A Mobile Learning Application for Delivering Educational Resources to Mobile Devices

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*Abstract-***Recording lectures have potential to serve as supplementary material to a conventional face-to-face lecture. One of the challenges of face-to-face lectures is the lack of persistency. In contexts of varied levels of student preparedness for higher education, such as South Africa, the lack of persistent of face-to-face lectures makes it difficult for students who struggle to understand lectures delivered in English which is a second or third language for most students. Recording of lectures provide flexibility on when and where it is played back whereby empowering students to self-pace their learning. This paper argues distribution of lecture resources as podcasts for listening to before and after class may enhance student engagement of lectures and foster interaction between student-student and student-lecturer, and student-content interaction. The use of automated approaches of recording face-to-face session, coupled with the affordances of distribution of audio via the Internet, has potential to enhance student learning and engagement with learning resources. The paper exploits the intersection between mobile devices for playback of audio media and Opencast for automated recording of face-to-face sessions and proposes a mobile framework to expose opencast artifacts to mobile devices.**

Keywords- Mobile learning; Opencast; Podcast; Mobile devices

I. INTRODUCTION

Most institutions of higher education are using podcasting as a way of widening access to e-learning to improve learning among their students [6]. A podcast is a collection of digital media files (audio) distributed over the internet using Really Simple Syndication (RSS) technology or Atom feeds[1].

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[1] http:// validator.w3.org/feed/docs/rss2.html

[2] www.opencast.org

Most institutions of higher education have a productive podcasting program already but are less efficient than they would like it to be and poorly situated to scale in response to the growing demand for lecture recordings and handling of media objects for the future.[2] Many educational institutions are embracing Opencast to produce and store large volume of recorded lectures to facilitate easy access for students[2] Opencast Matterhorn is a free, open-source platform to produce lecture recordings, manage existing video, serve designated distribution channels, and provide user interfaces to engage students with educational video[5].

With the advances in mobile and wireless technologies, usage of Smart Phones, iPhones, iPads and Tablets have become prominent in mobile learning [13]. In University of Cape Town (UCT), South Africa; explorations of possibilities of using Opencast mobile learning application is taking shape; students can watch opencast recorded lectures on their mobile devices while on campus where they have free access to internet and can also download it and move with it to off campus where most students do not have access to free internet. Students move from campus to off campus with their Opencast recorded lectures on their mobile devices and collaborate with other students anywhere and anytime. Our proposed mobile learning application supports the theory of mobile learning as argued by [10], that a theory of mobile learning must be tested against the following criteria:

- Is it significantly different from current theories of classroom, workplace or lifelong learning?
- Does it account for the mobility of learners?
- Does it cover both informal and formal learning?
- Does it theorize learning as a constructive and social process?
- Does it analyze learning as a personal and situated activity mediated by technology?

Our proposed Opencast mobile learning application seek to activate the educational shift from a formal, classroom-based and teacher-centred approach, which is prominent with the face- to -face traditional lecture to an informal, collaborative and learner-centred approach where learning occurs when the learner wants it[13].

II. FROM PODCAST TO OPENCAST

A. Podcasting Technology

Copley in [2] notes that a number of universities have begun to use podcasts to deliver supplementary lecture materials for campus-based students' (p.388). He further said that the most common use of podcasts in the universities is for the distribution of lecture recordings to enhance student review and revise.

Lecturing is the main teaching method used in universities [4] and remains the most common form of communication. However, lectures suffer from lack of persistence. Dolnicar in [3] indicated that the delivery of effective lectures can provide intellectual insight into challenging and innovative ideas. To make the traditional face- to-face lecture more effective as argued by Dolnicar in [3] we propose the recording and distributing of these lectures with our proposed opencast mobile application. The general passive role of students in most lectures emphases the need for more student centred learning strategies [7]. Despite the rigidity of lectures to change over the years, the evolution of digital technologies is opening up many possibilities. Podcasting technology assists in achieving student centred learning. After a user has subscribed to a podcast feed; podcasts are automatically pushed to the RSS reader or aggregator[1] (e.g. iTunes, iTuneU). Even if a learner with a portable device is disconnected from the internet for a certain period, podcast can still be pushed to the device as soon as reconnection is established. Learners can choose the most suitable time and venue to listen to podcasts or watch vodcasts.

