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Development and Evaluation of Co-CAMP: A Platform for Co-curricular Activities Management for Students

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Abstract

For quite a while, information technology has been extensively implemented and encouraged in education. Various information systems have been developed to collect, integrate, and disseminate information from numerous sources to support planning, policy formulation, monitoring, and management in education. Unfortunately, there has been insufficiency of accessible systems that concentrate on co-curricular activities management. Co-curricular activities have been considered to be very influential on students' interdisciplinary learning. These are components of non-academic curriculum, and do not offer any form of academic credit but in some way, supplement and provide form of complementary instruction and learning for students. Therefore, the development and implementation of a co-curricular activities management system is extremely recommended.

By adopting a co-curricular activities management platform architectural design, and utilizing descriptive and developmental research designs, the researchers were able to develop the platform. Following the phases of Dynamic System Development Method (DSDM) as the software engineering methodology, the researchers were able to deliver a working prototype of the platform. With the aid of readily available software development tools in the market today, DSDM can yield valuable software in a short span of time because it can adjust to frequently changing system's requirements.

The level of usability of the developed platform was later on assessed through a survey questionnaire administered to selected end-users and IT experts. The usability evaluation results indicated that the developed co-curricular activities management platform is functional sustainable, usable, reliable, and efficient in supporting the co-curricular events that are sponsored and offered byhigher educational institutions. Although the effectiveness of the co-curricular management platform could depend on many aspects, to get optimum results, further study on the effects of the platform to the performance of students is needed.

Keywords: *co-curricular activity management platforms, student engagement, educational systems, co-curricular activities, usability evaluation, system development*

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I. INTRODUCTION

The field of education has been expansively influenced by information and communications technology (ICT) as it has been implemented and encouraged for a very long time. Its benefits to the quality of education have been proven by a vast number of scholarly papers [1], and unquestionably it has affected the ways of learning, teaching, and researching. [2] Studies also suggest that there have been pieces of evidence that information technology provides effective and inflexible methods for professionally developing teachers. [3] [4] [5]

The pure academic form of education that 21st century students have been introduced to, is now steadily shifting to a whole new type of education that focuses specially in incorporating three major categories: reasoning, emotional learning, and psychomotor. The core aim of education, which is a broad concept that surpasses the bounds of a classroom, is to foster the wholistic development of a student that includes physical, moral, intellectual, and social development. In the growth of man into a well-developed person, education plays a fundamental role, and in fulfilling these objectives, a need for a prominent balance between co-curricular activities, syllabus, and curriculum in education arises. [6]

Co-curricular activities have been considered to be very influential in students' interdisciplinary learning. These are components of the non-academic curriculum and do not offer any form of academic credit but in some way, supplement and provide a form of complementary instruction and learning for students. Traditionally referred to as student activities, extracurricular activities, extra class, and non-class, co-curricular activities are activities that are more student-centered that enhance regular curriculum and enrich classes during normal days. [7] Regardless of the lack of a precise term, students during co-curricular activities accept responsible positions of leadership; affiliation and experiences are determined by students' immediate need and spontaneous interests, and the teacher-supervisor role shifts as a mentor or guide instead of as an instructor. [8]

Co-curricular activities essentially take place outside a typical classroom experience complementing curricular activities; it also provides students the opportunity to improve their special skills and showcase their non-academic abilities. These might be compulsory like music, arts or drama classes, or voluntary, such as participating in school athletic team, a student publication, or joining in student government organizations, but either case, both can assist students in more than one way. Involvement in co-curricular activities empower students to develop critical thinking, cooperative working, taking responsibilities, expressing creative skills, organizing work, and effective communicating skills. [9] Development of social-emotional learning aptitudes in students are also reinforced by participating in co-curricular activities. Social-emotional learnings are multilateral and mind-boggling skills that exist in all components of life which comprises of social-emotional capability and social knowledge, and emotional insight [10], also, social-emotional learnings are processes to organize, recognize, and manage emotions, to accept responsibility, to make right choices, to have empathy, to act fairly and ethically, and to avoid disagreeable behaviors so that students can achieve their life's responsibilities [11] [12]. Students with established social-emotional learning skills has established strong relationships, can respect other person's emotions and rights, know how to reject inappropriate requests, act more autonomously, has developed empathy, and can participate in collaborative works [13]. Further, various studies have accentuated that students with high level of social-emotional learning aptitudes also have stronger learning desires and exemplary critical thinking abilities, and advanced scholastic accomplishments. [14]

