

Managing an Information System Transformation in Higher Educational Institutions:

A Case Study on CMC Portal in Ghana

<https://doi.org/10.3991/ijet.v14i22.11240>

Emmanuel Dortey Tetteh^(✉), Zhiguang Qin
University of Electronic Science and Technology of China, Chengdu, China
edtetteh@gmail.com

Benjamin Kwofie
Koforidua Technical University, Koforidua, Ghana

Abstract—The provision of computer-mediated communication (CMC) portal services through information technologies (IT) in higher educational institutions (HEIs) in developing countries should not be an impossible task considering the growth in information systems (IS) and an upsurge of internet users. There have been numerous efforts aimed at implementing CMC portals by HEIs but just a few could be said to be successful. To guide the implementation efforts of HEIs in developing countries especially Ghana, qualitative research is carried out on Koforidua technical university in Ghana which has implemented a CMC portal and a proposed CMC portal implementation framework, as well as a structuration perspective discussion, is presented. Findings of the research include the initiation, promotion, and adoption of technology into institutional processes, the physical deployment of the system and the post-implementation activities which can improve the adoption, implementation, and institutionalization of a CMC portal initiative.

Keywords—Information systems, CMC portal, adoption, implementation, institutionalization

1 Introduction

This research looks at the implementation of an information system (computer-mediated communication (CMC) portal) which serves as an aid for the delivering and supporting of teaching, learning, and administration of students within higher educational institutions (HEIs).

In spite of the fact that studies by researchers and HEIs into the nature and utilization of information systems, specifically CMC portals, has been done and still ongoing, the understanding of the whole institutional approach to the entire implementation process (adoption, implementation, and institutionalization) by HEIs is still on the drawback. Considering the CMC portal implementation advantages just as the

high failure rate seen in practice, this research aim is to develop a framework that can help to provide a better understanding of how to manage the entire process so as to bring the expected advantages to institutions who have implemented or planning to. Various systems can be utilized for computer-mediated communication portal in education. For asynchronous communication, a simple email list allows a group of students to get in touch with one another. On the other hand, the Internet supports a wide scope of web forums, just as newsgroups. For synchronous communication, there are text-based chat tools, instant messaging, and audio- and video-conferencing systems. Computer conferencing systems are more specialist tools designed to support group communication, primarily via asynchronous discussion, but also encompassing synchronous communication. Various institutions around the world have developed their own online portals which can incorporate the transmission of teaching materials with facilities for collaborative work as well as asynchronous and synchronous discussions. In recent years Virtual Learning Environments (VLEs) such as Blackboard, Moodle and WebCT have become widely available, and many universities are using these systems with their students [1].

The CMC Portal system introduction in HEIs for the support of teaching, learning, and administration of students can be said to be an information systems (IS) or an information technology (IT) innovation that brings onboard new ways for the conveyance of education.

This research describes and analyzes the implementation process of Koforidua technical university in Ghana and identify the factors that influence the implementation process.

2 Theoretical Foundation

The CMC Portal system introduction in HEIs for the support of teaching, learning, and administration of students can be said to be an information systems (IS) or an information technology (IT) innovation that brings onboard new ways for the conveyance of education.

A useful framework proposed by Kwon & Zmud, [2] that integrates the elements of change of Lewin [3] is the information systems implementation framework. The framework proposes that for any institutions or organizations to implement a new IS, it must go through six sequential (6) stages of a process which include:

- Initiation
- Adoption
- Adaptation
- Acceptance
- Use
- Incorporation

There was a further modification of the framework later which replaced the last two stages consisting of use and incorporation with routinization and infusion that recommend that institutions move from unfreezing to refreezing stages within the

implementation process by Cooper & Zmud [4]. They went on to contend that, some of the stages can happen in parallel when classified as activities in spite of the fact that Kwon and Zmud [2] proposed a sequential stages order, and that the framework can include numerous IT applications and implementation processes within institutions. This framework by Cooper & Zmud [4] does a great deal of help for institutions who wants to implement an IS innovation by highlighting the significance of a full understanding of the entire IS implementation process from its introduction until its implantation.

Below is the framework of Cooper & Zmud [4] consisting of elements of change by Lewin [3] outlining the different stages of implementation. Cooper and Zmud [4] (cited in [5],p4) suggest that “infusion is the final stage of a six stages sequential model of IT implementation. The first stage, initiation is the process of scanning organizational problems and opportunities and of undertaking IT solutions and is associated with Lewin’s [3] unfreezing stage. The next two stages, adoption and adaptation, represent Lewin’s change stage. Adoption implies to get organizational supporting the IT implementation while adaptation encompasses its development, installation, and maintenance. The last three stages, acceptance, routinization, and infusion can be mapped into Lewin’s refreezing stage. Cooper and Zmud [4] define the acceptance stage as the efforts undertaken to induce organizational members to commit to using the technology. Routinization represents the alterations that occur within the work system to account for the IT such that it is no longer perceived as new. Finally, infusion occurs as the IT becomes more deeply embedded within the organization’s groups’, or individuals’ work systems”.