B. Opencast Matterhorn

Opencast Matterhorn a free, open-source platform for supporting the management of educational audio and video contents has the ability to further improve the efficiency and production of lectures recording than podcasting [5]. Most institutions of higher education will produce a huge number of audio and video lecture recordings which are stored; opencast has the ability to store these huge recordings in a server and provide instant access to them. Podcast also works with a variety of tools and programs to produce and distribute content while opencast offers all the relevant functionalities as an integrated whole which reduces the amount of manual work needed to shepherd media objects across various sub-systems, thus increasing productivity and reliability [5].

Opencast also provides the educational community with a rich media platform for educational research, both technological and pedagogical. Higher education students can be reached in more ways, through plugging into the right learning context (e.g. LMS), or access through mobile devices hence increasing interaction, universal access and improved discoverability [5].

III. MOBILE LEARNING

A. Mobile Learning

Quinn's vision of M-learning in [9] stated that M-learning faced two major challenges, namely the problem of managing learning through intermittent connections and lack of cross-platform solutions to give all learners access to all materials independent of the devices they use. The latter issue is being addressed through interoperability efforts i.e XML related technologies overcoming the heterogeneity of different mobile devices.

In solution to the first challenge, Trifonova and Ronchetti in [11] describes m-learning delivery mechanism as being two extremes "pure connection" and "pure mobility" "pure connection" refers to a situation whereby the mobile device is continuously connected to the internet; "pure mobility" occurs when no connection is available, therefore, all needed learning contents must be downloaded to the mobile device beforehand in anticipation of a period of limited or no connectivity. This paper will focus on these two m-learning delivery mechanisms. In our exploration in University of Cape Town, South Africa, students have free access to internet while on campus but the access is not free off campus. When students are on campus they download learning resources to their mobile devices where the internet is free (pure connection) and make use of these resources off campus where there is no internet (pure mobility).

Our own definition of mobile learning is the ability of a learner to continue learning using the available educational resources as he/she moves from formal learning settings to informal learning settings.

IV. OPENCAST MOBILE LEARNING FRAMEWORK

A. Design Requirement Analysis for Opencast Mobile Learning

According to [8]; three general design concerns for mobile learning are:

- Generic mobile environment issues. Mobility of the learner should be looked at in different ways; Mobility of the user, mobility of the device, and mobility of the services
- Learning context: This determines the learning context: Wang's six dimensions[12]: identity, learner, activity, collaboration, spatio-temporal and facility
- Learning experiences and objectives should be emphasised

The design requirements of the Opencast Mobile learning are described below in

i.   Design Issues:

- User roles and profile
  ❖ Students that cannot cope with the face- to- face lectures only
  ❖ Fulltime Postgraduate students (FPS) on campus most of the time and attend all lectures
  ❖ Part time Postgraduate students (PPS) always on the move so they may not attend all the lectures
- Mobility support
  ❖ FPS move mainly within the campus with their mobile devices
  ❖ PPS move often from campus to outside the campus with their mobile devices
- Interface design
  ❖ Opencast Matterhorn software is used to record and automate lectures which students download to their mobile devices.
- Media
  ❖ The recorded lectures are available in images, video, text, and audio formats.
- Communication
  ❖ Student can download lectures to their devices through Wi-Fi, Bluetooth, 3G and server technologies

ii.   Learning Context [12]:

- Identity
  ❖ Lecturers/Presenters
  ❖ FPS
  ❖ PPS
- Activities

  ❖ Attending face- to face-lectures
  ❖ Downloading opencast lectures to mobile devices
  ❖ Moving from campus to off campus
- Facility
  ❖ Mobile devices: iPad2, Android phones, Nokia phones, Blackberry, 7inch and 10.1inch Samsung tablets

iii. Learning Experience:

