Research Article

Development of an Information Technology-Enabled Learning Environment for Bataan Peninsula State University

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Abstract: The research Information Technology-Enabled Learning Environment for Bataan Peninsula State University was developed to provide an easier and faster process of submission of class requirements and ratings of student works which will help the faculty members to manage their classes efficiently via intranet and an internet-based connection. It is capable of allowing the students to submit soft copies of their requirements such as major course output, laboratory exercises, case studies, and other projects. Faculty members are allowed to validate currently enrolled students, create classes, accept students in listed classes, post announcements through the content feeds, and maintain grading system per course and its rubrics of assessment. Finally, the application allows students to check announcements, requirements, and projects posted by the faculty member through the content feeds. The system was developed using PHP as the programming language, Apache for the webserver, MySQL as the Database Engine. It passes the user's acceptability evaluation based on ISO 2510102011 with sub-criteria such as effectiveness, efficiency, satisfaction, freedom from risk, and context coverage.

Keywords: management system, learning environments, intranet-based systems, content management

1. Introduction

Bataan Peninsula State University (BPSU in its mission to develop graduates who are competitive continually provides relevant, innovative, and transformative knowledge-based programs and services to its stakeholders. Vital in this role is the roster of qualified and competitive faculty members who make up the academic council of the university.

According to the Chapter 2 of the BPSU code, the duties and responsibilities of each faculty member is to identify the learner needs, prepare and follow a course syllabus based on the needs identified, facilitate the learning process through the active engagement in classroom tasks and activities, develop students' analytical and creative thinking skills through purposive activities with focus on higher-order thinking skills, and design alternative and innovative models of teaching for all types of students.

Currently, there are different learning tools which are used by the faculty members to aid them with stated responsibilities. Among them are Facebook pages, Google classroom and Facebook group chats. These technologies although very useful are not at all integrative in nature where its information can be used for other purposes and normally, would only be valid in a particular class.

In this manner, there is a need to develop an intuitive learning environment where the faculty members can control the contents of a learning tool in the aspect of class requirements, due dates, tasks and class activities. There is a need to provide a way for the faculty members to post lessons and announcements. There must be a way for the students to submit the soft copies of their requirements online. This will be beneficial to the students as well as the faculty members. This kind of learning environment will enable the students to maximize their potential and familiarize themselves with the use of technology.

2. Market Potential

In the report titled "Philippines IT Industry – By Hardware Market (Computer Sales and Peripherals Sales, By IT-BPO Market (Contact Center, Software Development, Transcription, Animation and Other BPOs), By Software Market (Software Development and Software Publishing) and By Antivirus Market (Enterprise Customer and Retail Customer)" highlights the overall market size for hardware, IT-BPO, software solutions in the Philippines. Market segmentations were also gained focus specifically by its types such as contact centers, software development, transcription and others. It covers the overall comparative landscape, scenarions, growth drivers, trends and regulation which affects the market as a whole. The report concludes with future projections for all the segments and analyst recommendations highlighting the major opportunities and cautions. [1]

As mentioned, in the past, software development in the Philippines became one of the more well-known sub-sectors in the IT and IT-ES industry. In comparison with other countries in the region, it is known that the critical factors that fueled its development are its cultural and western-accent similarities specially with the US; cost competitiveness and good knowledge in terms of IT background; thus establishing a more useful resource. The

major players operating with the country includes IBM, Accenture, Genpact, UST Global, Pointwest, ExistGlobal and others. In the specified forcast period, the software market in the Philippines is expected to grow owing to the increasing number of software-centric startups within the country.

All in all, projects involving software development and software as a service will be very beneficial to the university as a whole since projects involving this is a welcome strategy to any organization in the country.

3. Review Of Literature

Robinson, Molenda & Rezabek pointed out that the meaning of intellectual and technical development of educational technology such as the following (1) Educational technology as the theory and practice of educational approaches to learning. (2) Educational technology as technological tools and media that assist in the communication of knowledge, and its development and exchange. (3) Educational technology for learning management systems (LMS) such as tools for student and curriculum management, and education management information systems (EMIS). (4) Educational technology as back-office management, such as training management systems for logistics and budget management, and Learning Record Store (LRS) for learning data storage and analysis. (5) Educational Technology itself as an educational subject, such courses may be called "Computer Studies" or Information and Communications Technology. [2]

Yuvienco specified the four key areas to address the challenges in education where ICT can be applied. These are the following: teaching and learning, communication, governance planning, and decision-making as well as process and operations. [3]

According to Campanotti, CSM or Content Storage Management is a method for the improvement of traditional mecia archive technology used by different media companies and content owners to store and protect valuable file-based media assets. It focuses on active management ot contents and media assets regardless of fotmat, type, interfaces and sources. These media files often contains video, images or sounds. A CSM system may be directed manually but is more often directed by upper-level systems, which may include media asset management (MAM), automation, or traffic. [4]

