iConAmoc- Intelligent Context-Aware Mobile College Portal Implementation for Event_Notification in Tertiary Institution in Nigeria

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ABSTRACT
Mobile College Portal stands for (MCportal) which serve as a student portal service platform using a mobile phone. Mobile devices are well known for the provision of messaging service, voice and data communication using online internet through the help of global wireless network service. It offers a service(s) over a portal through software using the internet to the student devices. The portal would allow online transaction for student activities anytime and anywhere. Latest mobile devices are context-aware using context and bundle of sensors inbuilt, and these devices are a significant part of daily life and best means of information transfer. This paper proposes 'iConAmoc'; which is a conceptual framework for an intelligent context-aware mobile college portal. The system uses the ontology-based technique, multi-agent model to enhance the existing context-aware architecture and separates domain knowledge from operational experience. The system also helps to disseminate relevant information and service(s) to students with an event_notification feature using appropriate university context. Another added feature is that during an emergency, relevant information can also be disseminated quickly to concerned students/staff. The ontology-based technique facilitates reuse and formalization of students'/staff context for knowledge construction and representation in an academic environment.

Keywords
Context-aware, User-agent, Context ontology, MCportal, Event_notification.

1. INTRODUCTION
Context-aware is a scenario where the device is aware of the state of its user [1]. This area of research is active and has gained maximum attention across the world as noted in the global market worth value of US$ 120 billion as at June 2018 [2]. Context-aware devices are known for adaptation whenever they are in use [3-5]. Sometime in an institution certain problem confronts management to change examination time table. As such the new adjusted time table do not get to all students, thus result to student missing the exact time when an examination is schedule to hold. Apart from the student the course invigilator somehow due to many activities owning to Nigerian factors, may forgot his/ her time table schedule which again could obstruct the examination. In view of this, the article intends to offer an alternative approach to this menace by suggesting an intelligent Context-Aware Mobile

College Portal (iConAmoc) for event_notification through sensitization with the help of install app on the mobile device within and outside the campus environment in the following tasks:

- Assignment
- Course schedule
- Calendar
- Payment
- Result checker
- Notification

However, for the detail of the conceptual framework on this implementation see [6].

2. METHODOLOGY
2.1 Proposed Approach
The method adopted for the implementation of the proposed approach is ontology-based multi-agent architecture for the mobile portal. It offers an intelligent context-aware application to support student and staff services. The approach utilizes the knowledge, logic distribution, reasoning capability and Knowledge reuse [7-8]. The existing MCportal does not pay attention to the characteristics such as Knowledge distribution, reuse and logic reasoning. Python was used to design and implement the interface that offers the necessary services to the target audience for both students and staff in the institution under review.

3. DESIGN AND IMPLEMENTATION OF EVENT_NOTIFICATION BASED ON ICONAMOC
iConAmoc attempts to resolve, the emergency occurrence of sudden academic activity or any kinds of changes in the tertiary institution with event_notification application conceptualized in our previous work [6]. The event_notification consist of phone_no, courseshedule, matric_no, student_name, event_notification, and staffprofile who will also benefit from the services if put to use in the institution. The concepts are achieved with ontology classes for flexibility and extensibility reasoning. The event_notification ontology courseshedule is modelled in an equivalent way to context ontology. The event_notification describes the event_notification type. It may be character values like courseshedule or timetable which is either (Examination or lecture timetable); resultchecker values is in character, one's result is ready, the server agent with the help of context-aware will pass the result to user agent for onward delivery to the student. If student is owning, only their finance status will be made known to them to clear their debt. After, payment the student will now be eligible to have access to their result through the same context in an automatic way. The

event_notification is active to any of the activities capture in the algorithm implemented in this scenario. However, the approach is dynamic in the sense that an update can be made in case of any additional activity is noticed in the institution pertaining to staff or students.