- Organized contents
  ❖ Lectures, tutorial, lab information
  ❖ Assignments, assessments, Quiz
- Outcome and feedback
  ❖ Access to learning materials through download
  ❖ Students collaborate with each others
- Goals and objectives
  ❖ Access to learning contents anywhere and anytime
- Social interaction
  ❖ Interaction between FPS and PPS
  ❖ Interaction between PPS and PPS
  ❖ Interaction between FPS and FPS
  ❖ Interaction between Lecturers, PPS and FPS

iv. Objectives: Improve learning situations and standards

B.   Exploration: Opencast Mobile learning

Some Postgraduate students in higher education take on part time studies so that they can work some hours weekly to pay for their tuition and meet other needs. There is concern in the educational sector that part time students should get the same quality of education as their full time counterparts who invest their whole time to study.

Owing to the flexibility and portability of using mobile devices for learning anywhere and at any time, most learners have the flexibility to choose at will whichever location that suits them. For a full-time higher education (FPS) student living on campus, this choice may not seem as crucial as for another part-time student who has family and work commitments and commutes onto campus every day; This student has typically much more limited time than the full time student, and because of this constraint, it is much more important and necessary for this student to be able to make optimal use of any time that they have available and be able to learn effectively at any location.

These students frequently get into unplanned situations where they could learn if only the

learning can move with them and adapt to their need. Examples of such student are mothers having to wait in the doctor's waiting room for hours and students working as salesmen spending a lot of time driving from one customer to another either on train or in their own car [1].

Also due to different level of preparedness by students from different local educational background, some of these students cannot easily learn effectively with English language as a second or third language. Some students need to go through the lectures many times to actually understand; the traditional face -to -face lectures lack this kind of persistency. There are also some students who are too shy to ask lecturers questions during the face to face lecture [6]. Our proposed mobile opencast application is designed to improve the learning standards of these types of students and serve as a support for students who cannot learn effectively with the face- to-face lectures only. Our proposed opencast mobile framework is shown in figure 1; this shows the lecture capture by the lecturer or presenter, the encoding and processing of captured lectures into different file formats by Opencast Matterhorn and distribution to different mobile devices.

C. *A mobile Application Builder for Mobile Opencast*

Opencast Matterhorn has come as a way of automatically capturing and recording lectures in higher education. Pilots are currently being run at the Faculty of Health Sciences, University of Cape Town; this has grown to cover at least 12 venues at Upper Campus.

For part-time students or students always on the move there is need to have a mobile version of the Opencast. Currently Opencast lacks the user interface to expose recorded lectures to mobile devices; we have developed a mobile application UCTOPENCAST; a mobile user interface to Opencast which can run on some mobile devices (This is displayed in figure 2 and 3). Students can watch and listen to the opencast lectures on their mobile devices. Students that are shy to ask questions during the face to face lectures can make use of this application. This Mobile opencast application enables students to collaborate with each other using the blog option of the application. This mobile application has the ability and potential of enhancing learning among higher education students.