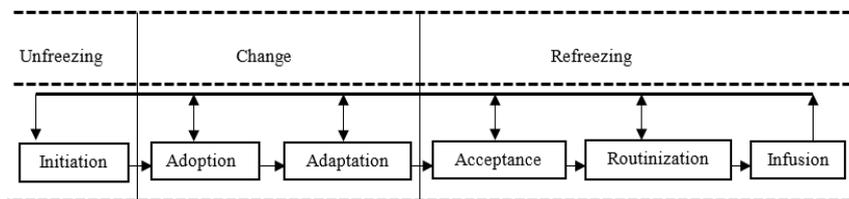


Fig. 1. IS implementation framework (Cooper & Zmud, 1990)

2.1 Proposed CMC portal implementation framework

The framework which is proposed in this research is an extension of Cooper & Zmud [4] IS/IT implementation process that suggested that such a technological innovation as a CMC portal goes through a process of an origination of an idea to its physical deployment as well as sub-processes or phases that occur in series which outlines directly or indirectly activities that the institution undertakes with the aim of having an understanding of the purpose of the system.

The proposed institutional CMC portal implementation framework depicts a complex connection of activities and contextual factors cooperating to accomplish an expected institutional outcome and furthermore connotes a strategic approach in im-

plementation which is based on the IS implementation process framework, organizational innovation process, innovation diffusion theory and planned change process.

The framework encompasses a straight succession of procedures and activities that highlight a logical movement of an institution’s endeavors to introduce an innovation such as the CMC portal for online/distance and on-campus learning purposes. This is in no way, a recommendation that it is a standard as a general rule as captured by the two-way arrow in the diagram below and as highlighted by both cases in the research but instead, this framework aims at highlighting the vital stages in an institutional information system (CMC portal) implementation process, alongside the contextual factors that shape its outcomes. From the diagram below, there are three (3) broad phases of the educational change process (Adoption, implementation, and institutionalization) frequently found in the institutional innovation and IS innovation kinds of literature and seven (7) sub-categories which include initiation, promotion, adoption, adaptation, acceptance, routinization, and infusion. A description of the stages in detail and how it can be used to guide an institutional online/distance and on-campus learning implementation using a CMC portal is presented in the remainder of this section.

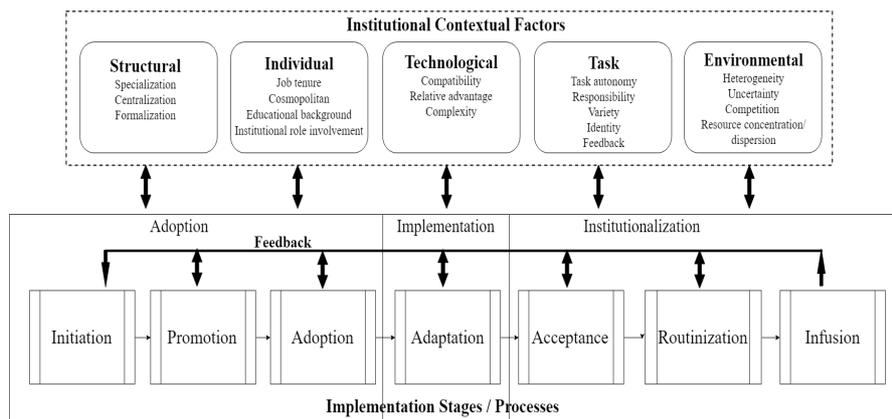


Fig. 2. Institutional CMC portal implementation framework

As demonstrated from the diagram above, the external boundary indicated by the dashed lines and labeled “Institutional Contextual Factors” at the upper part of the diagram shows the context within which the institutional implementation of the system occurs. The bidirectional arrows linking the external boundary to the main implementation process represents the contextual factors (structural, individual, technological, task, and environmental) that institutions need to be aware of in advance of, in the course of, and after the CMC portal implementation process.

At the lower part of the diagram is the actual implementation process which is divided into three (3) major phases (Adoption, Implementation and Institutionalization) and seven (7) sub-categories (initiation, promotion, adoption, adaptation, acceptance, routinization, and infusion) representing specific stages in the process and are linked by directional connectors that highlight the outputs from a particular stage. With the

exception of initiation and infusion stages, the rest of the stages has a bidirectional arrow that connects into a solid black line showing a feedback process into the previous stages which highlight the possible consideration of activities that should have been considered in past stages yet were either not considered or the outputs from a specific stage was insufficient to facilitate the activities of the subsequent stage. It likewise shows an indication of how some of these activities can happen in parallel with other activities which are supposed to belong to a particular stage.

The solid black lines to which the arrows interface indicates the feedback process which is vital in each stage that enables corrective measures or improvements to be made to strengthen each stage outcome(s). Significantly, the arrow at the infusion stage which happens to be the last stage in the implementation process highlights the possible beginning of a new implementation objective, which can be an upgrade to a current objective or a reconsideration of activities that could have been properly addressed in the previous stage. Successfully implementing a technological solution like this CMC portal does not suggest an end to other unconsidered utilizations to which it could be put to but rather, it connotes the beginning of a new institutional objective particularly where that objective was earlier not considered.

Below is the summary of the various stages and its outputs:

Initiation: At this stage, Active as well as passive examining of institutional issues/opportunities and information technology solutions are birthed. Innovative ideas such as this, typically originate from either perceived institutional need (pull), perceived advantages of the technology (push) or both.

