



Developing a Community-based Electronic Learning Management Ecosystem for the New Normal

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Received ## May. 2021, Revised ## May. 2021, Accepted ## May. 2021, Published ## May. 2021

Abstract: This paper's analysis surpasses the outdated, rigorously defined, shared environments from a central, disseminated or hybrid system into a flexible domain, demand-driven, cooperative environment. This paper provides detailed explanations of what the Online Community-based Ecosystem entails, its analogy, architectural design, and delivery for a more information-driven sustainable management technology. Afterwards, the authors will bring the benefits of the proposed ecosystem to light compared to the existing platforms readily available. On the contrary, this paper will also identify problems with the systems at two universities, University A and University B. Currently, there is a disintegration of systems used in higher learning institutions. This proposed ecosystem aims at bridging the gap of repetition and data redundancy common in universities. This paper will create a learning community culture amongst five prominent role members that are the standard in a higher learning institution. The authors concluded that an ecosystem is essential to aid student's learning and make them better graduates, well learned with experience for the job market even when many lessons are taught remotely. The objectives, purpose and aim for the online community-based ecosystem will be fully actualized using educational technology.

Keywords: Community-based, ecosystem, education, educational technology, information systems, information technology, learning management, new normal, redundancy, sustainable learning.

1. INTRODUCTION

Educators over the years have introduced strategies that could be used to improve the concept of learning [1][2]. Still, due to contemporary knowledge from the inception of the internet, there is a constant need to increase lifelong learning and transmission. Since the education system has confined students to acquire knowledge for the sake of being tested, there is an inevitable demand for delivery methods [3][4].

OnCE (Online Community-based Ecosystem) is an automated ecosystem that consists of a complete life cycle of education technology for a proper and thorough

education which stems from idea inception to the hands of the final consumers. With the use of all possible forms of knowledge acquisition such as online video tutoring (such as television, etc.), social networking (such as Facebook, etc.), vast access to professionals in every educational field (such as lecturers, admin staff, etc.), and the final consumers/customers (such as companies/organizations, etc).

Tab. 1 below summarizes literature surveys related to this paper.

TABLE I. LITERATURE SURVEY OF THE ONLINE COMMUNITY-BASED ECOSYSTEM

Citation	SYSTEM	Platform	Primary Contribution
Wangoo et al. [5]	Internet of Things Smart Learning Environment	Graphical User Interface Tools	The Internet of things enabled a smart learning environment framework using graphical user interface enabled tools for IoT wearables for building innovative educational ecosystems.
Abney et al. [6]	Intercollegiate Social Media Education Ecosystem	Twitter, Social Media Platform	The research showed that participants improved their professional communication skills while using language that provokes greater cognitive processes.
Kumari et al. [7]	Higher Education Institute's Social Ecosystem	Open Engagement Platform (Co-creation)	Promote social innovation by actively encouraging collaborative learning tools through mutual learning and knowledge diffusion.
Cai et al. [8]	Innovation Ecosystem	Collaborative open learning platform	Provide a new definition to innovation ecosystem and identify three roles of universities in innovation ecosystems.

Based on several literature surveys, helpful information was gathered and summarized in Table 1 above. The information gathered suggests a standard system used for contributing to education is an ecosystem [5]-[8]. Additionally, shared learning platforms were indicated in previous literature surveys [5]-[8].

As a result of this, interacting with one another for the sole purpose of sharing knowledge is sometimes referred to as a community of practice [9].

Every student has a unique learning style. It could be quantified with pace, time, and period and could be qualified by schemes, track records, and assessments, but lectures, assignments, and examinations cannot confine learning.

The developed system's architecture is represented in Fig. 1.

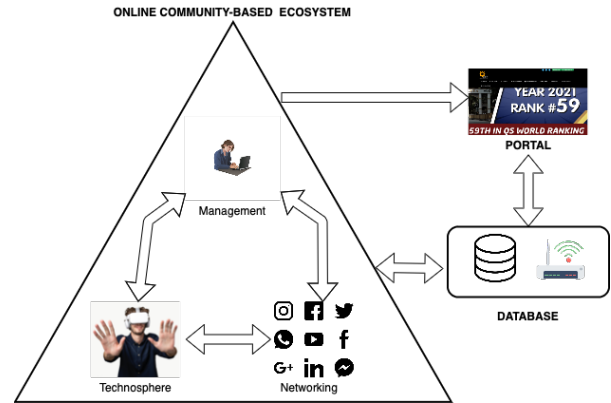


Figure 1. The conceptualized architectural overview of the Online Community Based Ecosystem.