3.1 System Sequence Diagram1 for Implementation of Event_Notification for iConAmoc:

Fig.1 presents the expected interactions of server agent and a user agent in a System Sequence Diagram (SSD). The server agent will communicate with the user agent, through a context object/component by exchanging messages to each other. The server sends a request message to the user via the user agent, and the user replies to this request through the user agent by sending either inform or refuse messages. The server agent and the user agent would interact in the following way:

1. User agent verifies with context object/component and registers user through the server agent by specifying 'context-aware' as the event/activity description.
2. User agent queries server agent for the context object/component which specified 'context-aware' as the event/activity description.
3. Server agents reply User agent's query by sending agent identifier to the user.
4. User agent sends a request message to the server agent. This message includes userID, password.
5. If the request message contains missing or incorrect information, then a refusal message is sent to the user agent stating the error type.
6. If the request is valid, then an informed message containing context-aware information that is relevant to user's context is sent to the user.
7. If there exist, nearby users such as student/staff identify have been registered; then the similar message is sent to the users has been relevant to user's context has a message to the user.
8. If the time duration between the event/ notice is far from each other, then the server agent sends a reminder to guide.
9. On sending a reminder message, the user receives 'context-aware' of event/ activity notification through a server agent.

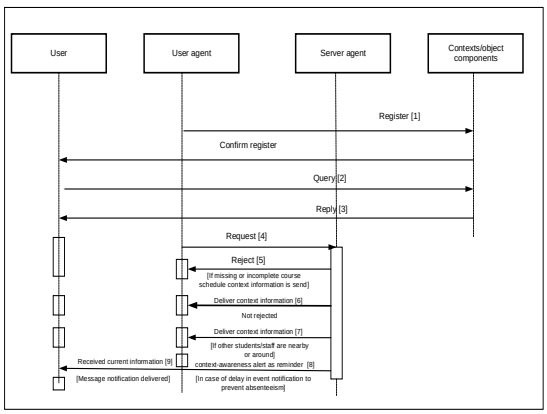

Fig.1: The flow of Interaction of the server agent with a user agent on the proposed approach for iConAmoc [6].

3.2 Result and Discussion based on iConAmoc Implementation

Fig. 2, shows the home page of the proposed approach prototype design. This page allows students and staff to accept and install the event_notification. Thereafter, a user name and password are required to complete the process of installation for subsequent use of the application which is stress free and save them from putting so many activities pile up in their brain. Basically, it sensitizes students and staff on any important schedule meant. However, the users need internet at all time. This may require bulk subscription at very cheap rate for beneficiary at all time. Thus, to encourage both students and staff despite the current hardship.

Fig. 2: Home page of iConAmoc interface

Fig. 3, presents the interface with the menu for the list of activities considered in the proposed solution implementation. As seen on the interface student assignment can be handle via the application. The chart perhaps is option but someone student can use it as platform for learning and solving problems that cut across them be it undergraduate or postgraduate. Course schedule at all levels can be assess through this button. However, if examination or test such comes up as a context to sensitize students or staff at the needed time prior to the stipulated time depending on how close is the event. Calendar displays activity in the order of priority task. Payment this button is tide to student account. They can use to make payment while Transaction Authorization Code (TAC) applies for any kind of payment. TAC is basically for security to restrict access to unauthorized users. Meanwhile, the application or mobile device owner should avoid giving their phone out. As this may pave way for hacker or illegal users to defraud rightful owner.

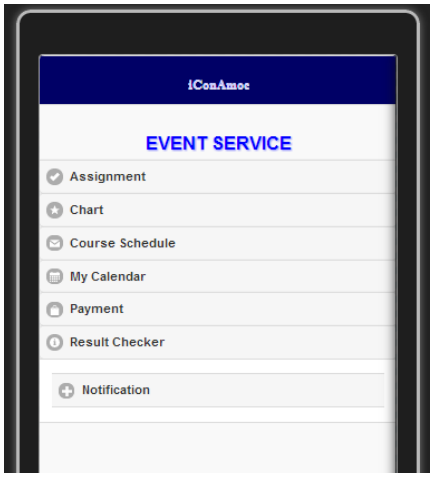

Fig.3: Event service screenshot menu

Fig. 4, shows the content of assignment that permits student to carry out any given task related to this icon on the interface. It allows students to carry out their assignment and submit it through the same medium to the course lecturer. Students can perform several assignments on weekly basis depending on how frequent the course lecturer gives one.