Moreover, in the Handbook of Classroom Management: Research Practice and Contemporary Issues (2006), Evertson and Weinstein characterize classroom management as the actions taken to create an environment that supports and facilitates academic and social-emotional learning. Toward this goal, teachers must (1) develop caring, supportive relationships with and among students; (2) organize and implement instruction in ways that optimize students' access to learning; (3) use group management methods that encourage students' engagement in academic tasks; (4) promote the development of students' social skills and self–regulation; and (5) use appropriate interventions to assist students with behavior problems. [5]

In addition, Agustin describes network software as a system or a software which operated over a network instead of running on individual computers. It may perform tasks that are supplemental to end-user software or may totally replace it such as a network-based antivirus software supplementing a desktop version of it. Another example is a network messaging server which enables end-user computers to send messages to other computers in the network back and forth. The common goal of every network software is to increase productivity and improve security for network users. [6]

Moreover, PJ Web Solution specified that network-based systems have evolved due to improvements in security and technological advances and, in many cases, it offers significant advantages compared to traditional software-based applications. [7]

Since, the learning environment will be used by the faculty and the student, a need for a network-based system is more appropriate. This will ensure that there will be cohesiveness on the data being processed and transmitted.

Likewise, Sun Microsystem pointed out that the client-server model is a distributed application structure that partitions tasks or workloads between the providers of a resource or service called servers, and service requesters. [8]

Furthermore, the Journal of Computer Engineering and Information Technology mentioned that the Database Management System is a collection of computer software allowing an interface between users and databases. It is used to analyze the data using software applications. Furthermore, it is responsible for preserving the integrity and safeguarding the stored data and also to retrieve the information in case of system failure. Defining, creating, querying, updating and administration of databases are done by general-purpose DBMS which is a software system. [9].

Moreover, Online Thinkers website emphasized that in website creation, the designers should focus on the objective of attracting visitors and make them stay longer. It is important that the end-users attention are taken and that users are enticed to browse and access the website. Photography plays a main role in sustaining visitors to the website. Likewise, creating websites and maintaining it became a main tool in the success of a business. The importance of having an online presence is highly recognized but the importance of having a good website design is still a rather subjective concept [10].

Likewise, Smashing Magazine pointed out that the actual usability and utility and not its visual designs determines the success and failure on a website. Since the visitor of the page is the only person who clicks the mouse and therefore decides everything, user-centric design has become a standard approach for successful and profit-oriented web design. [11]

As a summary, the study intends to provide an easier and faster process of submission of class requirements and ratings of student works which will help the faculty members to manage their classes efficiently via intranet and an internet-based connection.

4. Methodology And Materials

The study was conducted at Bataan Peninsula State University that will be beneficial to both faculty members and students.

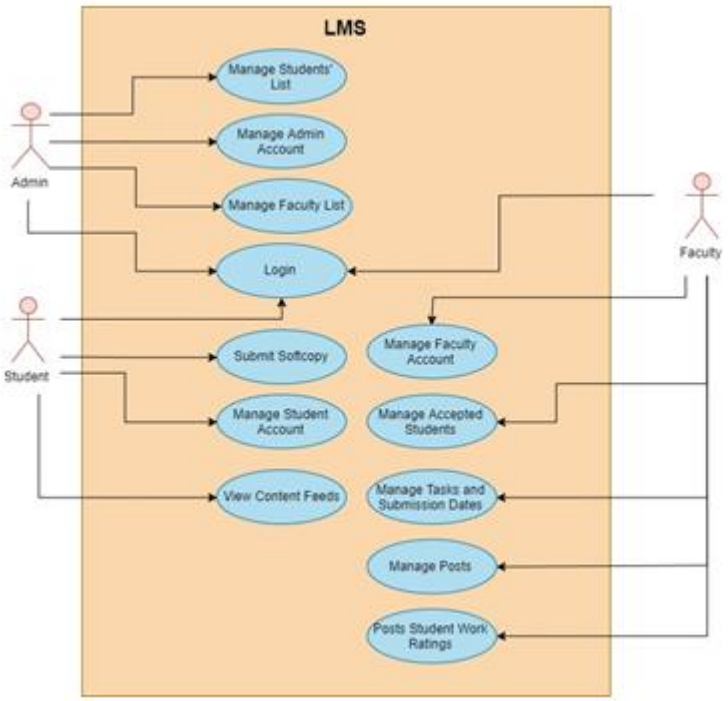

Fig. 1. Use Case Diagram

Fig. 1 shows the Use Case Diagram of the Developed System where it has three actors involved which includes the administrator which can control and manages user accounts. He will manage the students' list. Another actor is the faculty where he has the capability to manage accepted students, manage tasks and submission dates, and manage posts as well as post student work ratings.