The system employs three main parts of the online community-based ecosystem to interact with each other and then share their information with the database (PHPMyAdmin) when connected to the internet via the OnCE portal (<https://citedum.com>), the portal supports Laravel/HTML/CSS.

The development of this electronic ecosystem is for higher learning students to enhance the knowledge depth of their field of study by educational technology.

Fig. 1 above shows the block diagram of the online community-based ecosystem describing every aspect of the ecosystem. The proposed system involves the management, technosphere and networking in constant communication on the OnCE portal. The information exchanged with the three factors are stored via the internet on the database. As depicted in Fig. 2, the Management consists of the admin portal, student information system and station. All three management parts allow the administrator and external auditors to control the ecosystem and ensure compliance with the education standards. It also consists of the commercial zone and resource centre where users may access journals, links to other lecturer's and student's publication for free or for sale, helpful for other learners' knowledge acquisition. The Networking contains both the TV and the Radio for audiovisual online video tutoring broadcast networks that students can learn. Also, it integrates social networking such as Facebook. The niche combines sustainable academic learning with other aspects of life to create a learning culture, making it a way of life. Social media platforms are incorporated every day into education by creating groups and pages on Whatsapp and Facebook for peer authentic research sharing and assessments. The broadcast network can have the same impact: merging virtual with physical learning to construct component management and community

learning structure. Lastly, the technosphere consists of the InTechPro, Inventor's hub, and InTech, the learning studio, expert exhibition space, and professional development points of interest.

All these sectors in the ecosystem create a one-stop for all learning needs a student requires at their fingertips, everywhere they go, thereby making education sustainable and a way of life while reducing data redundancy.

This paper aims to find and study the existing methods used in neighbouring Universities for managing instructions. The authors will also identify factors that will lead to the success of the sustainable OnCE system. The authors will know the current problems users of the current system(s) face and identify the factors influencing the Management, TechnoSphere and Networking in the OnCE system. The authors will also discover and disclose the present design needs of Universities and suggest practical ways the OnCE system will be accomplished from the execution stage to the delivery stage to ensure the OnCE system fulfils the admin's needs, lecturers, and students.

The actualization of these objectives will lead to the success of the online community-based ecosystem.

2. METHODS

Evidently, like any other ecosystem, every factor must be feeding off each other just like a shared mental framework to gain recognition of their work and reach full potential based on Maslow's theory [9].

According to [11], the phrase "mental model" is theorized knowledge structures people use to reason about the world to make suggestions based on the available information and make predictions. Generally, the concept of mental models is based on groups and group members having functions in their group. These groups also have mutual functions with other groups, creating a shared mental model (SMM) to help make decisions and adjust individual behaviours based on the expectations of other group member's state currently, activities that may occur in the future actions. Therefore, and ultimately, a shared mental model is required to make sense of the group's efforts and understand the vigorous changes in their needs and goals, functions, and roles [12][14].

Knowledge diffused through integration and transformation of social relations are essential components for social innovation [8]. One of the social innovation processes [7] is Co-create, which is expressed as mutual learning and resource integration.

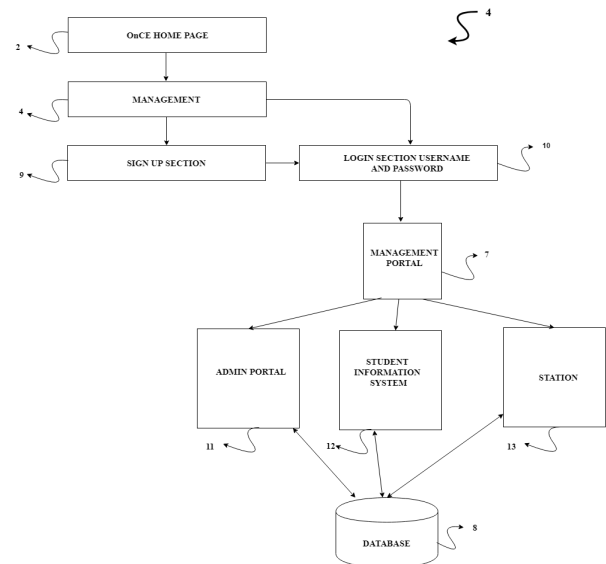


Figure 2. The online community-based ecosystem (OnCE) management system layout.