Stage Product: The identification of a match between CMC portal solutions and IT solutions in the institution.

Promotion: The identification and development of promotional strategies at all institutional levels, including faculty and departments, administrations, university resource centers, and students are carried out because successful implementation of the CMC portal requires the promotion of the system among stakeholders.

Stage Product: The drive, cooperation, and enthusiasm of stakeholders that will facilitate the adoption of the CMC portal.

Adoption: Prudent and political talks ensue to get institutional support for CMC portal implementation.

Stage Product: A decision as to which type of CMC portal system to adopt based on some institutional specifications is carried out.

Adaptation: The development of the CMC portal system is carried out, configured to suit the requirements of the institution as well as maintained. Development of revised institutional processes are done as well as the training of stakeholders in the utilization of the new system and its new processes in the institution is also done.

Stage Product: The CMC portal system which may be proprietary or Open-source type is developed from scratch and is available for utilization in the institution.

Acceptance: Members of the institution are induced to commit to the utilization of the CMC portal system.

Stage Product: The CMC portal system is employed in the institutional activities.

Routinization: The utilization of the CMC portal as an ordinary activity by integrating with institutional processes and practices is encouraged.

Stage Product: Accustomed institutional processes and practices relating to the general administration of the institution are embedded with the CMC portal system practices.

Infusion: The integrated manner and the comprehensive utilization of the CMC portal system to help the work of higher-level areas within the institution brings about improved institutional effectiveness.

Stage Product: The CMC portal system is utilized by all users within the institution to its fullest potential.

3 Research Approach

The qualitative research using a case study design and a variety of research approaches including the proposed CMC portal implementation framework and a structuration perspective discussion will be used to achieve the objectives of the research. The case study methodology presents a unique opportunity to understand antecedent decisions and actions contributing to current observable situations of a phenomenon, providing a holistic understanding of the implementation phenomenon [6]. According to Yin [7], the case study design has been proven to be a useful methodology for achieving a deep understanding of contemporary phenomena that occur in a real-life context, aims at understanding how and why the phenomenon occurs, and over which the researcher has little or no control.

Participants' selection was primarily based on their association with the CMC portal implementation process and the criteria utilized is laid out beneath:

- Involvement in the portal related activities
- Involvement in the decision making related to the portal
- Involvement in the deployment and utilization of the portal

Various data collection tools including interview, observation, and document review were utilized in this research and the reason being that, they have the ability to capture critical data about a specific information phenomenon.

An iterative data analysis procedure was utilized in this research. The first step was the transcribing and examination of the data. The subsequent step included the critical study of the transcripts utilizing Cooper & Zmud [4] IS/IT implementation conceptual framework involving three major phases and sub-phases which was to identify events, activities, and choices made by the institution in relation to the CMC portal implementation. Lastly, the findings were interpreted utilizing the proposed CMC portal implementation framework and a structuration perspective discussion.

4 Case Description

4.1 Background

Koforidua Technical University (formerly Koforidua Polytechnic) was established in the year 1997. It has a student population of 6,895 for the 2016/2017 Academic year and has produced graduates with Higher National Diploma (HND) in Accountancy, Marketing, Purchasing and Supply Statistics and Computer Science as well as Diploma in Business Studies (DBS).

The University currently has five faculties and one institute namely, the Faculty of Business and Management Studies, Faculty of Applied Science, Faculty of Health and Allied Sciences and Technology, Faculty of Built and Natural Environment, Faculty of Engineering and the Institute of Open and Distance Learning (IODL). The University has increased its academic program offerings significantly from two (2) at the inception of 1997 to a total of twenty(20) Higher National Diploma (HND) programs and Thirteen (13) Bachelor of Technology (B-Tech) program[8].

The administrative structure of the university is as follows. At the top is the University Council that oversees the strategic decisions of the university. Directly below the council is the Vice-Chancellor (VC). Who is directly followed by the Pro-Vice-Chancellor who directly heads the various faculties and schools represented by the Deans. Directly under the deans are the heads of the various departments and coordinators. Below these departments and coordinators are heads of units. These are followed by lecturers and research fellows. The Vice-Chancellor directly heads the following units: Finance Office, Internal Audit, Library, Registrar, Quality Assurance, Business Development, Public Relations, and Research Directorate. The internal audit office directly heads the senior internal audit office which also supervises the assistant internal audit office. Likewise, the Librarian Office directly supervises the senior assistant librarian, who also supervises the assistant librarian. The Registrar's office is directly responsible for two offices: Academics and Administration. These two departments each have senior assistant registrar positions under them. These senior posts each have an assistant and junior assistant positions respectively under them.

4.2 The CMC portal implementation process

Background: The need for the introduction of the CMC portal system came as a result of the institution taking part in a workshop organized by the Commonwealth of Learning (COL) on educational technology strategy in Canada in January 2012. A group was put together to plan for the implementation of an institutional CMC portal in partnership with the COL after the workshop.

The planning stage saw the implementation group setting priorities and deciding strategies for the implementation of the CMC portal. The administrative structures responsible for the management of undertakings of this nature which was one of the key processes sought after in the planning stage were set up in other to guarantee the

success of the entire project. The acquisition of important hardware and software, as well as organizing meetings and workshops, took place at this stage.