Various information systems have been developed to collect, integrate, and disseminate information from numerous sources to support planning, policy formulation, monitoring, and management in education. Students' curricular activities and learning processes are managed by universities with the use of learning management systems. Unfortunately, these systems do not support co-curricular activities management, and

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there has been an insufficiency of accessible platforms that concentrate on co-curricular activities management. All learning management platforms that are available today in the market are incapableto support co-curricular activitiesmanagement. Majority of learning management systemsavailable,are just forclassroom learning management including student progress and participation monitoring, course content management that include student's study tools, and other components related to student's classroom learning. [15] [16] Therefore, the development and implementation of co-curricular activities management platform is highly recommended to fill-in this gap in the education landscape.

A. Architectural design of Co-curricular activities management platformfor students

Through an in-depth review of related literature and utilization of descriptive research using guided interview surveys, an architectural design of a co-curricular activities management platform for students shown in figure 1 was developed.

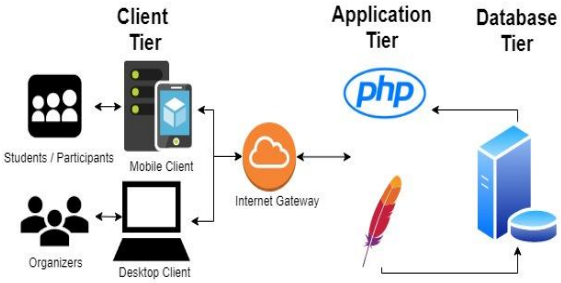

Figure 1. Co-curricular activity management platform design architecture

The co-curricular activities management platform architectural design is presented in a 3-tier architecture composed of three layers of logical computing.The 3-tier architecture design is used becausethe co-curricular activities management platform is specifically a client-server type system. Web browsersare usually the client in this 3-tier architecture design. The students or participants of co-curricular activities can gain access to the system through the optimized mobile application,as clearly shown from the figure. The platform design is intended to be completely web-based, a native mobile application is optimized to be installed in the mobile phones of the students or participants, and for the system's administrator and co-curricular activities organizers, any computer system with web browsers installed will enable them to access the system.

The platform will provide the details of upcoming co-curricular activities that are planned by the organizers to the students or participants of co-curricular activities through the mobile application. The co-curricular activities that will be shown in the feed of the students will be filtered based on the individual preferences and interests of the students. Students can also subscribe and follow organizations that are open for membership. By showing the names of interested students in a certain co-curricular activity, students now have the opportunity to increase their friendship network in the campus. On the other hand, co-curricular activities organizers can provide details with their planned activities, updates, and announcements into the platform, and the platform will disseminate this information to the students based on the registered members and subscribers of a particular organization.

All the dynamic contents and the interactions between the database tier and the client tier are processed by the application tier. The application tier also performs as a variety of dynamic gateways. On the hand, the database tier holds the programs for managing the read and write access to the databases of the web-based platform.