Fig. 2 is the Management (4) layout which consists of the OnCE home page, indicated by the reference numeral (2); a signup section, indicated by reference numeral (9); a login section username and password section, indicated by reference numeral (10); a management portal, indicated by reference numeral (7); which comprises of an admin portal, indicated by reference numeral (11); a student information system, indicated by reference numeral (12); a station, indicated by reference numeral (13); and a database, indicated by reference numeral (8). The OnCE homepage (2) advantageously presents the direct URL for the first-time user to the user details sign-up section (9). The information needed to be registered will be the user's name, matric number for students or staff ID for the lecturer. The link that directs the user to the login username and password section (10) where which, if the username and the password are a match, the system will bring them directly to the management portal (7) that comprises of an admin portal (11), the student information system (12) and station (13).

Using the shared mental model and Maslow's needs theory, the Online Community Based Ecosystem framework was modelled for immense clarity. The Ecosystem consists of five (5) active members. They include students, lecturers/professors, admin/auditors/external assessors, industrial participants/potential employers, and the public. They all interact with each other one way or the other to create a shared mental model [12][10]. The Lecturers and Professors upload research information that students and the public can access, information like assignments, exam questions, and attendance can also be uploaded for



future reference. Another function of this category of users includes upload publications they are willing to share for free or sale [13].

The next category of users is the Students, the Students can upload their profile information, and they can access research data and information uploaded by lecturers and professors. There is also leeway for students to indicate their previous work for potential employers to view and perhaps purchase, reaching their utmost potential. For everyone visiting the OnCE, without being a University A student, there is restricted access, and this category of users is referred to as the public. The public has access to community service provided by both lecturers and students and projects that may and may not be for sale, granting the students respect and recognition for their work [15][16] and frankly, that of the lecturers/professors also. The industrial participants, like potential employers, can see practical work done by Students under supervision by Lecturers, thereby enabling recognition for the student. And the admin oversees all these by allowing external assessors and examiners to check that this learning method is up to the standards placed by government agencies. This helps for warm school culture and security stability [15][16].

A. The Needs of an Online Community-Based Ecosystem (OnCE)

Tertiary education is often acquired because of competition in the job market to have more desirable qualifications than other job seekers [17]. This is very pragmatic given that degree holders are likely to own better-paying jobs than skilled professionals who are not graduates [18]. Hence, getting the most of university education is paramount. It entails attending classes and studying for exams and having an ecosystem that will enable learning to be successfully carried out, resulting from this, getting the most from a college education.

The OnCE has been broken down into three (3) main sectors, which are Management, TechnoSphere, and Networking.

Management: This sector of the OnCE is handled by the Administrator. It consists of the Admin Portal, Student's information System, and Station. The sector is accessed by the Administrator and external auditors for auditing purposes.

TechnoSphere: The Technosphere comprises of the; InTechPro, Inventor's hub, and InTech.

Networking: This sector houses the online broadcast of both audio and visual transmission. Online talk shows done by the Online Community Based Ecosystem (OnCE) can all be found here. Also, a social network

such as Facebook for communication amongst users of the system can be found here. This sector of the OnCE can be accessed by all users of the system

For the purpose of this research, qualitative research methods techniques extensively used for data collection are in-depth interviews, participant observation, and document analysis research.

Lectures, students, and administrators will be questioned on this to essentially know what's on the mind of the interviewees and know what they think and feel about their current system, if there are any. Lecturers and Students of any faculty and department can be interviewed based on the research question and the conceptual framework. Based on the responses given, there will be back and forth questions that may not have been scheduled in the initial interview questions just to understand the interviewee's point of view clearly [19][4].

Also, the current problems being faced by users (lecturers and students) of the system must be identified. For clarity, the current needs are determined based on the Lectures, potential clients, and user's perspectives. The interview conducted will provide clear findings of the existing methods now and the factors that may encourage them to embrace the Online Community-based Ecosystem (OnCE). The interview will be structured based on the current system being used and the wants and needs of an Ecosystem important to the interviewee. The instrument for the In-depth Interview will be the interview questions which will start easy to get the interviewee talking and then gravitate to abstract and then sensitive problems.