In our mobile opencast design, students can watch the video of any of the recorded lectures by selecting on the "Feed option". Students can also comment on the lectures by selecting the "Blog option" (figure2)
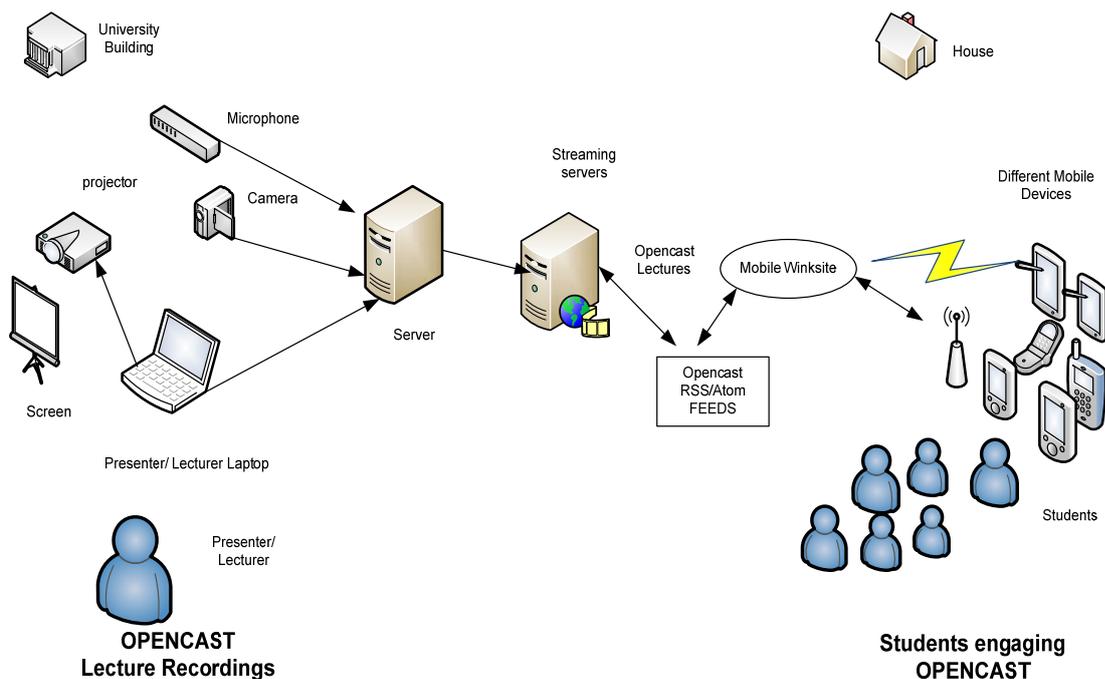