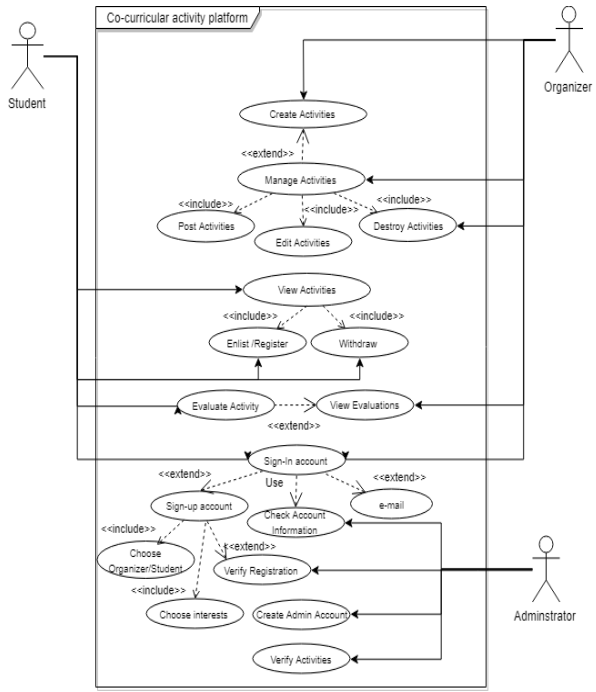

Figure 2. The Use-case diagram of proposed co-curricular activities management platform

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B. *User's and system's requirements*

In the design and development of accurate software systems, considering the user's and system's requirements are important. The researchers managed to capture the requirements using guided interviews on identified end-users of the platform and then determined the Use-cases (figure 2) that are related to the situations and activities that are intended for the target end-users. The architectural design of a co-curricular activities management platform was created utilizing the information gathered and considering the specific requirements of the users and for the system as inputs.

C. *System development methodology*

Dynamic system development method (DSDM) is a software system development technique that focuses on the full project lifecycle, an agile project delivery framework, created by rapid application development (RAD) project managers after they pursued for more governance and discipline to RAD's new iterative way of working in 1994. [17] Agile software methodologies are oftenmistaken with cowboy or ad hoc coding because the designing process is done on acontinuing basis compared to all at once and upfront designing process, this stresses the quality in designs in a certain way. DSDM demands for a series of prototypes to address unstable and unclear areas like new user interface design, new business rules, and new technologies to utilized. [18] Figure 3 illustrates the whole process of theDynamic System Development Method.

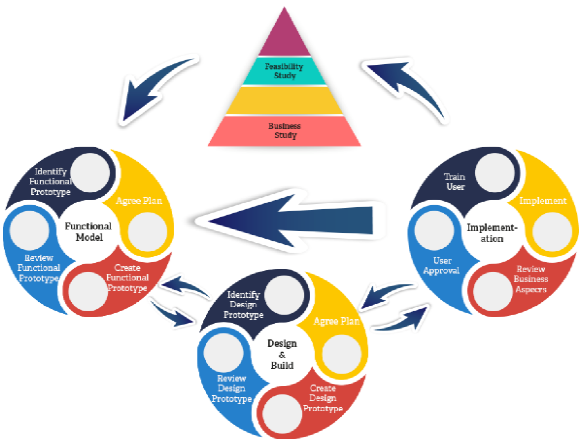

Figure 3. Dynamic System Development Methodology

D. *Level of usability evaluation*

The International Organization for Standardization (ISO) developed ISO 9241-11 as the first standard or model for usability. Usability is the degree to which a product can be utilized by quantified users to attain a specified goal in a specifiedcontext of use with effectiveness, efficiency, and satisfaction. Usability is measured generally using observable and quantifiable metrics; it is not a single, one dimensional property but a combination of factors. [19] [20] This standard defines usability in terms of user performance and satisfaction, and it doesnot consider important aspects of software quality in use, particularly safety and flexibility, and satisfaction is only defined in relation of acceptability of use and comfort. [21]