Deployment and use of the CMC portal: The downloading and installation of the Moodle as the CMC portal solution application was done and hosted on the institution's website as a subdomain. After the successful installation and configuration of the CMC portal platform, the trained ICT personnel which were led by the ICT Director with the help of the COL set up the programs and courses on the system. The training of the rest of the stakeholders in the system's utilization proceeded thereafter.

CMC portal utilization for teaching and learning activities: The utilization of the institution's CMC portal platform was at both the regular and weekend school sessions, but in particular, the weekend school session. Except for the certificate and professional programs where the course resources were provided by the certificate awarding institution, the course resources of the other programs introduced by the institution including Btech, HND and DBS had to be developed by the lecturers or facilitators and placed onto the system. It was made a prerequisite by management for all lecturers teaching on the various programs.

The utilization of the portal was however on the low side at the DBS program level as lecturers were seen not to be uploading of course materials as well as interacting with their students.

Institutionalization: Institutionalizing the utilization of the CMC portal for teaching, learning, and the general administration in the institution can be found in the policy formulations to guide and regulate its utilization. These policy formulations indicate an institutional willingness to embark on an integration of a CMC portal into the traditional activities involving teaching, learning, and administration of students.

5 Discussion

An interpretation of the data of each of the stages of implementation of the case under consideration according to the stages highlighted in Cooper & Zmud, (1990)IS/IT implementation framework is presented. A five-stage Likert scale instrument is also utilized to test the institutional efforts (IE) at the various stages of implementation.

5.1 Initiation stage

The initiation stage features vital background activities and processes that enable an increasingly significant understanding of the prior activities and consequences of the institutions' efforts.

Table 1. Initiation efforts scale

Evaluative terms	Meaning	Score	IE
Absent	Institutional efforts directed towards initiation is thoroughly missing; no indication of intention likewise commitment	1	
Inadequate	Institutional effort directed towards initiation is somewhat present; a few indications of intention and commitment	2	
Barely adequate	Institutional efforts directed towards initiation is reasonably present; clear indications of intention yet weak commitment	3	√
Adequate	Institutional effort directed towards initiation is existent; very clear indications of intention and a modest commitment	4	
Very adequate	Institutional effort directed towards initiation is exceptionally present; obvious indications of intention and high commitment	5	

The institutional efforts aimed at the introduction of a CMC portal for teaching, learning, and administration purposes can be described as practically present. This is highlighted by the utilization of the CMC portal platform for the weekend school session, the inclusion of the Moodle CMC portal as the institutional CMC delivery platform, the training of various staff in the administration of the system, and the utilization of the system for the mid-semester examinations. The provision of a sensitization and training program in the utilization of CMC portal for stakeholders depicts a clear indication of intention to utilize the system yet its utilization in the institution's weekend school session concurrently, depicts a weak commitment from management since carrying out these institutional efforts at the same time shows an uncoordinated as well as not clearly aligned efforts aimed at introducing an institutional CMC portal system.

5.2 Adoption stage

This stage which includes the making of a choice to adopt or not to, have severe implications for an institution as it requires the dedication of more basic resources in other to achieve the implementation objective. In spite of the fact that it is a top management decision with respect to institutional utilization, stakeholders' views can be valuable at this stage.

Table 2. Adoption efforts scale

Evaluative terms	Meaning	score	IE
Bottom-up adoption	Adoption decision was taken by a few of individual stakeholders and pushed for institutional adoption	1	
Moderately bottom-up influenced adoption	Adoption decision was taken by a group of leaders and pushed for institutional adoption	2	√
Top-down and bottom-up adoption	Adoption decision commonly shared by management and all stakeholders	3	
Highly top-down influenced adoption	Adoption decision was taken and advocated by management with the inclusion of a few stakeholders	4	
Top-down adoption	Adoption decision was taken by management and pushed downwards for acceptance	5	

The institutional adoption decision to utilize Moodle as the institutional CMC portal solution was aided by a group of enthusiasts who included the institution's high-level management members and the head of the ICT department. A number of actions aided this decision to adopt the Moodle CMC portal system, especially its utilization for the regular school mid-semester exams and its application at the weekend session school. The inclusion and acceptance for the adoption of the system in the institution's ICT policy subsequently represented clearly the institution's understanding and the readiness to adopt it.

5.3 Adaptation stage

The CMC portal is set up or configured to either follow institutionally prescribed processes or stakeholders adapt or utilize the functionalities of the system for their day to day processes or activities undertaken. Integration of other IS operated in the institution is also carried out at this stage of implementation.

The deployed CMC portal had next to no alterations by way of incorporation of institutional requirements into it. The lecturers were to develop the courseware and instructional manuals and populate it on the course sites which was set up by the ICT director. An essential activity needed for the successful deployment of the CMC portal was the training of all stakeholders in its utilization. Stakeholders attended the initial training organized by the institution but the level of utilization is still low and also, an integration plan of other IS in the near future is yet to be seen notwithstanding the fact that this may occur.