Furthermore, the last actor is the student where he has the capability to submit a copy of activities and other requirements and manage student account as well as view content feeds.

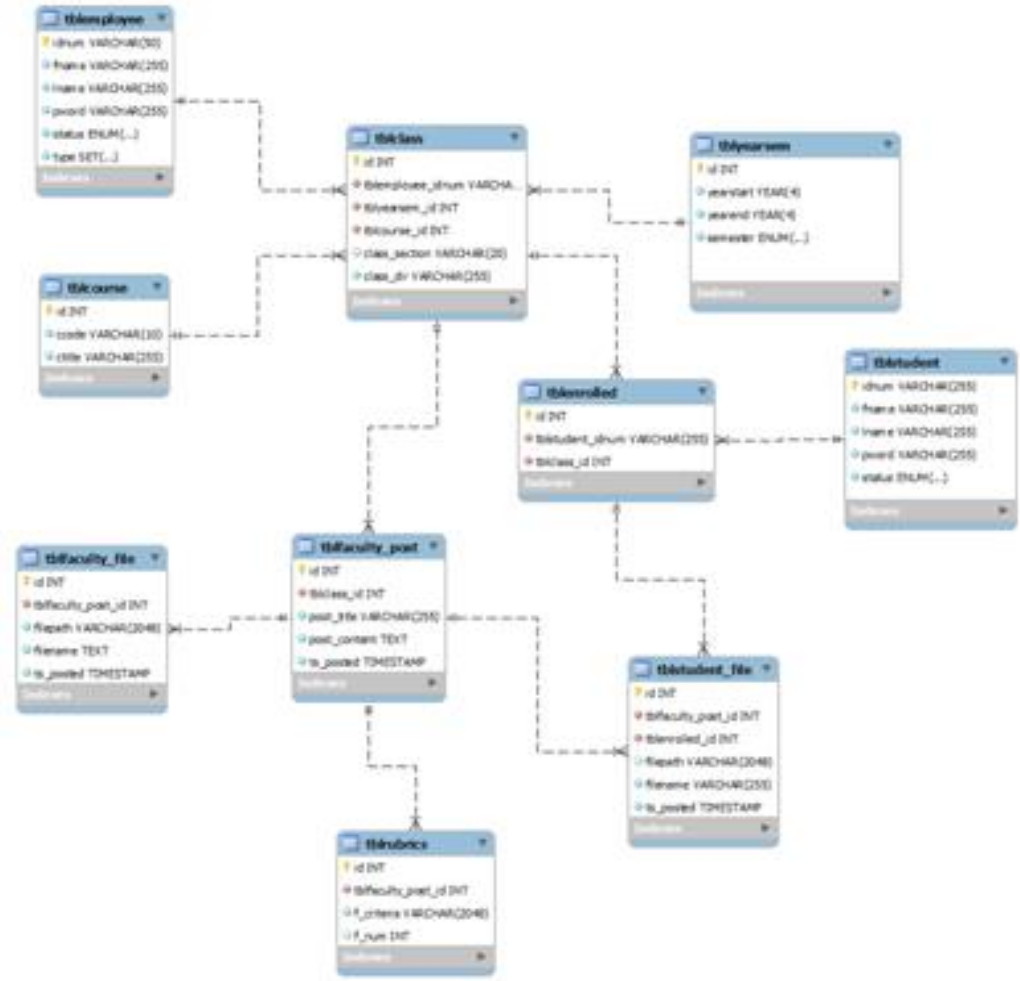

Fig.2. Entity Relationship Diagram

Figure 2 shows the Entity Relationship Diagram of the Developed System where it comprises different tables such as table employees, where it handles all the details about the employees, table class where it holds the details about employee, course, section, and sem. In addition, the table course where it handles the details about the course code and course description. Moreover, it includes a table faculty post where it handles the details about the post title and posts content. Furthermore, table student file where it includes the details about the table faculty post, file path, filename and file posted. It also includes a table for table rubrics where it contains details about faculty posts and criteria as well as table year semester where it includes the details of year start, year-end and semester.

5. Discussion of Results and Findings

The survey instrument used in the study adheres to the standard of ISO 25010:2011 which focuses on different criteria in terms of Effectiveness, Efficiency, Satisfaction, and Freedom from risk as well as Context Coverage.

Each criterion was assessed using the five (5) point Likert scale with the corresponding rating.

Table 1. Likert's Scale

Numerical Rating	Equivalent
5	Highly Acceptable
4	Very Acceptable
3	Acceptable
2	Moderate Acceptable
1	Not Acceptable

Table 1 shows the Likert scale which was used as a basis of numerical rating and verbal interpretation of

respondent's evaluation.