Figure 1. A Mobile Opencast Framework
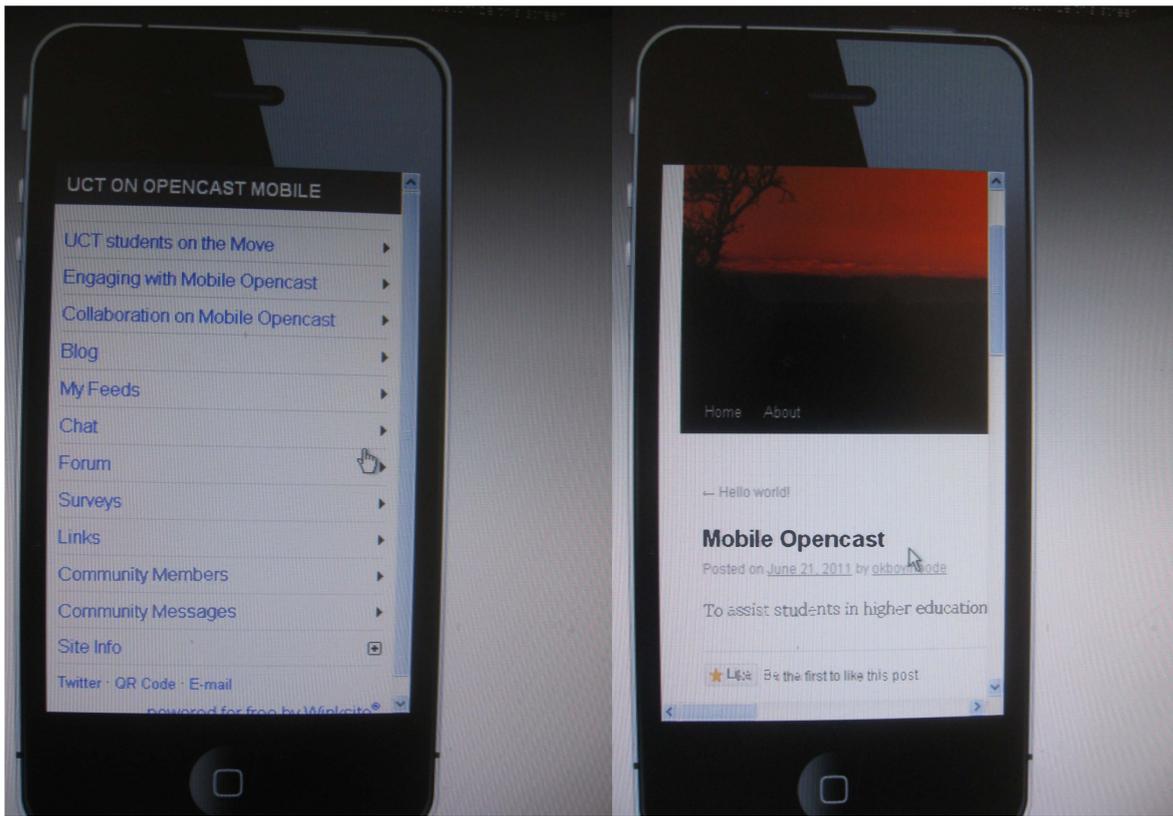
Figure 2. A Mobile User interface to Opencast
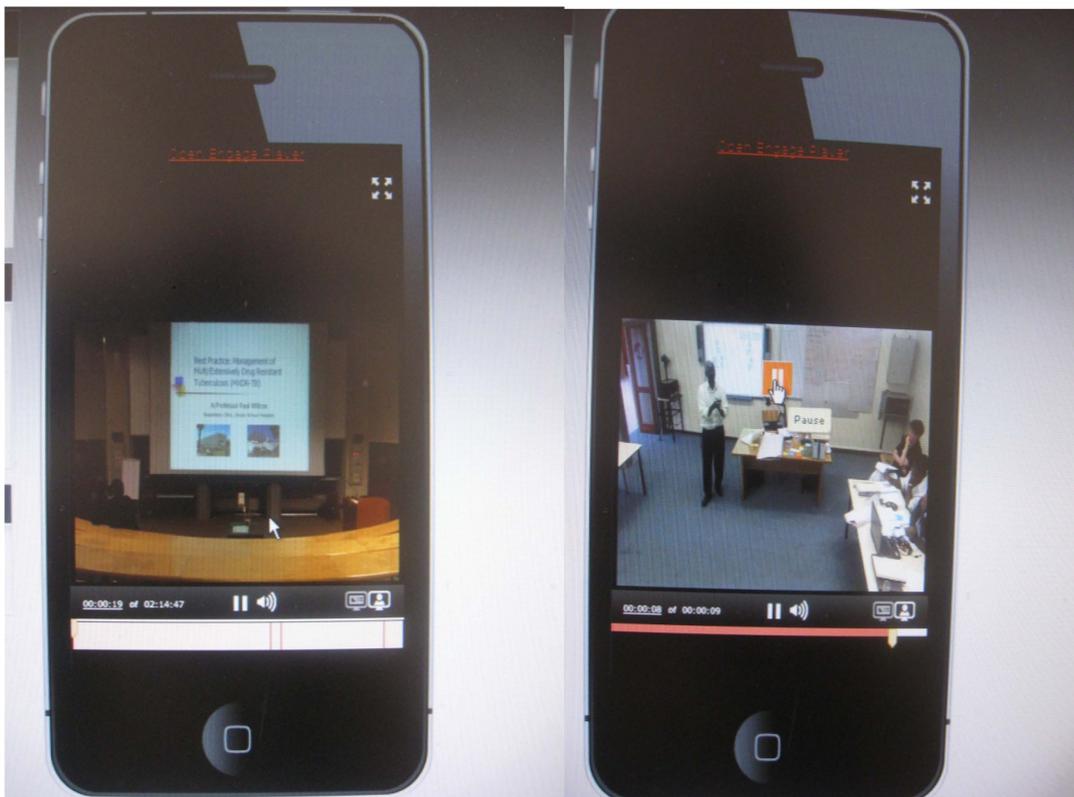
Figure 3. A Mobile User interface to Opencast

V. CONCLUSION AND CURRENT WORK

This paper discussed the design issues and application models that are important to opencast mobile learning. It incorporated the best practice in M-learning research into a practical framework of M-learning design requirements based on Opencast. In this paper we have been able to build a mobile opencast application that runs on some mobile devices, which aim to assist students in higher education to learn and collaborate with others while on the move. This mobile application will supplement the traditional face to face lecture. Our current work is evaluating this application and determines its usability and effectiveness in enhancing learning in higher education in South Africa.

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