The ISO/IEC 25010 model outlines usability as a software quality attribute and as a constituent of quality in use composed of components that include"effectiveness in use", "satisfaction in use", and "efficiency in use" emphasizing on quality in use. This model is appropriate for evaluating human-computer systems, including the computer system in use evaluation and software products in use evaluation. The ISO/IEC 25010 model also separates the notion of "quality in use"from"safety in use", "flexibility in use", and "usability in use". It defines "satisfaction in use"further, as pleasure, trust, likeability, and comfort and describes"flexibility in use" which is the characteristics of context comprehensiveness of the model, as "context conformity use", "accessibility in use", and "context extendibility in use". [22] "Satisfaction in use" is composed of "effectiveness in use" and "efficiency in use". The model also incorporates "safety in use" and "flexibility in use" in the "quality in use". [23]

The quality in use model includes five characteristics that are related to the interaction outcome when a product is utilized in a specific context of use. The product quality model is composed of eight characteristics: 1) functional suitability, 2) performance efficiency, 3) compatibility, 4) usability, 5) reliability, 6) security, 7) maintainability, and 8) portability that are related to static properties of software and the dynamic properties of the computer system.

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II. MATERIALS AND METHODS

The Dynamic Systems Development Method served as the software engineering methodology in the development of the entire system in this study. The architectural design and the user's and system's requirements of the co-curricular activities management platform were based on the previous study conducted by the researchers. [16] A set of questionnaires was distributed to identified end-users, IT practitioners, and experts to determine the level of usability of developed co-curricular activities management platform.The researchers adapted ISO/IEC 25010 model using five characteristics that are highly dependent on the application domain: The five characteristics were“functional suitability”, “reliability”, “usability”, “performance efficiency”, and “portability”. The questionnaires contain queries concerning the use and the quality of the platform as perceived by the respondents. The usability evaluation was based on a Likert-scale of “excellent” (5), “good” (4), “fair” (3), “poor” (2), and “very poor” (1) for the selected quality characteristics. Responses ranging from 2.60 to 5.00 are interpreted as “usable” for which the platform has met the minimum expectations of the respondents, and responses ranging from 1.00 to 2.59 are described as “not usable”.

III. RESULTS AND DISCUSSION

A. The developed co-curricular activity management platform

Following the phases of DSDM as the software engineering methodology, the researchers were able to deliver a working prototype of the platform in a short span of time with the aid of readily available software development tools in the market today.DSDM also helped the researchers in a feasibility study and business study that guided them in gathering information about related processes and operations, the user's and system's requirements that are necessary to be included in the platform, and the architectural design considerations to be included in the co-curricular activities management platform.

In the functional model or prototype iteration phase of DSDM, the researchers identifiedthe requirements to be included in the prototypeof the co-curricular activities management platform and then reviewed further for improvement. Based on the gathered data in the previous phases,a functional model of the platform was created after. Lastly, the functional model of the platform underwent testing, validationand user's approval to ensure that requirements are met.

Figure 4 shows the administrator's dashboard of the developed platform. The administrator, being the superuser of the system, oversees all the activities, including the approval of student users of the system, the registration of new organizations, and the approval of activities submitted by organizations before it will besent publicly to the different users.