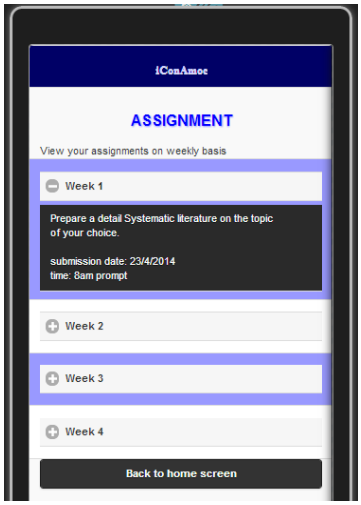

Fig. 4: Assignment activity screenshot menu

An example of the application with an adjusted lecture time scheduled for CSC 205 and 305 are display in Fig. 5 (a and b). Previously when such change is made the copy of the time table is manually published on the notice board on campus. Alternatively, copy is distributed to lecturers while interested student gets it and makes photo copy. As such the interface with a screenshot shown simplify the method by putting students and teaching academics staff on track by reminding them of the course type, time and venue to reduce the rate at which students miss their classes. It works in real time.

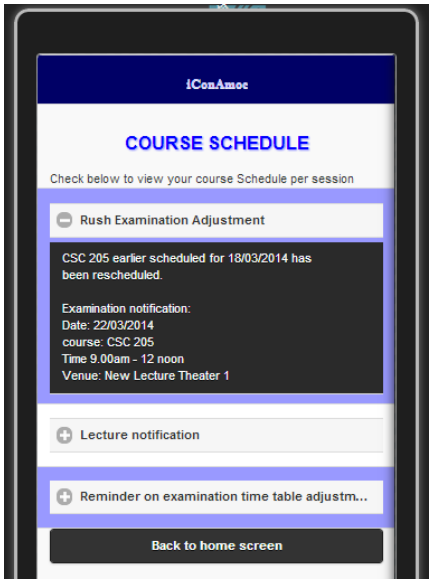

Fig. 5a: Course schedule for CSC 205 examination time table adjustment and change of date sensitization

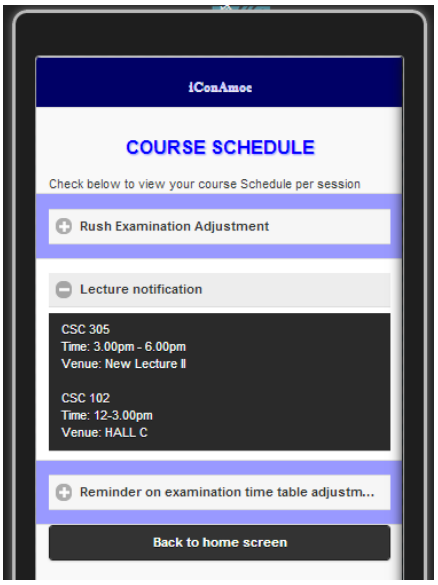

Fig.5b: Course schedule for CSC 305 examination time table adjustment and change of date sensitization

In Fig 6, examples of the interface that shows an examination time table rescheduled are displayed. Previously when such change is made the copy of the time table is manually published in the notice board on campus. As such some students or lecturers may fall short of getting the proper information on the new date as a result, of not seeing the notice or inadequate information through friend or colleague. Sometimes other activity may pre-occupy the lecturer and forget the actual time or date of the examination

The proposed approach with the interface in Fig. 6 from time to time sensitize both students and lecturers at every interval to solve the issue of student missing the course examination or lecturer failure to participate in the invigilation as schedules. It works in real time.

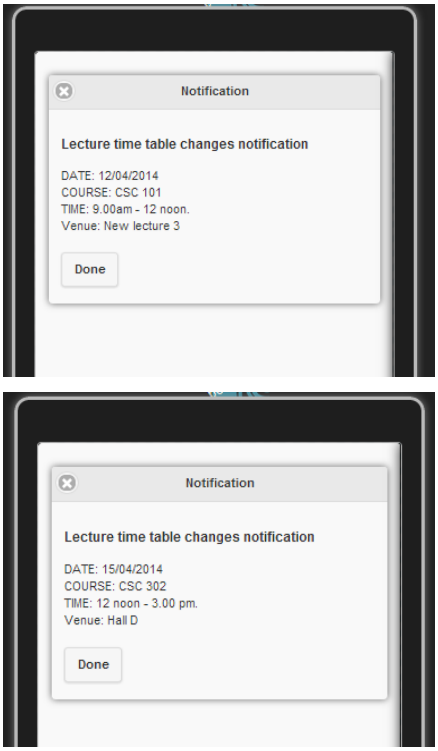

Fig.6: Course rescheduling for CSC 301 and 302 examinations and change of date sensitization notification

The last stage is the result checker screenshot of the interface. As soon as student results are ready. The student receives sensitization alert that his/her result is out and display for student to access his/her performance at the end semester. Once the session end the same cummulative result is made accessible. However, for some students who may be allowed to write examination with fee deficiency, such students recieves notification that outstanding should be made to enable see their result and their academic status.