Participant observation is used to learn about the people being studied in their natural setting doing their activities as usual. This will include actively looking, writing detailed notes, informal interviews, and patience [20][4]. Asides from observing by actively looking patiently, natural conversations can be engaged in, as well as checklists, unobtrusive methods, and even questionnaires. The instrument for the Participant's Observation is the Checklist. The Checklist is used to structure the observation and evaluate the participant. This list of items will be marked as either yes or no, and comments will be added if there is any need. This instrument is used for consistency [21][22].

There are three types of documents, public records, personal documents, and physical evidence [23]. Public records are official records of an organization's activities, such as mission statements which are documents on why an organization exists. They include transcripts, student transcripts, policy manuals, student handbook, syllabi,

and strategic plans. At the same time, personal documents are people's actions, beliefs, and experiences being accounted such as calendars, blogs, Facebook posts, scrapbooks, journals, newspapers, duty logs, and incident reports. Finally, physical evidence is physical objects, also known as artefacts like flyers, agendas, training materials, handbooks, and posters.

The best advantage of data collection is that the analysis verifies findings and supports evidence from other data collection techniques.

For this research, five (5) documents regarding other Management systems used in higher learning institutions were analyzed. At the end of the analysis, the authors graded each document based on the rubric. This was rated based on how correct the information is, how clear it is and the general content's usefulness [24].

3. FINDINGS AND DISCUSSIONS

For this research, the systematic combing method of data analysis was used. The combing method entails going back and forth between interview answers, empirical observation, and theories. Fig. 3 shows the breakdown and flow of the research done.

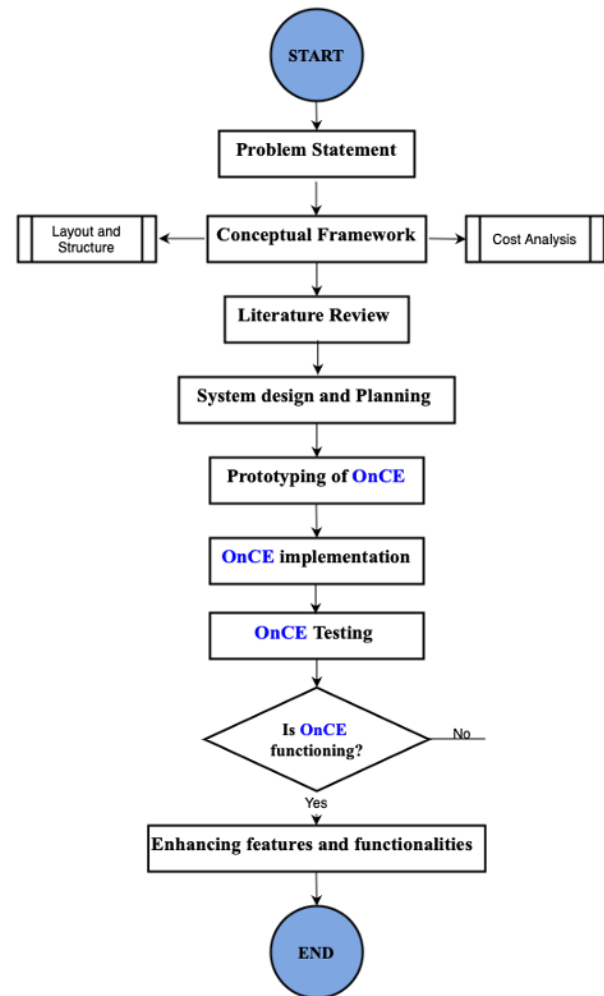


Figure 3. Flowchart of the research activities from idea inception to developing and enhancing the online community-based ecosystem.

Fig. 3 shows a flowchart of the research activities process from the idea based on the problem statement(s) to the conceptual framework, including the layout structure and cost analysis. Previous literature in the similar field of online electronic education ecosystems is surveyed. As soon as recent literature has been gathered successfully, the research outcome for this study was knowing the existing systems currently being used in the University, and other universities, the problems being faced by role members in the University, the current trends needed to incorporate in a proposed Ecosystem and proposing a design to implement the prototype.

Then, the system design, planning and prototyping of the online community-based ecosystem was concluded.



The OnCE system was developed based on all data collected and was analyzed for matching, direction, and redirection, through document analysis, participant observation, and interviews.

Testing of the OnCE system was conducted to ensure it functioned as it was intended to during its inception. Enhancements were done and concluded.

