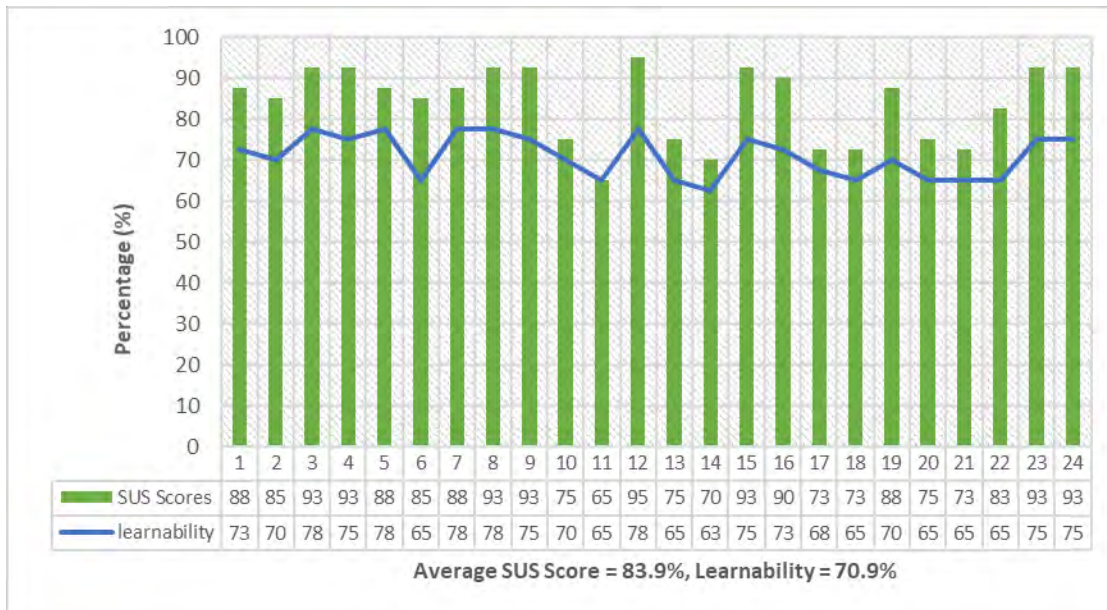


Figure 8: SUS Score Chart

From the data in Figure 8, we note that the average SUS scores for participants 11 and 14 was 65% and 70% respectively while the majority of the other participant scores were above 80% (16 of the 24 participants). On average, the perceived SUS score was evaluated as 83.9% and learnability was 70.9%. The category of the grade ranking is presented in Table 2 below.

Table 2: *SUS and Grade Ranking (Sauro, 2018)*

Grade	SUS	Percentile Range	Adjective	Acceptable
A+	84.1 – 100	96 – 100	Best Imagined	Acceptable
A	80.8 – 84.0	90 – 95	Excellent	Acceptable
A-	78.9 – 80.7	85 – 89		Acceptable
B+	77.2 – 78.8	80 – 84		Acceptable
B	74.1 – 77.1	70 – 79		Acceptable
B-	72.6 – 74.0	65 – 69		Acceptable
C+	71.1 – 72.5	60 – 64	Good	Acceptable
C	65.0 – 71.0	41 – 59		Marginal
C-	62.7 – 64.9	35 – 40		Marginal
D	51.7 – 62.6	15 – 34	OK	Marginal
F	25.1 – 51.6	2 – 14	Poor	Not Acceptable

DISCUSSION

Several factors limiting the usage of academic web portals for the social learning construct have been discussed in this study. Deploying a learning platform that integrates collaborative interaction on both social and academic services mandated the design of activity diagrams in Figure 2 and Figure 3, for the purpose of modelling the interactions between two or more participants. The implementation of implemented dashboards that supported interactivity and the social construct of learning was noted in Figures 4, 5 and 6. Developed with usability features, the design and implementation activities were able to accommodate some of the challenges noted by Kyari et al., (2018), and Adeoye et al., (2020), which explored the potential of web portals for increased learning usage in universities.

In related studies (Adeoye et al., 2020; Adeyeye et al., 2014; Kyari et al., 2018), alternative modes of learning in Nigerian Universities have been purported as a panacea to cushion the effects of the COVID-19 pandemic, and at the same time improve academic standards. However, the usability factor has minimized realization of the full potential of academic web portals for social academic services and thus, usability has been evaluated against design (Abdulhamid et al., 2010), as it remains a means to validate how easy it is to learn and use a web portal with expected benefits.

The usability evaluation involved 24 evaluators designated with social academic tasks to determine the efficiency and perceived satisfaction of the deployed platform via a post-task SUS assessment questionnaire. The SUS scores were documented and presented in a table and graphical forms to enable informative insights and meanings.

On the construct of usability of the deployed social academic platform, the resultant average SUS score calculated from the odd and even score computation as shown in Figure 8 was 83.9% with an “*Excellent*” percentile range of 90 – 95 ranked from Table 1. According to Sauro (2018), a system with a SUS score of above 68 is good and acceptable at the 50th percentile. The construct of learnability was perceived with an average SUS score of 70.9% with a “*Good*” percentile range of 85 – 89. Learnability with a SUS score of 70.9% on the other hand does not indicate an excellent category of ranking – a fact that may seem to have limited the deployed platform from attaining the

best-imagined category. However, with the SUS score slightly above the acceptable range, it suggests that the social academic platform can easily be learned and improved on. In summary, the platform is designed with well-integrated modules that can foster social academic-related tasks with swift and effective usage. Notably, the platform has an acceptable learnability feature and excellent perceived usability with high support for interactions with users and among its users to increase academic web portals usage beyond admission and managerial services.

CONCLUSION

A key emphasis of this study is on the utilization of web technologies in fostering a platform for social-academic interactions in the era of a pandemic. The usability of a learning platform has been evaluated to validate the social academic aspects of academic web portals which were relatively deficient in the observed learning institutions. Usability assessments demonstrated an acceptable learnability quality and excellent system usability with increased interactivity via the deployed platform. The outcome of this study serves as an insight to fostering two-way learning via web portals for Nigerian universities. Usage increase is also observable with proper integration of the platform into the existing learning institutions portals. Adaptation by appropriate management authorities and stakeholders for integration is paramount to gauge its usability and targeted expectations. Further evaluation is recommended.

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