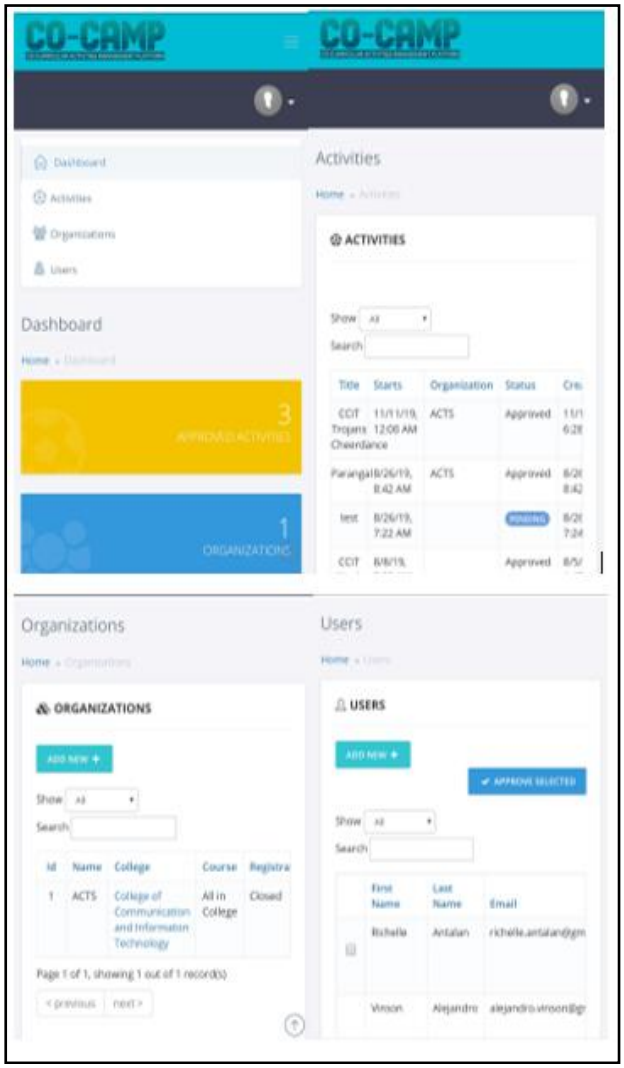

Figure 4. Administrator’s dashboard and graphical user interface of Co-CAMP

The account for organizations that manages co-curricular activities has the provisions to create new co-curricular activities. Depending on whether it is an exclusive or open to a membership organization, co-curricular activities created are broadcasted through the feed of students that belong to or a member of the organization.

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Organizations can also track students that are interested in joining their activities and also students that signed-up for the activities. The following are shown in figure 5.

Students must register first to gain access to the system. By logging in, students can now view co-curricular activities that are posted by the organization that the student belongs to, and also from other organizations that the student would want to follow. The student's dashboard provides provisions for the students, as shown in figure 6, to view upcoming activities, give review and feedback to completed activities, and view other organizations that are available.

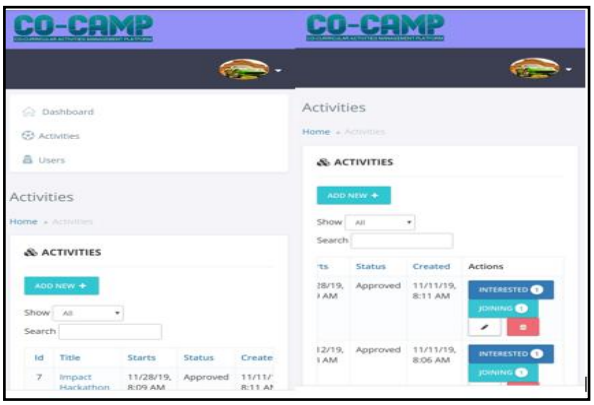

Figure 5. Organization's dashboard and graphical user interfaces of Co-CAMP

B. Level of Usability evaluation of Co-CAMP

Usability is the scope to which a product can be utilized by quantified users to accomplish a specified goal in a detailed context of use with effectiveness, efficiency, and satisfaction. Usability is measured generally using observable and quantifiable metrics, is not a single, one dimensional property but a combination of factors. [24]

The developed platform was validated and evaluated by 30 identified end-users of the system, and 10 IT experts and practitioners adapting ISO/IEC 25010 model utilizingthe five out of 8 characteristics of a product quality model namely, "functional suitability", "reliability", "usability", "performance efficiency", and "portability". The gathered data were then analyzed and interpreted using frequency count and mean.