The Online Community Based Ecosystem (OnCE) eradicates the need for physical documents and contact. All interactions are done online in an ecosystem where all users can interact with each other remotely. Currently, there are multiple systems used in the University, making them cumbersome and sometimes redundant. Barab's ecological impact framework (2015) is based on noticing current systems are built for human engagement to get foresight and integration. These three determine a system's success. Hence, [25] proposed that instead of systems being all about the product, it should be more about (impact) what people do with the product. Barab also explained that the product should just be one component of the constantly changing system and the method (innovation) is a shared accomplishment distributed across the components, thereby making all components innovators. The components in Barab's framework include the product, users, facilitators, and other ecosystems [26]. Yusop's Civic Minded Instructional Designers (CMID) framework is a civic-minded instructional designers' framework that gives education to instructional designers with community-based service-learning approaches. The framework views an instructional designer as the most impactful socially in the interconnected contexts [26][16]. Basically, Yusop explained that the CMID framework guide's a grad school's faculty to infuse a civic dimension into their curriculum. Therefore, making the CMID framework the standard of their curriculum's competency [27].

As regards components, the components for OnCE are the technosphere which contains the central location users share their creativity. This is referred to as the "Inventor's hub", "InTech", "InTechPro", and "Immense Learning Studio". The Documentation sphere includes all documents needed for all users. For the students; their profile, for the lecturers; their notes and documents for evaluation. The admin's documentation includes evaluation forms for the lecturers, management files for events. The social sphere consists of the communication used between users that is more lenient than emails and phone calls which is Facebook and WhatsApp communication. The "station" is a library sphere with a collection of journals, books, publications of users of the system.

The components for Barab's ecological framework include human-centric (engaged individuals), product-centric (designed components), eco-system centric (enabling implementation environment), service-centric (skilled facilitators), and impact outcome centric (goals). The impact innovation is encouraged through thoughtful designs, individuals who are inspired, experienced facilitators and ecosystems that are enabled [28].

Yusop's components include belief, knowledge, skills and dispositions [27]. The framework also contains the micro context /community problems, macro context /national, social problems, and mega context /global problems. The micro context encourages students to explore life issues that are real in their immediate contexts. Then, relate them to a broader macro and mega context, making it more reflexive on how their roles and work affect society, becoming more morally and ethically inclined.

Suggestions for the online community-based ecosystem suggests a merger of all systems used in higher learning institutions for easier accessibility. Also, users must interact with each other via mobile, tablets, or personal computers. This will help students achieve their goals faster and allow lecturers to get information across faster to either the students or administrators of the system.

Suggestions from Barab's framework are the impact-focused; hence, the authors chose content to make sure real-world values are positioned as a part of their user-inspired trajectory, making a connection to personal and career goals [26]. Also, the users should be empowered by blended learning ways that will enable the learner's engagement and personal valued milestones. Finally, the user will attain success when their experience relies on carefully curated contents, customizable, and adaptive to fit local relevance.

Yusop's framework suggests education should be more "problem-driven" and not method-driven, thereby directing focus on solving social rather than technical problems [13] [12]. It is recommended that the instructional designer reconstruct existing teaching methods to solve micro, macro and mega level social problems. The instructional designers may support the civic identities of students from the start of their academic programme. The instructional designer should also help students create projects to be community-based and involve non-profit organizations, perform user-centered and participatory plan approaches, and discern and fix social problems [5].

4. RESULTS

Although significant research studies have reported on management learning systems, a linked ecosystem has not been implemented. Although there are similarities between learning management systems and an online community-based ecosystem, the latter has many unique features that could improve learning methods and make them sustainable or derail them. The participants interviewed reported that not all the learning management systems put in place are being used. An admin responded that a reason could be because the systems are not user-friendly. During the observation data collection process, the lack of system use was also noticed by the authors.

Another participant mentioned the presence of too many management systems used and further explained it could be why lecturers and students prefer to communicate via social media.

Albeit helpful, the participants had more negative reports about their current system than positives. Hence, the need for significant improvements to suit the user's needs.

All web applications analyzed for document analysis proved the interviewee's (from the in-depth interview data collection) dilemma. One system is never enough to help achieve their academic goals both as an educator or a student. A minimum of two systems is often needed at once.

Based on the recommendations, the OnCE system has been created. The design is mobile-friendly. It is accessible on any platform, like mobile phones, mobile pads, laptops, and larger screens.

The system has upload and download features for class notes by lecturers and assignment submissions by students.

The system has a virtual online platform for events coordination from the registration stage to awards/certificates announcements. All information needed by the jury will be submitted via the system, and every information needed to be passed to participants will be done via the system.