Table 3. Adaptation efforts scale

Evaluative terms	Meaning	Score	IE
No adaptation	No modification is made to CMC portal functionality; lack of clarity and enforcement of training; no clarity in the course site, courseware, and instruction manual development; no clarity of future integrations.	1	
Low adaptation	Little modification made to CMC portal functionality; some clarity in training but no enforcement; some clarity in the course site, courseware, and instruction manual development; little clarity in future integrations	2	√
Moderate adaptation	Reasonable modification to CMC portal functionality dependent on institutional requirements; clarity in training and some enforcement; clarity in the course site, courseware, and instruction manual development; reasonable clarity in future integrations	3	
High adaptation	High modification to CMC portal functionality dependent on institutional requirements; high clarity in training as well as enforcement; high clarity in the course site, courseware, and instruction manual development; high clarity in future integrations	4	
Very high adaptation	Very high modification to CMC portal functionality dependent on institutional requirements; very high clarity in training strategy as well as high enforcement; very high clarity in the course site, courseware, and instruction manual development strategy; very high clarity in future integrations	5	

5.4 Acceptance stage

The deployed CMC portal had next to no alterations by way of incorporation of institutional requirements into it. The lecturers were to develop the courseware and instructional manuals and populate it on the course sites which was set up by the ICT director. An essential activity needed for the successful deployment of the CMC portal was the training of all stakeholders in its utilization. Stakeholders attended the initial training organized by the institution but the level of utilization is still low and also, an integration plan of other IS in the near future is yet to be seen notwithstanding the fact that this may occur.

There was a sense of eagerness among stakeholders with the introduction of the CMC portal but the utilization of the system by some of the administrators was as a result of compliance with management instruction for the utilization of the system for that particular activity or process whilst utilization on the part of lecturers was intermittent and mostly characterized by the placement of course resources or materials for student access and the organization of mid-semester examination as well as some forum discussions. No clear plan aimed at making stakeholders commit to the utilization of the system could be seen from the institution and the stakeholders who were seen utilizing the portal for their day to day activities were either compelled to utilize the portal since there was no other alternative for undertaking that activity or they were simply devotees who are inspired to utilize the portal out of its apparent usefulness.

Table 4. Acceptance efforts scale

Evaluative terms	Meaning	Score	IE
Poor acceptance	Stakeholders resist utilization; no institutional inducement strategy for utilization	1	
Low acceptance	Few stakeholders show signs of acceptance; infrequent utilization of the CMC portal; no institutional inducement strategy for utilization	2	√
Adequate acceptance	Stakeholders show signs of acceptance; frequent utilization of the CMC portal; some clarity in institutional inducement strategy for utilization	3	
High acceptance	Stakeholders show high acceptance; more frequent utilization of the CMC portal; high clarity in institutional inducement strategy for utilization	4	
Very high acceptance	Stakeholders show very high acceptance behaviors; very high frequent utilization of the CMC portal; very high clarity in institutional inducement strategy for utilization	5	

5.5 Routinization stage

This stage is characterized by the Institutional efforts aimed at integrating the CMC portal into institutional processes and activities. Routinization is achieved when stakeholders are not able to perform their daily institutional activities or processes without the utilization of the portal. For institutions which existed before the introduction of the CMC portal system, the traditional way for the administration of the institution which includes teaching and learning would have to be modified to take into consideration the utilization of the CMC portal.

Table 5. Routinization efforts scale

Evaluative terms	Meaning	Score	IE
Hardly ever	System users hardly utilize the CMC portal for teaching, learning, and administration purposes; no institutional encouragement to utilize; no change in the structure of administration	1	
Occasionally	System users occasionally utilize the CMC portal for teaching, learning, and administration purposes; insignificant institutional encouragement to utilize; little change in the structure of administration	2	
Sometimes	System users sometimes utilize the CMC portal for teaching, learning, and administration purposes; some institutional encouragement to utilize; some change in the structure of administration	3	√
Frequently	System users frequently utilize the CMC portal for teaching, learning, and administration purposes; high institutional encouragement to utilize; high change in the structure of administration	4	
Almost always	System users almost always utilize the CMC portal for teaching, learning, and administration purposes; very high institutional encouragement to utilize; very high change in the structure of administration	5	

The lecturers teaching at the weekend school session were the ones seen to be utilizing the CMC portal more for teaching and learning purposes and this was as a result of the coordinator for that weekend School making the utilization of the portal mandatory. Inspiration to utilize the portal at the regular school session was derived from the weekend session's utilization yet institution-wide initiatives aimed at routinization of the system is yet to be propelled. Except for the policy on the utilization of the CMC portal for mid-semester examinations and uploading of students examination results which had been approved and in enforcement, a policy on the total utilization in the institution was yet to be put in place as well as a clear strategy aimed at the routinization of the CMC portal into the institution's day to day processes and activities.

5.6 Infusion stage

This is the stage where the institution is by all accounts seen to be well-organized as it is now able to provide institutional services in a more convenient and effective way utilizing the same or fewer resources used previously. A lot more students can be served more promptly utilizing the different delivery alternatives of the CMC portal. Higher level aspects of institutional work can now be realized because of the system's support of vital institutional functions which ultimately will result in efficiency and effectiveness in the administration of the institution.

The institution had other information systems being utilized for students' registration and other issues concerning examination such as results and transcript generation yet it was not done in an integrated manner so as to save time and resources. Despite the fact that the course sites for both regular and weekend school sessions had been set up, utilization of the platform was mainly by the weekend school lecturers. Many of the lecturers mostly utilized the platform for courseware materials storage for students' access as compared to just a few enthusiastic lecturers who explored the functionalities of the portal to a greater level. The delivering of full teaching, learning, and administration of students on the CMC portal platform were not too clear.