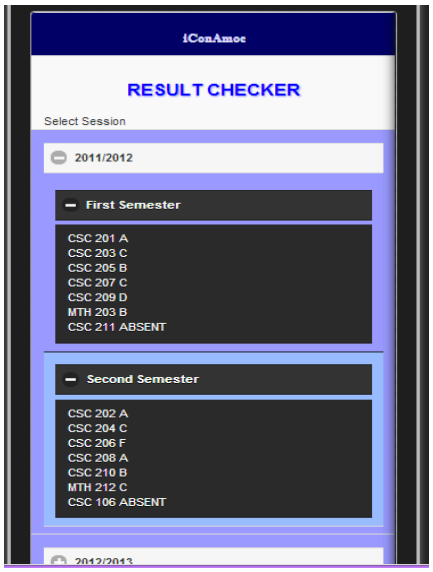

Fig.7: Result checker for students at the end of semester and session

4. COMPARISON OF ICONAMOC WITH OTHER RELATED WORKS

Table 1 presents the comparison of the frameworks based on the approach used with other similar approaches in the literature. The study improves on [9], by adding intelligent to the existing context-aware architecture using ontology technique and presents the implementation detail of the approach used. The additional features simplify the activity tasks of students and academic staff to easier their affairs through sensitization using notification alert in emmergency situation. This therefore minimizes the rate at which students miss lecture time table or examination. Also, it help lecturers in prompts participation of their academic activities with less burden with reminder system. Few of such automation is found in social activitiy but rarely seen in tertiary institution, hence the motivation for the contribution presnts in this study. This is will improve productivity of students and academics staff in our various institution in Nigeria if embrace and adopted into the system. Especially, when the need to change course schedule like examination time table or lecture time table, due to unavoided situation task occurrence on campus.

Table 1. Comparison of Proposed Approach 'iConAmoc' and other methods

Framework name	Agent-based	Context ontology	Domain for implementation
eAgora(SA)[10]	Yes	No	User behavior patterns in university
UniNav [11]	No	No	Navigation on campus road
CONON [12]	N/A	Yes	Uniform pattern identification
COSAR [13]	N/A	Yes	Activity inference using location data
Libaagent [14]	Yes	No	Augmented reality for book identification
UoLmp[15]	N/A	N/A	Personalized mobile learning
CaMsimu[9]	N/A	N/A	Theory and simulation with mobile device
iConAwa [16]	Yes	Yes	Social activity
iConAmoc [6]	Yes	Yes	N/A
iConAmoc implementation	Yes	Yes	Education (academic activities with various screenshots as prove of concept)
*Note- N/A: Not applicable			

The study improves on [6], with the implementation of real life scenario for handling an emergency situation, which was the limitation of previous conceptual framework. The approach presented various screenshot interfaces to expalin how the iConAmoc works through Figs 1 -7 as described in Subsection 3.2. The details of the designs and tools can be seen in [6]

5. CONTRIBUTIONS

Our main contributions in this paper are outlined as follows:

1. Implementation of iConAmoc system based on previous conceptual framework in [6].

2. Presentation of numerous examples from the system testing with the screenshot as prove of concept.

3. Propose approach will facilitate students and academic staff in the case of unavoided occurrence on campus with event-notification.

5.1 Limitation of the study

This work mainly focuses on academic activities in tertiary institution in Nigeria.

6. CONCLUSION AND FUTURE WORK

Based on the need for flexible handling of academic activities to simplify access method for both students and academics staff. This study proposed and implements an intelligent context-aware MCportal called iConAmoc. This will help to achieve smooth interactive system with real time event_notification, thus minimizes the rate at which students miss their lectures or examinations because of previously used manual method. At the same time the iConAmoc ease the academics staff task and lessen their burden among other daily routine service confronting us as individual especially in Nigeria through the utilization of contexts benefit in this digital age

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