External auditors will use the system to receive the information they need for assessments via the system. Their comments and recommendations will be passed along via the system.

The other systems analysed in this research were compared to the developed ecosystem in Tab. II below.

TABLE II. COMPARISON OF THE PROPOSED SYSTEM AND OTHER PROTOTYPES

Item	PROPOSED SYSTEM	University A's Systems	University B's Mobile Application
Scalability	The development of the system can be easily expanded	The development of the system can be expanded	The development of the mobile application can be expanded
Cost	Less than 3000 USD	Less than 3000 USD	3000 USD or more
Upgrade	Online upgrade	Online upgrade	Online Upgrade
Access	Use of one weblink	Use of several web links	Requires downloading
Compatibility with other products	Easily linked	Linked with other UM products	Nil
Customization	Open-source and easily customized to fit different universities	It was customized specifically for University A	It was customized specifically for University B
Power	Internet connection	Internet connection	Internet connection
Mobile Compatibility	Mobile Friendly	Not Mobile Friendly	Mobile Application
Versatility	All-in-one System for students, lecturers, admin and public.	Multiple systems are required for students, lecturers, admin and the public.	Multiple systems are required for students, lecturers, admin and the public.

Compared to other systems shown in Table 1 [5]-[8], the proposed ecosystem is developed on Lavarel, HTML, CSS, suitable for any higher learning institute. Instead of being either a mobile application [29] or several web applications, the proposed ecosystem is an all-in-one mobile-friendly web application shown in Table 2.

The characteristics of the proposed ecosystem compared with the current systems used in University A and University B are shown in Tab. II. The proposed ecosystem contains every feature and functionality students, lecturers and administrators need to aid learning through its mobile-friendly web application.

The proposed ecosystem does not require additional downloads on a mobile phone or computer device. With access to the internet connection, users can access its endless possibilities.

The significant features of the proposed ecosystem are its open-source software, easy accessibility, cost and compound, all of which makes it innovative and unique.



5. CONCLUSION

The strategies introduced over the years have become so cumbersome that there are no proper management methods and adequate structuring that bridge the gap between lecturers, students, and potential clientele [30]. In private and public higher education, to attain the utmost need, there is a requirement to ensure every student's learning satisfaction is met. The OnCE is a concerted effort that provides the students who graduate from higher learning institutions are better equipped with knowledge and experience before graduating and becoming a part of the working class. Therefore, the online community-based ecosystem is a necessary mechanism to enhance student's knowledge of their field of study and their experience in it.

The first objective of this paper is to find and study the existing methods used in Universities for managing instructions and identify factors that will lead to the success of the OnCE system. The current methodologies used in University A and University B for managing instructions were identified based on the data gathered. They include separate systems for learning management, an online library, a student portal, an instructor's management system, and University B's Student Portal. Using document analysis, the systems were studied. The criteria used include the interface of the systems, the aesthetic value, which are alignment, regularity, uniform separation, page security, white space fraction, balance, and interaction. From the data collected, factors that will lead to the success of the OnCE system were suggested by participants during the in-depth interview. They include improving the system's interaction by mixing academic features with the social forum [31], making the features more straightforward with online discussions with videos and video learning.

Based on the data collected and the analysis made in this paper, the proposed system is user-friendly and can capture video, simplified and less complicated. The outcome of the first two objectives is the suggested factor for improvement to be implemented into the OnCE system. The OnCE system has been developed from design to execution. The scope was identified, which is divided into planning, definition, creation, verifying and control. Based on the data collected, users need a modern, user-friendly, mobile-friendly, and connected system. These have been integrated into the OnCE system.

6. FUTURE RESEARCH

The online community-based ecosystem (OnCE) is committed to creating a system fitted for a department in University A and not generic for other departments and universities at large. For future enhancements, the ecosystem must be generic to fit into any university or higher learning institution in the world.

Additionally, the world is becoming a global village, and everything we do involves being on the internet. Having a 100% non-physical interaction between colleagues and lecturers-student is becoming the new normal. This must be incorporated into the online community-based ecosystem for education technology.

ACKNOWLEDGMENT

We are thankful to the Department of Curriculum and Instructional Technology, Faculty of Education, University of Malaya, Malaya, for their support through a grant (GPF0100-2019).

We are thankful to participants who approved and took part in the data collection aspect and provided expertise on the researched existing systems.

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