Table 6. Infusion efforts scale

Evaluative terms	Meaning	Score	IE
Very low effectiveness	The Institution manually spends time processing and supporting students' academic needs; utilization of more features of the CMC portal in traditional education lacking; utilization of the CMC portal for non-traditional education lacking	1	
Low effectiveness	The Institutional help for the processing and supporting of students' academic needs with the portal is moderate but it does so not in an integrated way; occasional utilization of more CMC portal features in traditional education; utilization of the CMC portal for non-traditional education undistinguishable	2	√
Moderate effectiveness	The Institutional help for the processing and supporting of students' academic needs with IS in an incorporated manner; utilization of more CMC portal features from time to time in traditional education; utilization of the CMC portal for non-traditional education distinguishable	3	
High effectiveness	The Institutional help for the processing and supporting of students' academic needs are incorporated as well as a core part of institutional work; high frequency in the utilization of more CMC portal features in traditional education; utilization of the CMC portal for non-traditional education very distinguishable	4	
Very high effectiveness	Utilization of CMC portal is of utmost importance for providing and supporting students' academic needs in an incorporated manner in both traditional and non- traditional educational programs. Hard to isolate the CMC portal from the institution.	5	

6 Conclusion and Future Work

6.1 Introduction

In this concluding Chapter, based on the proposed CMC portal implementation framework of this research, conclusions are drawn and presented from the research findings aimed at providing a blueprint on how an innovation like a CMC portal can be implemented in HEIs and an overview of potential future research work also provided.

6.2 Adoption phase

The adoption phase which involves the initiation, promotion, and adoption stages of the implementation process, plays a vital role in achieving a successful implementation of a CMC portal in any educational. The outputs of the stages in this phase of implementation determines the success of the other stages (adaptation, acceptance, routinization, and infusion) and it is in this vein that serious consideration and planning ought to be the utmost priority of any institution planning on implementing such system. The following are the different ways at the adoption phase by which institutions can achieve implementation success.

Needs/opportunities specification requirements: The knowing and documentation of the reason for the introduction of the CMC portal is a very important aspect in achieving a successful implementation. The reason can be a solution for a need or an opportunity for either an off-campus (online) or on-campus (hybrid) type of education. An institutional readiness assessment as well as which type of CMC portal solutions can only be made after an evaluation is done to see if there is a match between the functionalities of the various software or systems on the market and the needs/opportunities specification requirements of the institutional activities or processes.

Institutional readiness assessment: Knowing how ready an institution is in implementing an innovation like the CMC portal aimed at supporting an off-campus and on-campus style of education is a great step in achieving a successful implementation. An institutional readiness assessment can be carried out on stakeholders, ICT infrastructure and technical system support. Assessment on stakeholders should cover the perception, knowledge, and concerns about the utilization of the system, their ICT literacy level and the kind of training needed before full system utilization. With the ICT infrastructure, assessments must be done in areas of computer hardware, software, and internet connectivity to check its adequacy, reliability, and effectiveness. Technical system support assessment is needed before physical deployment because, for a successful implementation, there will be the need for technical expertise in the development, installation, configuration and hosting of the CMC portal system. The Identification of an Institutional CMC portal solution can then be done after the results of all the assessments indicate a satisfactory institutional readiness for the implementation.

Identification of an institutional CMC portal solution: The choice of which type of CMC portal solution will be subject to the availability of technical expertise to the institution. To achieve the objectives for the introduction of the system, one or more solutions can be deployed which can be either an open source or a proprietary one. There are pros and cons to selecting any of them. An open source solution will give the institution the flexibility in terms of modifications and can also be integrated with other information systems easily, however, the drawback is that it will require a higher level of expertise to carry out these enhancements. A proprietary solution will offer the needed support when necessary but they are restrictive and lack the flexibility needed for the integration of other systems. The choice between which type of solution must be done in accordance with the short- and long-term objectives for the introduction of the CMC portal in the institution. The provision of a mobile application connectivity feature of the CMC portal solutions for stakeholders should also be taken into account before a decision as to which type of CMC portal software solution is made. This is because the use of the mobile devices by people is very high in the world now, and deploying a CMC portal solution which has this mobile application feature will help in the utilization of the system by stakeholders.

Promotion: Institutions should identify and develop promotional strategies at all institutional levels, including faculty and departments, administrations, university resource centers, and the students because successful implementation of the CMC portal requires the promotion of the system among stakeholders. The organization of

seminars or forums, simulations and hands-on testing of the system(s) will be of great help in promoting the utilization of the system, especially for already existing institutions. Stakeholders must be involved in the final selection or comparison of the CMC portal solutions where possible as this will go a long way to guarantee their ownership and loyal participation when it comes to utilization.

System implementation group set-up: After the promotion of the system, an implementation group consisting of lecturers, students, administrators, ICT staff, management, and external system specialists must be constituted and given the terms of reference for a holistic CMC portal system planning and implementation. This is particularly necessary for an already existing institution so as to ensure that all stakeholder's concerns are addressed before physical system deployment leading to a greater level of ownership and acceptance of the CMC portal system.