The researchers conducted several testing procedures to guarantee the efficiency of the system. System modification was also performed to ensure that the system fulfilled the needs of the organization. The selected respondents of the system were composed of Faculty members, students from Bataan Peninsula State University and IT experts that will validate the acceptability of the system according to its intended purpose. The suggestions and comments from the target respondents were very helpful and were used as a basis for improving the system's capabilities and user interface.

Prior to the evaluation, the system was presented to the target respondents. They were given the opportunity to use the system and assess the functionality of the system. The results were based on the data gathered from the questionnaires answered by a group of respondents. Each criterion of the software quality factors enumerated on the survey is illustrated in this section. Also, its calculated mean and equivalent descriptive ratings were also discussed. The characteristics of the evaluation tool were based on ISO 25010 using Acceptability testing.

Table 2. Summary of Project Evaluation

SOFTWARE QUALITY FACTOR	**AVERAGE MEAN**	**DESCRIPTIVE INTERPRETATION**
A. Effectiveness	4.74	Very Acceptable
B. Efficiency	4.75	Very Acceptable
C. Satisfaction	4.68	Very Acceptable
D. Freedom from Risk	4.70	Very Acceptable
E. Context Coverage	4.81	Very Acceptable
OVERALL MEAN:	**4.82**	**Very Acceptable**

The table provided a summary of the project evaluation. The overall findings achieved a mean of 4.82 with a descriptive interpretation of Very Acceptable in terms of the characteristics of ISO 2510. This manifests that the system is Very Acceptable to the needs of the target end-users.

To achieve this end, the suitability of the developed system was evaluated. The analysis of the study findings identified the following:

1. Effectiveness criterion got a mean of 4.74 with a descriptive interpretation of Very Acceptable. The findings ascertained that the accuracy and completeness of the system with which the end-user achieve specified goals**.**

2. Efficiency criterion got a mean of 4.75 with a descriptive interpretation of Very Acceptable. The findings showed that the system had delivered the performance of the system according to its intended purpose.

3. Satisfaction criterion got a mean of 4.68 with a descriptive interpretation of Very Acceptable. The findings revealed that the end-users are satisfied with the result of the system and have strong confidence in its behavior as its intended purpose.

4. Freedom from Risk criterion got a mean of 4.70 with a descriptive interpretation of Very Acceptable. The findings proved that similar the system has the capability to mitigate the potential risks based on its efficient operation.

5. Context Coverage criterion got a mean of 4.81 with a descriptive interpretation of Very Acceptable. The findings indicated that the system can be used with ISO 25010 characteristics using acceptabilitytesting.

6. recommendations

The following are based on the limitations of the study which can be improved and recommended to the future researchers for further improvement of the project.

1. Include a mobile application that can be used in uploading the files to the system.

2. Include support for other mobile operating system

3. Further research is needed on its effectiveness of its usage based on performance criteria of ISO 25010-2011.

There must be a separate evaluation once the system is being implemented. It should adhere to the standards of ISO 25010 specifically for "Acceptability testing" which focuses on the effectiveness and efficiency of the system.

References

1. Research and Markets, "Philippine IT Industry - By Hardware, Software and Antivirus Market," Philippine Software Association, Inc., Manila, 2019.
2. R. Robinson, M. Molenda & L. Rezabek " Facilitating Learning.Association for Educational Communications and Technology", 5., 2016
3. Yuvienco, "How DepEd is digitalising Philippines education sector,"2017.
4. Campanotti "Content Storage Management in the Newsroom,". National Association of Broadcasters (NAB) Proceedings (p.312) Holywood, LA: National Association of Broadcasters, 2017.
5. Weinstein, "Handbook of Classroom Maangement: Research, Practice, and Contemporary Issues"., Mahwah, N.J.:Lawrence Erlbaum Associates. ISBN 0-8058-4753-7.
6. S. N. Agustin, "Types of Network Software,"Retrieved from Techwalla:https://www.techwalla.com/articles/types-of-network-software, 2018
7. P.J. Web Solutions, "Benefits of a Network-Based System, . Retrieved from PJ Web Soultions " 2018.
8. Sun Microsystem, "Distributed Application Architecture," Retrieved from sun Microsystems: https://web.archive.org/web/20110406121920/http://java.sun.com/developer/Books/jdbc/ch07.pdf, 2018
9. Journal of Computer Engineering and Information Technology, "Database Management," 2017. [Online]. Available: https://www.scitechnol.com/information-technology/articles-on-database- management-systems.php . [Accessed 16 April 2018].
10. Online Thinkers Technology, "Web Development," 2017. [Online]. Retrieved April 17, 2018, from https://www.onlinethinkers.com/articles/
11. Smshing Magazine, "Principles of Effective Web Design ,"2018 [Online]. Available: https://www.smashingmagazine.com/2008/01/10-principles-of-effective-web-design/[Accessed 17 April 2018].