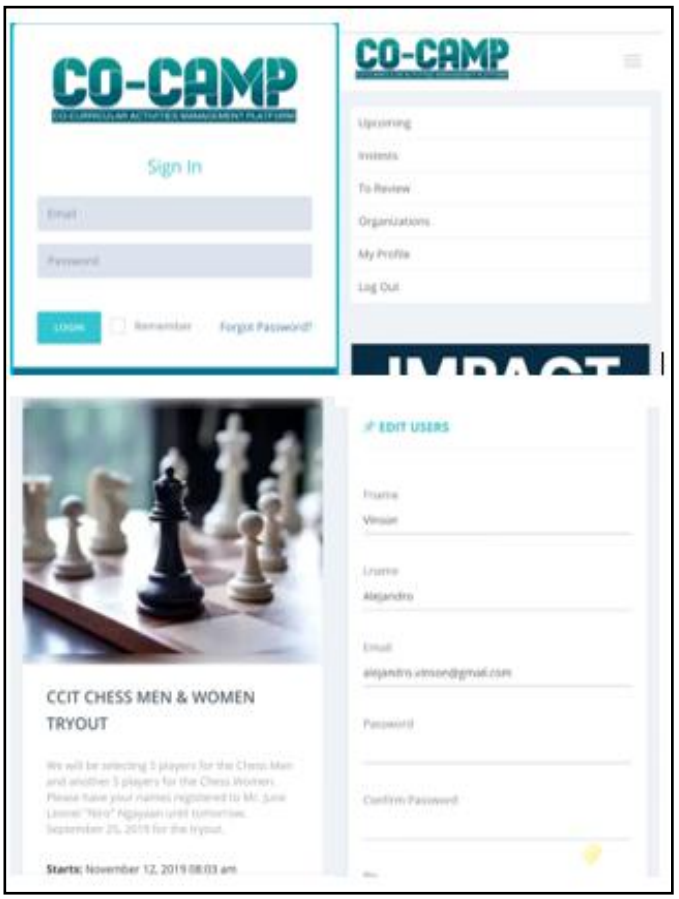

Figure 6. Student's dashboard and graphical user interfaces of Co-CAMP

Table-1. The level of usability evaluation of Co-CAMP in different characteristics

Charac-teristics	Excellent		Fair		Good		Mean Rating	Descriptive Rating
	n	*%*	*n*	*%*	*n*	*%*		
Functional suitability	21	53	12	30	7	18	4.35	Very Highly Usable
Reliability	27	68	9	23	4	10	4.58	Very Highly Usable
Usability	26	65	9	23	5	13	4.53	Very Highly Usable
Performance efficiency	25	63	13	33	2	5	4.58	Very Highly Usable
Portability	27	68	9	23	4	10	4.58	Very Highly Usable

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Overall	29	72	10	25	1	3	4.52	Very Highly Usable

The results of the level of usability evaluation of the different characteristics of the developed co-curricular activities management platform are revealed in table 1. Table 1 shows that majority of the respondents found the system "Excellent" in terms of “functional suitability” (53%), “reliability” (68%), “usability” (65%), “performance efficiency” (63%), and “portability” (68%). The highest average mean ratings are reflected on the system's “reliability”, “performance efficiency”, and “portability” with a mean rating of 4.58 described as "Excellent." The system's “functional suitability” has the lowest mean rating of 4.35. However, this is still bedescribedto be "Excellent”.

For the overall level of usability evaluation of the developed platform, 72% of the respondents perceived the co-curricular activities management platform as being “Very Highly Usable”, 23% as “Highly Usable” and 5% being “Usable”. None of the respondents rated the platform as “Moderately Usable” and “Not Usable”. The results indicated that the developed co-curricular activities platform is perceived “Very Highly Usable”by the respondents in aiding the learning process having an overall mean rating of 4.52.

IV. Conclusion

The dynamic system development method being utilized as the software engineering tool in the development of the co-curricular activities management platform was established to be effective and efficient. The developed platform was also delivered on-time because of its capability to adjust with changes in the system’s specifications and requirements.

The level of usability evaluation results also indicated that the developed co-curricular activities management platform is functional sustainable, usable, reliable, and effective in supporting the co-curricular events that are sponsored and offered by higher educational institutions. Although the effectiveness of the co-curricular management platform could depend on many aspects, to get optimum results, further study on the effects of the platform to the performance of students is needed.

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