System utilization policy: A policy highlighting the manner in which the system will be run and utilized is important before physical deployment. The policy should indicate the various roles played by stakeholders after deployment of the system, how the system is going to be rolled out (pilots, phases, parallel with traditional processes, or full) with timelines, and furthermore what sort of training is required by the stakeholders for appropriate and better utilization of the system. Stakeholder discussions on the policy are important at this stage particularly for already existing institutions in order to guarantee ownership and utilization of the CMC portal system leading to a successful implementation.

A decision regarding which sort of CMC portal software (open source or proprietary software), the technical expertise needed for installation, configuration and hosting, and the required resources needed for full implementation will be determined at this Adoption phase before the implementation phase.

6.3 Implementation phase

The implementation phase is the physical deployment of the system which involves the adaptation stage of the CMC portal implementation process. The set-up of the group responsible for the deployment should not only include technical ICT personnel but also other institutional stakeholders who can highlight the important pedagogical and institutional considerations needed for a successful physical deployment of the system. Below are the areas which need to be looked at during this phase.

CMC portal institutional requirements: The institutional requirements of the CMC portal need to be checked by the implementation group to see if all have been integrated into the system during the adaptation stage which includes the setup, configuration and hosting so that the objectives for the introduction of the system can be achieved. There is the need to also integrate the CMC portal with other IS being used in the institution to create an enterprise system. When an open source CMC portal system is used, technical expertise will be needed to integrate the other IS with it because the open source CMC portal system mostly come as a standalone system. Whereas the some of the proprietary systems mostly come with an already integrated module feature which allows easy connectivity with other IS but this comes with an added cost making institution to opt for the open source systems rather. The ac-

ceptance, routinization, and infusion of the CMC portal will be dependent on the integration of institutional requirements and other IS with it.

Courseware set up: The setting up of the courseware on the CMC portal includes the developments of the courses with their associated manuals and the course site setup. The utilization of the system by the students and lecturers is solely dependent on how the courseware is set up within that institutional structural and social context. The developments of the courses with their associated manuals can be done by the institution or an outsourced organization if the institution carrying out this implementation is a new one, but with an already existing institution, it can be done by the individual lecturers or a selected group of people within the institution since they are already using these course materials and manuals in teaching the students in the traditional way. The course site setup can be carried out by the ICT staff with the support of external expertise or an outsourced organization when the institution is a new one, and when the institution is an existing one, the course site setup can be done by the ICT staff with the support from external expertise within the implementation group or have it done by an external organization. The implementation group must make sure the courseware setup is in compliance with the institutional CMC portal objectives.

Training: For the successful utilization and institutionalization of the CMC portal system, there must be mandatory periodic training of stakeholders on the procedures and practices involved when utilizing the system for their daily activities. Regular training for stakeholders will make the utilization of the system easy leading to a greater acceptance which will aid in the institutionalization of the CMC portal. The delivery methods of the training should also be flexible in nature so as to attract the necessary commitments and participation from the stakeholders as well as sanctions applied to those who fail to avail themselves in these periodic training and also not utilizing the system.

Resource commitment: The successful implementation of the CMC portal will not be achieved if the institution fails to institutionalize the system for long term utilization. To achieve institutionalization, human, time and ICT resources need to be available. Human resource in terms of technical expert support for the running, maintenance, and upgrading of the system when needed must be provided. Time will also be needed by stakeholders in the utilization and training of the system as well as the provision of physical ICT equipment for the hosting and running of the CMC portal system. All these resources need to be provided as and when they are needed in order to achieve the objectives for the introduction of the system and stakeholder accountability of these resources must also be demanded.

6.4 Institutionalization phase

The institutionalization phase which is the Post-implementation phase within the CMC portal system implementation process includes the acceptance, routinization, and infusion stages. To achieve the full benefits and the objectives for deploying such a system, institutions should not only focus on just the implementation but also try and institutionalize the CMC portal utilization because it is at this stage where the system's functionalities are infused into the everyday activities carried out within the

institution. Below are some of the steps which can be taken to achieve institutionalization of the system.

Feedback/support: A higher level of Stakeholder acceptance and utilization of the system can be achieved through regular and consistent feedback between the technical staff responsible for the setup and maintenance of the system and them. A feedback channel can be set up and used to fine tune the performance of the system which will also lead to the improvement in the acceptance of the system. This feedback channel will also serve as a source of motivation for stakeholders to utilize the system without any fear of getting stuck for their daily activities or processes as help can be sorted through this medium. Another way to ease the system utilization is to provide a ready knowledge warehouse where the manuals of the various functionalities of the CMC portal including detailed operational manuals are stored for stakeholder reference when need be. The institutionalization of the system cannot be possible even if all the necessary resources for the implementation have been provided by the institution and there is a lack of feedback and support for all stakeholders of the system.

Institutional administration structure modification to suit utilization of CMC portal: Updating of existing institutional structures to incorporate the utilization of the CMC portal is an important activity that will bring about the institutionalization of the system. This is necessary especially for institutions which have been in existence long before the introduction of the system because there are existing traditional methods which stakeholders are used to in carrying out their daily activities and processes and the introduction of innovation like this CMC portal can bring about resistance or non-compliance on its utilization. A careful gradual modification of the institution's traditional ways of administration including management of staff and students and delivery modes used in teaching and learning, to suit the system will help in the routinization of the CMC portal in institutional processes, as well as improve the integration of work processes between different various departments leading to system institutionalization. Compliance to the system utilization in the daily processes and activities of stakeholders must be enforced and sanctions meted out to those who deliberately avoid its utilization. Rewards can also be given to those who utilize the system regularly for their daily activities, as this can serve as a source of motivation for others to fully utilize the system. Institutionalization can then be achieved when all these measures are put in place. There may not be the need for such measures for institutions that deployed the CMC portal during its inception.

System effectiveness and accessibility: The confidence in the utilization of the CMC portal by all stakeholders can be achieved only when the system is seen to be very effective when used in carrying out their day-to-day activities or processes. The effectiveness of the system can be attained when all other information system used in carrying out different activities like paying of fees, human resource management, library services, and etc. in the institution is integrated together to form an enterprise – like system. This will bring about ease and flexibility in the utilization of the system by all stakeholders which will go a long way in the institutions CMC portal Institutionalization efforts. The constant utilization of all the functionalities of the system in the management, teaching, and learning of students in both on-campus and off-campus type of education will allow stakeholders gain the much-needed experience in

using the system which will bring about system effectiveness. Making the CMC portal accessible to all stakeholders at all time using up-to-date technology will also help in the utilization which will help in the Institutionalization efforts. Accessibility can be enhanced by providing a CMC portal solution that has a mobile application connectivity feature as part of its functionalities, as this will help stakeholders to connect to the system from anywhere in the world without losing any of the functions or services provided by the system. The provision of a mirrored system as a backup should the system fail at any point in time will also ensure constant effectiveness and accessibility of the CMC portal.

The institutionalization of a CMC portal by institutions can only be successful through careful planning and adhering to all the implementation processes but despite the fact that there are success stories around, institutions continue to fail in their implementation efforts due to the non-adherence of these implementation processes.

6.5 Future work

Research into the implementation processes is just one part of how CMC portals can be used in HEIs. There is still the need for further research to be done on the process required for the integration of a CMC portal with other information systems forming an Enterprise resource planning system as well as how the modification of the institution's traditional ways of administration including management of staff and students and delivery modes used in teaching and learning, to suit the system is carried out. Since this research only focused on how the implementation of a CMC portal is done in HEIs, future research can also address how the implementation is carried out in other levels of education. This research has revealed so many issues in relation to how HEIs go about the deployment of a CMC portal system, yet there is more that can be revealed due to variations in an institution as well as different implementation environments so as to help HEIs in their implementation efforts of an IS particularly CMC portals.

Note: This paper is based on Kwofie (2015), referenced below.

7 Acknowledgement

This research is successful because of the key role played by Prof. Zhiguang Qin who is my Ph.D. supervisor at University of Electronic Science and Technology of China.

8 References

- [1] T. Browne, M. Jenkins, and R. Walker, "A longitudinal perspective regarding the use of VLEs by higher education institutions in the United Kingdom," *Interact. Learn. Environ.*, 2006. <https://doi.org/10.1080/10494820600852795>
- [2] T. H. Kwon and R. W. Zmud, "Unifying the Fragmented Models of Information Systems Implementation," in *Critical Issues in Information Systems Research*, 1987.

- [3] K. Lewin, "Group Decision and Social Change, in E. Newcombe and R. Harley, eds.," Readings Soc. Psychol. (New York Henry Holt.), pp. 459–473, 1952.
- [4] R. B. Cooper and R. W. Zmud, Cooper-1990-IT Implementation research- a technological diffusion approach.pdf. 1990.
- [5] A. Beaudry and A. Pinsonneault, "Advancing the Theory of Infusion: An Appropriation Model of the Infusion Process," Cah. du GreSI, no. 99, 1999.
- [6] L. G. Tornatzky and K. J. Klein, "INNOVATION CHARACTERISTICS AND INNOVATION ADOPTION-IMPLEMENTATION: A META-ANALYSIS OF FINDINGS.," IEEE Trans. Eng. Manag., 1982. <https://doi.org/10.1109/tem.1982.6447463>
- [7] R. K. Yin, Applied social research methods series. 1994.
- [8] Koforidua Technical University, "History." [Online]. Available: <https://www.ktu.edu.gh/about-ktu/the-university/history>.
- [9] B. Kwofie, "E-learning implementation in higher education institutions," Aalborg University, 2015.

9 Authors

Emmanuel Dortey Tetteh is a Ph.D. Candidate, at the School of Information and Software Engineering, University of Electronic Science and Technology of China, Chengdu, China.

Zhiguang Qin was a former Dean of the School of Information and Software Engineering at University of Electronic Science and Technology of China (UESTC), where he is also Director of the Key Laboratory of New Computer Application Technology and Director of UESTC-IBM Technology Center.

Benjamin Kwofie is a lecturer at the Koforidua Technical University in Koforidua, Ghana. He is at the computer's science department of the faculty of applied science and technology.

Article submitted 2019-07-10. Resubmitted 2019-08-11. Final acceptance 2019-08-12. Final version published as submitted by the authors.